DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 88TH AIR BASE WING (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE OHIO

88 ABW/JA
5135 Pearson Road RM 129
Wright-Patterson AFB OH 45433-5321

MAY 27 2004

Federal Sources
Attn: Ms. Elizabeth Steponkus
8400 Westpark Dr., Fourth Floor
McLean VA 22102

Dear Ms. Steponkus

This is in response to your 26 March 2004 Freedom of Information Act (FOIA) request for records relating to Teledyne contract MDA9729530013 . The FOIA control number assigned to this request is 04-246LK.

The records you have requested are partially exempt from disclosure. Portions of the information you requested contain commercial and financial information submitted by a person or entity outside the Federal Government on a privileged or confidential basis. If released, it is likely to cause substantial competitive harm to the submitter of the information or impair the government's future ability to obtain necessary information. The authority for this exemption may be found in the United States Code, Title 5, Section 552(b)(4).

If you decide to appeal this decision, write to the Secretary of the Air Force within 60 calendar days from the date of this letter. Include in the appeal your reasons for reconsideration and attach a copy of this letter. Please address your letter as follows:

Secretary of the Air Force
THRU: 88 CG/SCCM (FOIA)
Bldg 676 Rm 150
2435 5th Street
Wright-Patterson AFB OH 45433-7802

Sincerely

Michael L. Colopy

MICHAEL L. COLOPY, Colonel, USAF
Staff Judge Advocate

Attachments
1. AFMC Form 556, Invoice
2. Your Request Letter
3. Released Records

Kane Lynn C Civ 88 CG/SCCM

From: steponkl@fedsources.com
Sent: Friday, March 26, 2004 11:10 AM
To: WPAFB.FOIA@wpafb.af.mil
Subject: FOIA Request

Company Name: Federal Sources, Inc.
Name: Elizabeth Steponkus
Address: 8400 Westpark Dr., 4th Floor
City: McLean
State: VA
Zip: 22102
Phone: 703 610 8738
FAX: 703 883 0362
E-mail address: steponkl@fedsources.com

Description:
Teledyne contract MDA9729530013, including all attachments and exhibits and modification/amendment #2. Also a list of all follow-on Global Hawk contracts showing contract #, contractor, award and expiration dates, award value and title or brief description. Gail Parson is the POC.

Yes, I am willing to pay fees assessed for this request; however, please notify me if fees exceed: $200.

O. P. R. ERG
CONTROL # 04-246 LK
DUE DATE [illegible]

Contract No.	Award & Expiration Date	Award Value	Brief Description
F33657-01-C-4600	3/15/01 – 12/31/07	$45,000,000	EMD Program
F33657-01-C-4601	6/11/01 – 4/01/05	$20,524,297	LRIP Lot 1
F33657-02-C-5422	7/26/02 -- 12/31/06	$30,290,000	LRIP Lot 2
F33657-03-C-4310	6/27/03 – 8/31/06	$30,100,000	LRIP Lot 3
F33657-02-C-5424	4/08/03 – 12/31/04	$6,920,000	Logistics Support Contract
F33657-03-G-4306	1/09/03 – 1/09/08	$0	Basic Ordering Agreement (BOA)

AGREEMENT

BETWEEN

TELEDYNE RYAN AERONAUTICAL
A DIVISION OF TELEDYNE INDUSTRIES, INC.
2701 HARBOR DRIVE
P. O. BOX 85311
SAN DIEGO, CALIFORNIA 92186-5311

AND

THE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

(Hereinafter individually called a Party and collectively called the Parties)

CONCERNING

THE HIGH ALTITUDE ENDURANCE (HAE) UNMANNED AERIAL VEHICLE (UAV)
TIER II PLUS PROGRAM (Hereinafter called the Program)

Agreement No.: MDA972-95-3-0013
ARPA Order No.: C225
Total Estimated Government Funding of the Phase I Agreement: $1,000,000.00
Funds Obligated: $500,000.00
Authority: 10 U.S.C. 2371 and Section 845 of the 1994 National Defense Authorization Act

Line of Appropriation: AA 9740400 0200 5E4 6045 760013 0000 65990: $500,000.00

This Agreement is entered into between the United States of America, hereinafter called the Government, represented by The Advanced Research Projects Agency (ARPA), and Teledyne Industries, Inc. a California corporation, acting by and through its Teledyne Ryan Aeronautical Division (TRA) pursuant to and under U.S. Federal law.

FOR TELEDYNE RYAN AERONAUTICAL
A DIVISION OF TELEDYNE INDUSTRIES, INC.

(Signature)
R.A.K. Mitchell
President 11/2/94
(Name, Title) (Date)

FOR THE UNITED STATES OF AMERICA
THE ADVANCED RESEARCH PROJECTS AGENCY

(Signature)
(Name, Title) (Date)

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2701 HARBOR DRIVE
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CONCERNING

THE HIGH ALTITUDE ENDURANCE (HAE) UNMANNED AERIAL VEHICLE (UAV)
TIER II PLUS PROGRAM (Hereinafter called the Program)

Agreement No.: MDA972-95-3-0013
ARPA Order No.: C225
Total Estimated Government Funding of the Phase I Agreement: $4,000,000.00
Funds Obligated: $500,000.00
Authority: 10 U.S.C. 2371 and Section 845 of the 1994 National Defense Authorization Act

Line of Appropriation: AA 9740400.0200 5E4 6045 760013 0000 65990: $500,000.00

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FOR TELEDYNE RYAN AERONAUTICAL
A DIVISION OF TELEDYNE INDUSTRIES, INC.

(Signature)
R.A.K. Mitchell
President
(Name, Title)

11/2/94
(Date)

FOR THE UNITED STATES OF AMERICA
THE ADVANCED RESEARCH PROJECTS AGENCY

(Signature)
R. M. Reynolds
Dep. Director Management
(Name, Title)

11/4/94
(Date)

WP94-482(700-022A)

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AGREEMENT

TRA's TIER II+ VISION STATEMENT

Our vision is to team with ARPA and the ultimate Customer in an environment of collaboration and creativity to develop an affordable and very capable High Altitude Endurance UAV System.

ARTICLE I
SCOPE OF THE AGREEMENT

A. A joint Government-Industry team, using its best collective efforts, will define, produce and test the High Altitude Endurance Unmanned Aerial Vehicle System, providing the user with the maximum military utility at a specified Air Vehicle Segment Unit Flyaway Price (UFP). A close-knit team, motivated by the powerful incentive of operational necessity, in an environment unfettered by bureaucracy, can quickly produce the desired results within the cost requirements.

B. TRA has entered into a strategic alliance with E-Systems to complete the Tier II+ System definition. Close business relationships have also been established with other highly qualified and experienced companies, including Adroit, GDE Systems, Hughes and UNISYS to obtain the most capable partners in fulfilling the vision for the Tier II+ System. together, these companies form the TRA Team. Additional alliances and partnering arrangements will be developed with key sources as the Program proceeds, based upon trade studies, internal analyses and dialogue with the Government team.

C. TRA is taking full advantage of the unprecedented opportunity presented in the Agreement to establish business agreements and relationships which are not constrained by conventional Government contract rules and regulations. The TRA Team has and will continue to streamline business and technical approaches, including selection of the best of commercial or military practices, to assure the success of the Tier II+ Program.

D. The TRA Team is user-driven, and the Government team, through ARPA, will have continuous involvement with and full visibility into all activities throughout the Tier II+ Program. ARPA will obtain access to program results and certain data and patent rights pursuant to Articles IX and X. The members of the Government-Industry team, represented by ARPA and TRA in this Agreement, are bound to each other by a duty of good faith and best effort in achieving the program objectives.

E. The Program shall be performed in the following phases:

PHASE I - SYSTEM DEFINITION

1. The Tier II+ System preliminary performance objectives are specified in the Preliminary System Specification (Attachment 2). The TRA Team, in close cooperation with ARPA, shall perform those tasks necessary to refine the performance objectives of the Air Vehicle, Ground and Support Segments. The results of these efforts will be documented in a revision to the Preliminary System Specification and in the Preliminary Segment Specifications to be delivered to ARPA prior to completion of this phase. The studies, analyses, demonstrations and simulations performed during this phase shall be documented in accordance with the Integrated Master Plan (IMP) (Attachment 1). The TRA Team shall implement a systems engineering process to formulate and assess design trades, compare system capabilities and provide continuous visibility to ARPA of the configuration and Preliminary System Specification. Specific tasks to be performed by the TRA Team during Phase I are detailed in the Task Description Document (TDD), Article III of this Agreement. Key events to be accomplished during this phase include the System Objectives Review and Preliminary System Specification

Review, which shall be conducted in accordance with the IMP. System test plans for Phase II testing of the prototype system shall be developed to assure successful completion of the Flight Test Readiness Review during Phase II.

2. In conjunction with ARPA, TRA shall implement a program management process based on the concepts of Integrated Product Development (IPD). The IPD shall be accomplished through Integrated Product Teams (IPTs), with insights obtained from the Government team, to ensure that the Program progresses successfully through the Phase I (System Objective Review and Preliminary System Specification Review). The Management Information System identified in the IMP will be implemented during Phase I and will provide updated information to the members of the joint Government-Industry team. The Management Information System shall include the Technical Performance Measures (TPM), the Integrated Master Schedule (IMS) and the Financial Management System.

3. The IMP (Attachment 1) includes Accomplishment Criteria and TPMs to track the maturity of key program technical parameters and provide management indicators which forecast the achievement of program goals. The key TPM will be achievement of the Air Vehicle Segment UFP ($10M) requirement broken down by subsystem through Level 3 and the military utility provided by the Tier II+ System Configuration. The IMS shall be established and maintained to complement the IMP and provide continuous status of program accomplishments against time. This tiered system will provide visibility to Level 3 and selected Level 4 items. Lastly, the Financial Management System shall be implemented to provide ARPA with visibility into TRA's current budget and spend plan.

4. The period of performance for Phase I is six (6) months.

PHASE II - PROTOTYPE SYSTEM DESIGN, DEVELOPMENT AND INITIAL FLIGHT TESTING

1. The objective of Phase II is to design and develop the Tier II+ System; completely define the System Specification and all interfaces; produce a prototype system; and successfully complete initial flight testing. In Phase II, the Tier II+ System will consist of two (2) prototype air vehicles, a prototype Ground Segment, and a Support Segment capable of demonstrating initial system performance. The system shall be documented in the System Specification and Segment Specifications. The TRA Team shall prepare drawings and specifications required to produce the prototype system. Performance of this effort shall be oriented toward completion of the events outlined in the Tier II+ System IMP and the schedule contained in the IMS, as refined under Phase I.

2. Drawings and specifications necessary to produce the prototype Air Vehicle will be subject to initial and final design reviews and shall be delivered to ARPA prior to completion of Phase II. Two (2) prototype Air Vehicle Systems, integrated with propulsion and avionics subsystems and one (1) set of sensors, shall be produced and delivered for testing. The Air Vehicles shall be capable of demonstrating the credibility of the Tier II+ System as well as specific features of the design.

3. The TRA Team shall complete the prototype Ground Segment design and development and document its performance in the Ground Segment Specification, which will be delivered to ARPA prior to completion of this phase. The TRA Team shall provide one (1) Ground Segment for use in the prototype flight test program. This prototype Ground Segment may be an existing ground system or any combination of command and control, communications, data processing and mission planning hardware/software that will demonstrate performance of the Tier II+ System.

4. The TRA Team shall complete the design and development of the prototype Support Segment which shall be documented in the Support Segment Specification and delivered to ARPA prior to completion of this phase.

5. The TRA Team shall prepare for and conduct an initial flight test program and provide the logistics planning and support necessary to ensure the prototype tests are successfully completed in accordance with the schedule contained in the IMS. A Flight Test Readiness Review will be conducted using the flight test plan prepared in Phase I and updated to reflect Phase II refinements. A prototype flight test program shall be performed in accordance with the flight test plan which will demonstrate the initial operational performance of the Tier II+

System. Imagery shall be collected, processed and disseminated in this phase to evaluate end to end performance of the system.

6. The TRA Team shall complete implementation of the information architecture for the Management Information System established under Phase I and provide the computer resources necessary to support this architecture. This architecture will be used in providing the updated tracking information identified in Phase I which shall be provided on a monthly basis to members of the joint Government-Industry Team. TRA shall also implement an Earned Value Management System which will be used in association with the budgeting system established in Phase I as the basis for ARPA and TRA financial management of the program.

7. Phase II shall be performed in accordance with the updated IMP and the TDD contained in Article III. The period of performance for this phase will be approximately twenty seven (27) months. The actual time to complete this phase will be in accordance with the schedule contained in the IMS.

PHASE III - SYSTEM OPERATIONAL FIELD DEMONSTRATION

1. The objective of Phase III is to conduct a successful operational demonstration of the Tier II+ System. During this phase, the TRA Team shall produce and deliver eight (8) pre production Air Vehicle Systems fully integrated with all subsystems except for two (2) EO/IR sensors because of the mixed fleet analysis; two (2) Ground Segments capable of supporting the Air Vehicle Segments; and provide logistics support and planning for a User conducted two (2) year field demonstration of the Tier II+ System. This phase shall be conducted under an updated Agreement which shall include TRA's irrevocable offer to supply ten (10) Air Vehicle Systems under Lot 1 of Phase IV, for the recurring Unit Flyaway Price (UFP) of $10 million in FY 1994 Base Year Dollars. The $10 million UFP shall include all flight hardware including the airframe, avionics, sensors, communications, integration and checkout and is the total price paid by the Government, including profit, for the entire Air Vehicle System.

2. In support of the operational demonstration, the TRA Team shall provide the material and services required to operate and maintain the Tier II+ System. This support effort, including planning and preparations for the flight demonstration, logistics support and operator and maintenance training, shall be provided in accordance with the IMP and TDD incorporated into this Agreement.

3. The period of performance for Phase III will be approximately thirty-six (36) months. The performance schedule will be in accordance with the IMS.

F. This Agreement is an 'other transaction' pursuant to 10 U.S.C. 2358 and 10 U.S.C. 2371 and section 845 of the 1994 National Defense Authorization Act. The Parties agree that the principal purpose of this Agreement is to stimulate TRA IPD Team to provide its best efforts in development even though the acquisition of property or services for the direct benefit or use of the Government is present. The Federal Acquisition Regulation (FAR) and Department of Defense FAR Supplement (DFARS) apply only as specifically referenced herein. This Agreement is not intended to be, nor shall it be construed as, by implication or otherwise, a partnership, a corporation, or other business organization.

ARTICLE II
TERM

A. THE TERM OF THIS AGREEMENT. This Agreement commences 5 October 1994 and continues for the duration of Phases I through III of the High Altitude Endurance UAV (Tier II+) Program. This Agreement will be updated at various points to provide for downselection and phase transition. Such updates will include mutually agreed to terms and conditions. This Agreement ends at any downselect decision point at which the TRA IPD Team is unsuccessful.

B. TERMINATION PROVISIONS: Subject to a reasonable determination that the project will not produce beneficial results commensurate with the expenditure of resources, ARPA may terminate this Agreement by written notice to TRA, provided that such written notice is preceded by consultation between the Parties. In the event of a termination of the Agreement, the Government shall have paid-up Government purpose license rights to all data developed and delivered under this Agreement. ARPA and TRA will negotiate in good faith an equitable reimbursement for work performed toward the accomplishment of Payable Milestones at the time of Government termination. Failure of the Parties to agree to an equitable adjustment will be resolved pursuant to Article VII.

ARTICLE III
TASK DESCRIPTION DOCUMENT (TDD)

A. INTRODUCTION

Teledyne Ryan Aeronautical has formed a joint alliance and team with E-Systems, Inc. for the Tier II+ Program. At the program level, this alliance captures the basis of the Integrated Product Development (IPD) approach. Our alliance has been broken down to lower level IPTs that mirror the Tier II+ product hierarchy. Our IPTs jointly defined the essential Tier II+ Program tasks and requirements in order to design, develop, analyze, fabricate, integrate, and test the Tier II+ System. The TDD also identifies specific IPT tasks needed to help optimize the system design. The IPTs will use the candidate technical performance measures (TPMs) (Figure 3/A1/C-1, panel B), and systems engineering processes described in the Process IMP as the basis for their design efforts.

The IMP, together with the TDD and IMS, defines how we will conduct the Tier II+ Program. To maximize the effectiveness of the TDD, IMP, and IMS, these documents will be used together. To facilitate simplified traceability between documents, each of these (as well as our TA&S and PSS) employs our common numbering system based on the Work Outline Structure. Similar to a statement of work, the TDD describes the tasks that will be performed during the program. The IMP expands on the tasks of the TDD. Through a series of tables, the Product IMP details how higher level TDD tasking is broken down into accomplishment criteria that must be satisfied before we claim a significant accomplishment, and in turn, completion of a major program event. The IMS places the tasks used as accomplishment criteria in the IMP into the time domain. In the IMS, it becomes clear how the significant accomplishments of the IMP serve as entrance criteria for the identified program events.

As we have done in the Product IMP and IMS, we have arranged our TDD by phase and then by work outline in contrast to the arrangement provided in the TDD Guidance in the Tier II+ Program Solicitation. We believe that this arrangement will help us and ARPA conduct and track the progress of the program. Since program funding will be provided by phase, cost tracking and budget reallocations will be greatly simplified if the specific phase tasks are colocated. Additionally, as the program progresses through the initial three phases, the organization and skill mix of our IPTs will undergo change. Arranging the TDD, IMP, and IMS by phase simplifies our effort in assigning team responsibilities for the program tasks. Our IPTs have defined their tasks, accomplishments, and accomplishment criteria by performing an end-to-end product development analysis. We have elected to display the development plans and tasks by phase to simplify the execution of our program.

__Scope__. The Task Description Document encompasses the tasks that the TRA Team will accomplish to meet the primary program objectives. These primary requirements/objectives include:

— $10M Unit Flyaway Price (UFP),
— Compatibility with Existing Military Systems,
— Implementation of Concurrent Engineering and Integrated Product Development Philosophies,
— Reduction and Management of Program Risk,
— Maximization of Military Utility,
— Minimization of System Life Cycle Cost,
— Establishment and Development of a Customer/Contractor IPT.

The TRA IPTs will explore systems concepts and functional performance requirements for the Tier II+ System during Phase I. Performance is defined as the operational and support characteristics required to perform its assigned mission effectively and efficiently. The support characteristics of the system include supportability aspects of the design, and the support elements necessary for the systems operation. The teams will conduct trade studies, and will iterate the results of the studies to support the preparation for design, manufacture, integration, and test of the Tier II+ System commensurate with the primary objectives. The TDD will be maintained and revised throughout all program phases.

Because of the limited tasks for test and evaluation during Phase I, we have integrated systems engineering and test and evaluation tasks into a single IPT—System Engineering, Requirements, and Verification. In subsequent phases, this team will split into two teams: 1) Systems Engineering, and 2) System Test and Evaluation.

B. TASK DESCRIPTIONS

B.1 PHASE I

0000 HAE UAV (Tier II+) System. The tasks identified herein will refine the performance and interface requirements of the Tier II+ System. The IPTs will:

— Conduct and document trade studies,
— Perform analyses, demonstrations and simulations,
— Review current and emerging technologies,
— Perform subsystems' component selection and optimization,
— Define the integration requirements of the associated segments into the Tier II+ System,
— Establish a design concept that will satisfy the program objectives and provide for maximum military utility
Perform and document the manufacturing analyses and reflect it in the development of the design.

The results from these tasks and analyses will include a description of the selected designs, and a rationale for their selection based on design to cost allocations. The Team will update the Preliminary System Specification, and draft the three Preliminary Segment Specifications, and will deliver these to ARPA prior to the completion of Phase 1.

1000 Air Vehicle Segment. The Air Vehicle IPT will conduct the design tasks required to refine the air vehicle definition, design, and derived requirements based on trade study results. Design studies will be documented in the Preliminary Air Vehicle Segment Specification. These studies will be performed to ensure a system with maximum military utility at the $10M UFP requirement.

1100 Air Vehicle Integration. The Air Vehicle Integration IPT will define the integration plan for the air vehicle, the payloads, and the avionics, and will coordinate the air vehicle interface, functional subsystems, and systems integration requirements. The Air Vehicle Integration IPT will also complete the aerodynamic and performance trade studies in order to update the databases used for simulation of the Air Vehicle System, to establish detailed requirements for the landing gear and the ECS, to design the engine inlet and exhaust nozzle, and to define guidance and control concepts. To validate the air vehicle performance, aerodynamic and engine inlet wind tunnel testing will be conducted. The team will also:

— Perform UFP analyses and allocations to airframe, payload, and avionics elements
Write the Preliminary Air Vehicle Segment Specification, and define the airframe, payload, and avionics interfaces, and refine the air vehicle technical performance measures (TPMs),
— Conduct design tasks in order to define the electrical subsystem,
— Develop a simulation to verify the guidance and control system design,
— Define natural and induced environments, structural load limits, thermal models, and operational mission scenarios,
— Refine actuator performance requirements,
— Define the Phase II Air Vehicle Segment test requirements.

1200 Airframe Element. The Airframe IPT will perform trades, develop alternative concepts, and then select the best design that will meet the core performance objectives and the program UFP allocations. Trade study results will detail assumptions, specify ground rules, and address analyses. The team will define, and then refine the selected airframe itself, and the airframe mechanical and electrical interfaces. The airframe definition will include:

Stress and structural dynamics analyses,
— Mass properties analyses,
— Configuration control,
— Manufacturing processes and materials definition.
Tooling approaches and materials selection,
— Producibility and manufacturing robustness,
— Basic structural arrangements.

A three dimensional drawing, and a preliminary inboard profile of the airframe will be developed, and will be entered into a common design/product electronic database. Schematics of the fuel, electrical, cooling, hydraulic and pneumatic subsystems will be prepared, and trades will identify availability of commercial off the shelf hardware, or modified off the shelf hardware. Low speed wind tunnel scale models will be designed to support the aerodynamic and propulsion validation testing.

1400 Payload. The Payload IPT will conduct trade studies to assess, and establish a preferred payload baseline on the basis of military utility and performance. In addition, a SAR demonstration will be completed by Hughes using their company funds. The team will utilize the trade studies to refine the payload configuration, interface, and integration requirements, and will perform the trades and analyses for the:

- Synthetic Aperture Radar (SAR),
- Electro-Optical/Infrared Sensor,
- Self defense systems,
- Communications systems data links,
- Growth payloads,
- Sensor Management Unit,
- Airborne data recorder,

1500 Avionics. During Phase I, the Avionics IPT will adapt an existing PC based software simulator to the Tier II+ UAV System, and initiate an integrated avionics functional mockup of the system. The Avionics team will also develop a preliminary software design, and software development plan, and will prepare a software development cost estimate for Phase II. Other team tasks will include :

- Refining the hardware selection trades performed prior to proposal submittal,
- Developing and then documenting the hardware and integration requirements in an Avionics Element Interface Document,
- Developing the command and control concepts for the Air Vehicle System,
- Identifying the flight critical modes of the systems and subsystems,
- Developing and verifying the integrity of redundancy management algorithms.

2000 Ground Segment. The Ground Segment IPT tasks will include studies and analyses required to refine the key performance characteristics of the Ground Segment (LRE and MCE with embedded communications subsystems). The results of these tasks will be documented by the team in the Preliminary Ground Segment Specification (PGSS), and updated Preliminary System Specification, and will be delivered to ARPA prior to the completion of Phase I. In addition, the team plans to collect empirical performance data on the Ground Segment design by utilizing a hot bench and prototypes within the System Integration Laboratory (SIL).

2100 Integration. The Ground Segment IPT will provide input into the updated Preliminary System Specification, and draft a PGSS that will describe the overall Ground Segment. A Ground Segment internal Interface Control Document (ICD) for the MCE-LRE, and a draft Ground Segment integration and test plan will be developed. The PGSS will be drafted by the IPT as the design of the Ground Segment is iterated through Phase I. Subsystem functional allocations and data flows will be determined for each element of the Ground Segment, and will be documented in the PGSS. The team will also provide a functional hot bench that will simulate the test interfaces common to the Ground Segment. After government review, comments to the PSS and PGSS will be incorporated. Subjects of trade studies and analyses to be prepared at the Ground Segment level include :

- Operator workstation,
- Facilities/infrastructure (shelter, ECU, PDU, generators),
- High-speed network (FDDI vs. ATM vs. HIPPI),
- Mission planner (UAV survivability),
- Key TPMs : MTBF, MTTR, segment availability
- Datalink interface (hardware make/buy),
- Integrated Communication Support Plan,
- Mission planner (AFMSS Re-host and alternative approaches),
- Airspace deconfliction,

SOURCE SELECTION SE...

2200 Launch and Recovery Element. Following the completion of the Systems Objective Review (SOR), and based on the government's recommendations, guidance, and the established derived requirements, the LRE objectives will be documented in the LRE specification. The LRE specification forms a part of the Ground Segment Specification. Also during this program phase, the team will provide a hot bench prototype of the LRE Subsystem in order to aid in software development, early integration testing, risk mitigation, and early prototype development of the UAV command and control, and mission planning modules. Trade studies to be performed at the LRE level include configuring of the differential GPS station, and implementing the command and control subsystem.

2300 Mission Control Element. In parallel with the LRE effort, the Ground Segment IPT will refine the MCE Subsystem Architecture. Following the completion of the SOR, and based on the government's recommendations, guidance, and the established derived requirements, the MCE objectives will be documented in the MCE Subsystem specification. The MCE Subsystem specification forms a part of the Ground Segment Specification. The team will provide a hot bench prototype of the MCE Subsystem to aid in software development, early integration testing, risk mitigation, and early testing of the SAR and telemetry data demux, routing, display, and manipulation. Subjects of the trade studies to be performed at the MCE level include :

- System server,
- Sensor data storage,
- Product dissemination data format,
- Communications synchro/clock,
- Product dissemination (TCI/SSI)
- Ku Band SATCOM antenna configuration

3000 Support Segment. The Support Segment IPT will integrate the prime mission and Support Segments in order to maximize the utility of the system as a fieldable military resource. The Support Segment integration task will be to develop a coherent support concept in which the requirements that are specified for personnel skills, quantities, training, support equipment types and performance, prime mission equipment reliability, maintainability, safety and human factors, system element transportability, and spares and repair parts, are compatible with the system operation and maintenance planning.

Specifically, the Support Segment IPT will:

- Define Support Segment concepts and goals,
- Produce the Preliminary Support Segment Specification,
- Provide updates to the Preliminary System Specification,
- Perform sensitivity studies and analyses to identify the optimum organic versus contractor support mix, Identify preliminary system training objectives,
- Develop transportation requirements,
- Establish support equipment concepts, and list candidate support equipment,
- Define the preliminary spares and repairable parts concept, including identifying initial spares and repair parts, Identify fault tolerance, reliability, and maintainability impacts,
- Perform Support Segment life cycle cost analyses.

4000 Systems Engineering/Program Management The Systems Engineering and Program Management IPT tasks include the implementation of defined system engineering and management processes. These processes are based on the concepts of Integrated Product Development (IPD). The systems engineering process, and the management process will be used by all Teams in the Tier II+ Program. Both process descriptions are contained in the IPD Process Manual, and are summarized in the Process Integrated Master Plan (IMP). Both of these documents will be refined during Phase I and will be available on the management information system network.

The systems engineering process provides for the Systems Engineering Requirements and Verification Team to perform system level tasks such as management of reviews, trade study implementations and tracking, operations research, functional analysis, risk management, systems integration, and technical performance measures.

SOURCE SELECTION SENSITIVE

The program management process provides a vehicle for managing the activities of the teams through a series of tracking and control tools. For Phase I these tools include the program TDD, the program IMP, the program IMS, and a simplified budget and expenditure tracking and reporting system.

4100 Systems Engineering. Operations research during Phase I will concentrate on scenario modeling, military utility optimization, and system effectiveness trades. Functional analysis will result in a requirements database to establish functions, which will in turn be allocated to product teams responsible for hardware and software design.

Trade studies performed by the IPTs will be documented, and results will be incorporated into the functional analysis. Risk management will be coordinated, and the significant risks will be tracked, reported, and mitigated in conjunction with the responsible IPTs. Technical Performance Measures (TPMs) will be refined early in Phase I to allow tracking and to provide adequate schedule margin to make corrections. Integration of segment functions and identification of resultant interfaces will be accomplished, and the interface definitions will be incorporated into the PSS.

The PSS, including system reliability, maintainability, and safety, will be updated to have a draft available for review by the customer at PSSR. Customer inputs can then be incorporated prior to the end of Phase I. Review of Segment Specifications for format and consistency will also be performed.

The System Engineering IPT will organize, coordinate, and facilitate completion of all reviews conducted during Phase I. This task will entail providing guidance to participating teams, managing team data, and consolidating all team input into a coherent single presentation booklet that will serve as briefing slides for the reviews. Meeting minutes will be provided by this team to us and the customer after each review.

4200 Program Management. The TRA Team will implement and manage a program wide Management Information System to provide us and the customer with visibility into the program activities. The program management team will be responsible for maintaining the program WOS, TDD, IMP and IMS. Budget and cost status will be tracked using a tailored version of our existing program cost accounting system.

The program management team will be responsible for interfacing with the appropriate functional departments to ensure adequate resources are available to support the teams. During Phase I the functional department processes and procedures (i.e., Quality Assurance Manual, Operations Manual, Cost Accounting Manual, Engineering Design Manual, etc.) will be reviewed and modified to support the Phase II efforts.

5000 System Test and Evaluation. The Systems Engineering Requirements and Verification IPT responsibilities include the development of a Preliminary System Test Plan for Phase II testing of the prototype Tier II+ System. This plan will incorporate the segment integration and test plans. The plan will include system level testing necessary to ensure successful completion of the FTRR. The System Test Plan will include Phase II ground and flight testing of the prototype systems.

B.II PHASE II

0000 HAE UAV (Tier II+) System. The TRA Team will complete the design and development of a Tier II+ System. The system will include two prototype Air Vehicle Segments, one prototype Ground Segment and one prototype Support Segment, and will be capable of demonstrating complete systems performance. Iterative refinements and rationale for improvements will be developed throughout the design, development, and testing of the system. The required computer generated models, drawings, work instructions and tailored specifications (i.e., Product Data Package or PDP), will be completed by the team, in order to manufacture and integrate the system. The System Specification, and the three Segment Specifications will continue to be revised as the system design is matured.

1000 Air Vehicle Segment. The Air Vehicle IPT will complete the design, development and integration of two prototype Air Vehicles. The Product Data Package for the air vehicle will be completed, and presented during the review process of this program phase. UAV 001 will have all subsystems required for flight operations including propulsion, avionics, and provisions for the installation of the payload. UAV 002 will have all subsystems including propulsion, avionics, and payload subsystems. These two (2) air vehicles will be delivered for flight test, in order to verify the prototype operational Air Vehicle Systems performance. The Air Vehicle Segment Specification will continue to be updated as the design progresses.

1100 Air Vehicle Segment Integration The Air Vehicle System Integration IPT will validate and complete the avionics and payload element integration, and the hot bench development and hardware in the loop simulation in the SIL. The SIL will be used to 1) integrate air vehicle subsystems with the avionics hardware and software; 2) integrate the payload element with the avionics hardware and software; 3) test all interfaces at the element and subsystem level; 4) confirm the UAV closed-loop stability and control performance. The successful integration of all systems in the SIL will be followed by installation and systems test in the UAV. The Integration IPT will review the air vehicle test requirements to ensure that the System Test Plan will verify the design and performance requirements of the System Specification The team will refine, through simulation and analysis, the preliminary air vehicle characterization. This simulation and analysis includes:

- Refining the aerodynamic and propulsion performance,
- Selecting the flight control and guidance laws, and updating the 6DOF simulations,
- Analyzing ECS performance,
- Establishing structural loads, and structural dynamics characteristics,
- Defining electrical loads, and EMI/EMC controls.

Ground and flight test results will be analyzed, and lessons learned during the flight test phase will be incorporated into the final air vehicle configuration. By the end of this phase, the simulations for the air vehicle will be updated with the flight test results, and the air vehicle performance will be finalized.

1200 Airframe Element. The Airframe IPT will complete the design, development and integration of (2) prototype airframe subsystems. All airframe PDPs will be completed by the team in order to document the design and to facilitate manufacture and integration of the airframe subsystems. Acceptance criteria, initial work instructions, and tool designs will be included in the PDPs.

1400 Payload. The first set of flyable payload elements will be produced and tested during this phase. The Payload IPT will:

- Perform payload integration and testing in the SIL and the air vehicle,
- Characterize the performance for each payload element and the payload system as a whole,
- Perform payload management and imagery data handling tests,
- Document the Phase II interfaces and configuration of the payload elements,
- Write and test the Surveillance Management Unit software,
- Prepare ICDs, source control drawings, and specifications for the ESM and decoy system.
- Make recommendations for the use of P^3I for growth payloads.

1500 Avionics. During Phase II, the Avionics IPT will develop the detailed airborne hardware and software designs required to support the Tier II+ System. The avionics hardware solution requires only minor development. Therefore, TRA will finalize the hardware ICDs only as required. Installation design and procurement activities will be supported during the design and acquisition process. Test requirements will be developed as an integral part of the hardware design task. In addition, the Avionics IPT will develop a landing and takeoff testbed, to be flown in a manned aircraft in order to validate the automatic landing and takeoff algorithms.

Software design activities will parallel the hardware tasks and include the following:

- Write the Software Requirements Specification (SRS) and the Software Design Document (SDD) using DOD-STD-SDD as a guide, and develop it incrementally in conjunction with the air vehicle design,
- Code software as requirements are developed, and perform module level tests,
- Produce a Consolidated Software Test Document that captures the integrated software test requirements and documents the results,
- Perform hardware and software integration testing using the SIL facility,
- Build prototype hardware as required for software testing, including the UAV simulator/prototype.

2000 Ground Segment. The Ground Segment IPT will continue the definition and documentation of the Ground Segment Specification. SIL prototype development and testing will culminate in the integration and system demonstration of the prototype Ground Segment (LRE and MCE with embedded communications subsystem). The key segment TPMs (MTBF, MTTR and availability) will be reanalyzed, and verified empirically during the flight test effort. Upon the completion of the Ground Segment acceptance testing, all preliminary baseline documentation will be updated.

2100 Integration. The Ground Segment Integration IPT will finalize the Phase II integration and test plan and begin prototype segment development. After LRE and MCE Subsystem integration, the overall Ground Segment will be integrated and tested according to the I&T Plan. The prototype Ground Segment will then undergo system I&T.

2200 Launch and Recovery Element. The following specific tasks will be undertaken by the team :

- Perform early testing of the prototype differential GPS, and multiplexed VHF LOS interface of the UAV,
- Complete testing of the entire LRE data link interface including the UHF SATCOM interface,
- Complete LRE Subsystem integration.

2300 Mission Control Element. The following specific tasks will be undertaken by the team :

- Complete early communications testing (utilizing the SIL and UAV simulator/prototype),
- Prototype and test the image display software and SAR telemetry data demux, routing and manipulator tools,
- Complete MCE Subsystem integration.

3000 Support Segment. The Support Segment IPT will complete the specification of detailed support system requirements, and design, build, or provide the support system elements necessary to accomplish the Phase II system test program. The support system requirements will be documented in the updated Support Segment Specification.

3100 Support Segment Integration. The Support Segment IPT will continuously monitor the developing designs of the Air Vehicle and Ground Segments in order to ensure the evolution of system requirements into a supportable set of systems hardware and software. The Support Segment IPT will decompose the top level requirements in the Preliminary Support Segment Specification into detailed requirements for design and fabrication or definition of the support elements. The team will then use the decomposed requirements to enhance the supportability of the Air Vehicle and Ground Segment designs and to update the Support Segment specification. The team will also refine and update the life cycle cost analyses performed in Phase I.

3200 Training. The Support Segment IPT will identify training courses required to enable field personnel to operate and maintain the system. The team will define the course content and type of training that provides the most effective knowledge and skills transfer. Training requirements will be amplified in the Support Segment Specification. The Support Segment IPT will conduct the training required to support the flight tests of the air vehicle. The team will also develop O&M procedures.

3300 Support Equipment. The Support Segment IPT will finalize the requirements for common and peculiar support equipment required to service and maintain the Air Vehicle and Ground Segments. The team will update the Support Segment Specification with the finalized support equipment requirements. The requirements will be used to design, develop, and fabricate the support equipment required to implement the Phase II flight test program.

3400 System Fault Tolerance, System Reliability, and Maintainability. The Support Segment IPT will assess the effects of Air Vehicle and Ground Segment reliability and maintainability requirements on the Support Segment resources. After the reliability and maintainability effects analyses are completed, the Support Segment specifications will be updated to reflect the results of the analyses.

3500 Transportability. The Support Segment IPT will evaluate the system use concepts and the equipment physical parameters and environmental constraints to define the methods required to package, handle, store and transport the system elements. A major part of this effort will consist of the packaging of the system elements for transport in the cargo accommodations of the C-130. Requirements will be used to update the Support Segment Specification.

3600 Spare and Repair Parts. Considering the projected maintenance concept defined in Phase I, the Support Segment IPT will revise the list of the line replaceable units (LRUs), and spare and repair parts, required to maintain the system elements at the organizational maintenance level. A preliminary configuration for the Pack-up Kits (PUK) will be defined as an input for the Phase III effort. The team will also update the Support Segment Specification with the revised spares requirements.

4000 Systems Engineering/Program Management

4100 Systems Engineering. Phase II Systems Engineering IPT tasks will focus on the integration of the three segments, and on providing a refined information architecture that will provide visibility into all tracking tools defined during Phase I. Operations Research will concentrate on simulations and demonstrations that provide design guidance to the IPTs on observables, coverage, and survivability. Scenario modeling will be conducted to refine the requirements database, and to provide input for updates to the PSS and Segment Specifications. Risk management tasks will involve assessments, mitigation coordination, and reviews. Systems Effectiveness disciplines, such as reliability, human factors, maintainability, and system safety, will be coordinated, and the Process IMP will be updated. Technical performance measures (TPMs) will be updated along with status, actions, and recovery plans. Configuration management, change control, and standards as well as data management and release control will be an integral part of the Phase II activities. The Program Reviews will be organized, coordinated, and managed.

4200 Program Management. The TRA Team will continue to manage the program wide Management Information System in order to provide the customer with visibility into the program activities. The program management team will be responsible for maintaining the program WOS, TDD, IMP and IMS. The earned value management system developed during Phase I will be implemented. The program management team will be responsible for interfacing with all functional departments to ensure adequate resources are available to support the IPTs, and that functional department processes and procedures are in place and are working.

5000 System Test and Evaluation. The Systems Test and Evaluation IPT will develop the individual test plans and procedures necessary to conduct a successful ground test program of the prototype Tier II+ System. To reduce technical and schedule risks, verification testing will be conducted as early as possible and at the lowest practical level. Verification Ground Testing will include in-process inspections, in-process tests and component screening tests. Engineering tests will be conducted as required to qualify components, measure subsystem's performance, verify satisfactory segment integration, and demonstrate test range compatibility prior to flight test. In addition, integration and compatibility testing of the UAV and LRE/MCE will be performed.

The System Test and Evaluation team will develop and submit a General Flight Test Plan that will outline the requirements necessary to conduct up to (10) flight tests needed to verify total Tier II+ prototype system capability. This proposed flight test program will successfully demonstrate navigation, stability and control, range and altitude duration, UAV, LRE, and MCE functionality, mission planning and loading, payload and communication performance, military utility and overall operational Safety.

B.III PHASE III

0000 HAE UAV (Tier II+) System. The tasks identified for Phase III will include the fabrication, integration, assembly, test, and delivery of initial production Tier II+ UAV Systems. Our Team will prepare, and put in place the final plans needed for full scale production of the Tier II+ UAV System. Any changes will be incorporated into the System Specification, and the three (3) System Segment Specifications.

Support will also be provided to the user for field and operational demonstrations. This will encompass supporting the field demonstrations utilizing the logistics systems defined by our trade studies accomplished in the earlier phases.

1000 Air Vehicle Segment. The Air Vehicle IPT tasks for this phase will include the manufacturing and delivery of eight, fully integrated, initial production Air Vehicle Segments. The Air Vehicle Segments will be delivered in accordance with the IMS. The team will provide support during this operational demonstration.

1100 Air Vehicle System Integration. The Air Vehicle Integration IPT will incorporate design changes developed during Phase II prototype fabrication and testing into the appropriate system documentation. The team will:

— Complete all integration activities at the air vehicle and subsystem levels,
  Update the Systems Integration Lab hardware and software to the Phase III configuration,
— Conduct initial systems acceptance tests.
— Support all flight demonstrations.

1200 Airframe Segment. The Airframe IPT tasks will include the initiation of pre production for the Air Vehicle Segments. Pre-production will be accomplished by incorporating the design changes and revisions found during Phase II. Team tasks include:

— Release and validate the revised product data packages.
— Rework tooling changes needed, and proof out the tooling changes,
— Initiate the necessary procurement to support this phase,
— Support subsystems integration activities, and acceptance tests for the air vehicles

1400 Payload. The Payload IPT will update specifications, interface control documents (ICDs) and source control drawings (SCDs) as a result of changes indicated in Phase II of the program. Other Payload tasks include :

— Updating SMU software, and producing final payload documentation,
— Integration of the TWR and Decoy systems in the SIL.
— Integrating the final SAR processor into the air vehicle, evaluating the updated SAR software, and measuring SAR performance.

1500 Avionics. The Avionics IPT will revise the airborne systems design based on the experience gained during Phase II. The following tasks will be performed :

Incorporate any updated avionics system requirements,
- Revise software documentation and implement changes to software,
— Prepare ICDs and drawings,
— Perform testing of the Phase III software configuration.

SOURCE SELECTION SENSITIVE

2000 Ground Segment. The Ground Segment IPT tasks will include the delivery of two complete Ground Segments (LRE and MCE with embedded communication subsystem) fully capable of supporting the operational demonstration period. The Mission Planner will be upgraded to reflect the AFMSS core P^3I upgrades. The team will provide personnel to operate and maintain the Ground Segments during the operational demonstrations, and will work with DoD personnel to include their participation and evaluation of the ground system.

2100 Integration. The Ground Segment IPT tasks will include updating of the Phase II Integration and Test Plan, the incorporation of preplanned product improvements identified in earlier phases, and the definition of the Ground Segment production baseline through a series of design reviews. The approved design will enter production through the initial fabrication, and the acceptance of the two (2) pre-production LREs and MCEs. The key segment TPMs will be empirically measured during acceptance of the two segments. Once the Ground Segments are completed, the preparations for Phase IV will be accomplished by updating the final production baseline documentation, and incorporating any additional directed product improvements.

3000 Support Segment. The Support Segment IPT will provide the logistics support for the demonstration phase of the program. The level of support provided will include support equipment, training for operation and maintenance of the entire UAV system, and the initial spares needed for the Phase III demonstration. The team will support preparations for full production, and fielding of the Tier II+ System.

3100 Integration. The Support Segment IPT integration tasks include trade studies on changes required from Phase II testing. The team will finalize the service requirements for the production, operation, and deployment of the Tier II+ System.

3200 Training. The Support Segment IPT will revise the overall training plan, and training courses. The team will:

— Conduct training to assist the user.
— Review, incorporate, and validate changes to the O&M procedures based on the experiences gained during Phase II activities

3300 Support Equipment. The Support Segment IPT will be tasked with updating and incorporating revisions to the Support Equipment Requirements Documents. The team will have responsibility for :

— Defining and releasing the support equipment designs, and the support equipment procurement specifications,
— Procure and manufacture the support equipment,
— Validate support equipment operation before its delivery to the field.

3400 Fault Tolerance, Reliability and Maintainability. The Support Segment IPT will revise the reliability and maintainability (R&M) requirements by incorporating the R&M inputs collected during Phase II. The R&M performance of the system will continue to be monitored during this phase of the program.

3500 Transport. The information and results obtained from Phase II demonstrations and events will be used by the Support Segment IPT to update and revise the packaging, handling, storage, and transportation requirements. Other tasks to be performed will include :

— Revising of the final packing/unpacking plan and instructions.
— Procure and manufacture the reusable containers,
— Finalize the C-130 packing analyses and plan.

3600 Spare and Repair Parts. The provisioning requirements will be updated by the Support Segment IPT using actual usage and failure data collected during Phase II. For initial spares, the list will be updated and the initial spares for this phase ordered. The team will complete the requirements for the pack-up kits, and subsequently order the kit components needed to support the system in the field

4000 Systems Engineering/Program Management.

4100 Systems Engineering. The Systems Engineering IPT will serve as coordinator for all program management reviews to be conducted during this phase, and will prepare the agenda and minutes in support of these reviews. In addition, the team will support all the field operations, demonstrations and evaluations to be conducted by the user, and will conduct systems level verification. Any changes to the overall system design will be documented by the team, and evaluated for systems and inter-segment impact.

4200 Program Management. Our Team will manage the program wide Management Information System to provide the customer with visibility into the program activities and will remain responsible for maintaining the program WOS, TDD, IMP and IMS. The earned value management system will be maintained. The program management team will be responsible for interfacing with all functional departments to ensure adequate resources are available to support the IPTs, and processes and procedures are in place and working.

5000 System Test and Evaluation. The Systems Test and Evaluation IPT will be to plan, conduct, and support the field demonstration of two complete HAE UAV systems, and to plan for system tests in Phase IV

5100 Ground Tests. The team's tasks will include updating the Phase III ground test plan after reviewing the deficiencies found during Phase II testing. The revised test plans created by the team for all subsystem, and system level integration testing will be reviewed and approved by the affected IPTs. Data from the integration tests will be analyzed, and all results documented. The team will coordinate the validation of ground acceptance test procedures for the initial production Air Vehicle, Ground and Support Segments. Subsequent to acceptance of the first units, the team will conduct acceptance testing of the remaining air vehicles, and the remaining Ground Segment and Support Segment assets. The team will use the results obtained in Phase III to define the Phase IV testing requirements, and will prepare the Phase IV System Ground Test Plan.

5200 Flight Test. The Phase III flight test plan will be revised after reviewing the deficiencies identified during Phase II, and submitted with appropriate changes. The test team will validate the flight acceptance procedures, and will complete the first production flight acceptance test. After the initial test, the team will continue to conduct the flight acceptance testing for the remaining pre-production air vehicles. The team will provide O&M support to a government conducted two year Tier II+ system demonstration program.

ARTICLE IV
PAYABLE EVENT SCHEDULE

A. PAYMENT SCHEDULE: The TRA Team shall perform the work required by Article III, Task Description Document. TRA shall be paid in accordance with schedule set forth below, which may be revised or modified in accordance with Paragraph B of this Article.

Phase I: Schedule of Payments and Payable Milestones

Task	Payable Milestones	Payment Amount	Payment Schedule
1.	User's Conference	$500,000	2 Nov 1994
2.	Preliminary System Specification Review	$2,700,000	8 Feb 1995
3.	Preliminary System and Segment Specification Delivery	$800,000	4 Apr 1995

SOURCE SELECTION SENSITIVE

Phase II: To be negotiated prior to Phase II award.

Phase III: To be negotiated prior to Phase III award.

B. MODIFICATIONS

1. At any time during the term of the Agreement, progress or results may indicate that a change in the TDD and/or the Payable Milestones, would be beneficial to the program objectives. Recommendations for modifications, including justifications to support any changes to the TDD and/or the Payable Milestones, shall be documented in a letter and submitted by TRA to the ARPA Program Manager with a copy to the ARPA Agreements Administrator. This letter shall detail the technical, chronological, and financial impact to the proposed modification to the Program. Any subsequent modification is subject to mutual agreement. The Government is not obligated to pay for additional or revised Payable Milestones until the Payable Milestones Schedule is formally revised by the ARPA Agreements Administrator and made part of this Agreement.

2. The ARPA Program Manager shall be responsible for the review and verification of any recommendations to revise or otherwise modify the Agreement TDD, Schedule of Payments or Payable Milestones, or other proposed changes to the terms and conditions of this Agreement.

3. For minor or administrative Agreement modifications (e.g., changes in the paying office or appropriation data, changes to ARPA or TRA personnel identified in the Agreement, etc.) no signature is required by TRA.

ARTICLE V
AGREEMENT ADMINISTRATION

A. Administrative and contractual matters under this Agreement shall be referred to the following representatives of the parties:

ARPA: Robin M. Swatloski, Agreements Administrator 703/696 4434

TRA: Robert B. Carpenter, Agreement Administrator 619/260-4452

B. Technical matters under this Agreement shall be referred to the following representatives:

ARPA: John Entzminger, Program Manager 703/524-5199

TRA: Martin K. Winkler, Program Manager 619/260-4312

C. Each Party may change its representatives named in this Article by written notification to the other Party.

ARTICLE VI
OBLIGATION AND PAYMENT

(NOTE: The Parties shall negotiate payment methods and appropriate provisions for Phases II and III prior to the start of performance of each phase. If the payment method agreed upon is a type of cost reimbursement, Cost Accounting Standards (CAS) will apply.)

A. OBLIGATION: The Government's liability to make payments to TRA is limited to only those funds obligated under this Agreement or by amendment to the Agreement. ARPA may obligate funds for the Agreement incrementally. In the event the Program is incrementally funded, this Agreement will be modified to incorporate such funding.

B. PAYMENTS.

1. Prior to the submission of invoices to ARPA by TRA, TRA shall have and maintain an established accounting system which complies with Generally Accepted Accounting Principles, and with the requirements of this Agreement, and shall ensure that appropriate arrangements have been made for receiving, distributing and accounting for Federal funds.

2. TRA shall submit an original and five (5) copies of all invoices to the ARPA Agreements Administrator for payment approval. After written verification of the accomplishment of the Payable Milestone by the ARPA Program Manager, and approval by the ARPA Agreements Administrator, the invoices will be forwarded to the payment office within thirty (30) calendar days of receipt of the invoices at ARPA. Payments will be made by AFDW/FW, Attn.: Commercial Services, 170 Luke Avenue, Suite 280, Bolling Air Force Base, Washington, DC 20332-5113 within thirty (30) calendar days of ARPA's transmittal. Payment shall be made to the address of TRA set forth below unless changed by written modification to this Agreement.

3. Address of Payee: Teledyne Ryan Aeronautical
File No. 0011216
Los Angeles, CA. 90074-1216

4. Limitation of Funds: In no case shall the Government's financial liability exceed the amount obligated under this Agreement. If this Agreement is incrementally funded by ARPA, TRA shall notify the ARPA Agreements Administrator when the costs TRA expects to incur in the next sixty (60) days, when added to costs previously incurred, will exceed eighty percent (80%) of the total amount obligated. TRA is not obligated to continue performance or incur costs under this Agreement that would exceed the amount obligated by ARPA.

5. Financial Records and Reports: TRA's relevant financial records for each Program Phase, are subject to examination or audit on behalf of ARPA by the Government for a period not to exceed three (3) years after completion of that phase. TRA shall provide the ARPA Agreements Administrator or designee direct access to sufficient records and information of TRA to ensure full accountability for all funding under this Agreement. Such audit, examination, or written access shall be performed during business hours on business days upon prior written notice and shall be subject to the security requirements of TRA.

ARTICLE VII
DISPUTES

A. GENERAL: The Parties shall communicate with one another in good faith and in a timely and cooperative manner when raising issues under this Article.

B. DISPUTE RESOLUTION PROCEDURES.

1. Any disagreement, claim or dispute between ARPA and TRA concerning questions of fact or law arising from or in connection with this Agreement, and, whether or not involving an alleged breach of this Agreement, may be raised only under this Article.

2. Whenever disputes, disagreements, or misunderstandings arise, the Parties shall attempt to resolve the issue(s) involved by discussion and mutual agreement as soon as practicable. In no event shall a dispute, disagreement or misunderstanding which arose more than three (3) months prior to the notification made under Subparagraph B.3 of this article constitute the basis for relief under this article unless the Director of ARPA, in the interest of justice, waives this requirement.

3. Failing resolution by mutual Agreement, the aggrieved Party shall document the dispute, disagreement, or misunderstanding by notifying the other Party (through the ARPA Agreements Administrator or TRA Agreement Administrator, as the case may be) in writing of the relevant facts, identify unresolved issues, and specify the clarification or remedy sought. Within five (5) working days after providing notice to the other Party, the

aggrieved Party may, in writing, request a joint decision by the ARPA Deputy Director for Management and the TRA Vice President for Engineering. The other Party shall submit a written position on the matter(s) in dispute within thirty (30) calendar days after being notified that a decision has been requested. The representatives of the aggrieved Party shall conduct a review of the matter(s) in dispute and render a decision in writing within thirty (30) calendar days of receipt of such written position. Any such joint decision is final and binding unless a Party shall, within thirty (30) calendar days, request further review as provided in this Article.

4. Upon written request to the Director of ARPA, made within thirty (30) calendar days, or upon unavailability of a joint decision under Subparagraph B.3 above, the dispute shall be further reviewed by a Senior Review Board (the Board). The Board shall be composed of the Director of ARPA, personally or through a designee, a senior TRA official and an impartial third party selected jointly by the Parties. Following the review, the issue(s) will be resolved by a majority decision of the Board and the Parties will be notified in writing. Such resolution is not subject to further administrative review and, to the extent permitted by law, shall be final and binding.

ARTICLE VIII
AUTHORIZATION AND CONSENT AND NOTICE OF CLAIM

A. The Government authorizes and consents to all use and manufacture of any invention described in and covered by a United States patent in the performance of this Agreement or any subcontract or lower tier agreement.

B. TRA shall report to the ARPA Agreements Administrator, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Agreement of which TRA has knowledge.

C. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Agreement or out of the use of any supplies furnished or work or services performed under this Agreement, TRA shall furnish to the Government, when requested by the ARPA Agreements Administrator, all evidence and information in possession of TRA pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where TRA has agreed to indemnify the Government.

D. TRA agrees to include, and require inclusion of, this article in all subcontracts and agreements at any tier for supplies or services related to this Agreement expected to exceed $25,000.

ARTICLE IX
PATENT RIGHTS

A. DEFINITIONS:

1. "Invention" means any invention or discovery which is or may be patentable or otherwise protectable under title 35 of the United States Code, or any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

2. "Made" when used in relation to any invention means the conception of first actual reduction to practice of such invention.

3. "Nonprofit organization" means a university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

4. "Practical application" means to manufacture, in the case of a composition of product; to practice, in the case of a process or method, or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

5. "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this article, the size standards for small business concerns involved in Government procurement and subcontracting at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.

6. "Subject invention" means any invention of TRA conceived or first actually reduced to practice in the performance of work under this agreement, provided that in the case of a variety of plant, the date of determination (as defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of agreement performance.

B. ALLOCATION OF PRINCIPAL RIGHTS:

TRA may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this article and 35 U.S.C. 203. With respect to any subject invention in which TRA retains title, the Federal Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

C. INVENTION DISCLOSURE, ELECTION OF TITLE, AND FILING OF PATENT APPLICATION BY TRA:

1. TRA will disclose each subject invention to the Federal agency within 2 months after the inventor discloses it in writing to TRA personnel responsible for patent matters. The disclosure to the agency shall be in the form of a written report and shall identify the agreement under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the agency, TRA will promptly notify the agency of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by TRA.

2. TRA will elect in writing whether or not to retain title to any such invention by notifying the Federal agency within 2 years of disclosure to the Federal agency. However, in any case where publication, on sale or public use has initiated the 1-year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period.

3. TRA will file its initial patent application on a subject invention to which it elects to retain title within 1 year after election of title, or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. TRA will file patent applications in additional countries or international patent offices within either 10 months of the corresponding initial patent application or 6 months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

4. Requests for extension of the time for disclosure election, and filing under Subparagraph C.1, .2, and .3 of this article may, at the discretion of the agency, be granted.

D. CONDITIONS WHEN THE GOVERNMENT MAY OBTAIN TITLE:

TRA will convey to the Federal agency, upon written request, title to any subject invention-

1. If TRA fails to disclose or elect title to the subject invention within the times specified in Paragraph C of this article, or elects not to retain title; provided, that the agency may only request title within 60 days after learning of the failure of TRA to disclose or elect within the specified times.

2. In those countries in which TRA fails to file patent applications within the times specified in Paragraph C of this article; provided, however, that if TRA has filed a patent application in a country after the times specified in Paragraph C of this article, but prior to its receipt of the written request of the Federal agency, TRA shall continue to retain title in that country.

3. In any country in which TRA decided not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a subject invention.

E. MINIMUM RIGHTS TO TRA AND PROTECTION OF TRA RIGHT TO FILE:

1. TRA will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if TRA fails to disclose the invention within the times specified in Paragraph C of this article. TRA's license extends to its domestic subsidiary and affiliates, if any, within the corporate structure of which TRA is a party and includes the right to grant sublicenses of the same scope to the extent TRA was legally obligated to do so at the time the agreement was awarded. The license is transferable only with the approval of the Federal Agency, except when transferred to the successor of that part of TRA's business to which the invention pertains.

2. TRA's domestic license may be revoked or modified by the funding Federal agency to the extent necessary to achieve expeditious practical application of subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR Part 404 and agency licensing regulations (if any). This license will not be revoked in that field of use or the geographical areas in which TRA has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of the funding Federal agency to the extent TRA, its licensees, or the domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country

3. Before revocation or modification of the license, the funding Federal agency will furnish TRA a written notice of its intention to revoke or modify the license, and TRA will be allowed 30 days (or such other time as may be authorized by the funding Federal agency for good cause shown by TRA) after the notice to show cause why the license should not be revoked or modified. TRA has the right to appeal, in accordance with applicable regulations in 37 CFR Part 404 and agency regulations, if any, concerning the licensing revocation or modification of the license.

F. TRA ACTION TO PROTECT THE GOVERNMENT'S INTEREST:

1. TRA agrees to execute or to have executed and promptly deliver to the Federal agency all instruments necessary to (i) establish or confirm the rights the Government has throughout the world in those subject inventions to which TRA elects to retain title, and (ii) convey title to the Federal agency when requested under Paragraph D of this article and to enable the Government to obtain patent protection throughout the world in that subject invention.

2. TRA agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by TRA each subject invention made under agreement in order that TRA can comply with the disclosure provisions of Paragraph C of this article, and to execute all papers necessary to file

patent applications on subject inventions and to establish the Government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required by Subparagraph C.1 of this article. TRA shall instruct such employees, through employee agreements or other suitable educational programs, on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

3. TRA will notify the Federal agency of any decisions not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response period required by the relevant patent office.

4. TRA agrees to include, within the specification of any United States patent application and any patent issuing thereon covering a subject invention, the following statement, "This invention was made with Government support under Agreement No. MDA972-95-3-0013 awarded by ARPA. The Government has certain rights in the invention."

G. SUBCONTRACTS:

1. TRA will include this article, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or domestic nonprofit organization. The subcontractor will retain all rights provided for TRA in this article, and TRA will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

2. TRA will include in all other subcontracts, regardless of tier, for experimental, developmental, or research work the patent rights article required by Subpart 27.3.

3. In the case of subcontracts, at any tier, the agency, subcontractor, and TRA agree that the mutual obligations of the parties created by this article constitute an agreement between the subcontractor and the Federal agency with respect to the matters covered by the article; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under Paragraph J of this article.

H. REPORTING ON UTILIZATION OF SUBJECT INVENTIONS:

TRA agrees to submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by TRA or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by TRA, and such other data and information as the agency may reasonably specify. TRA also agrees to provide additional reports as may be requested by the agency in connection with any march-in proceeding undertaken by the agency in accordance with Paragraph J of this article. As required by 35 U.S.C. 202(c)(5), the agency agrees it will not disclose such information to persons outside the Government without permission of TRA.

I. PREFERENCE FOR UNITED STATES INDUSTRY:

Notwithstanding any other provision of this article, TRA agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any product embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by the Federal agency upon a showing by TRA or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

J. MARCH-IN RIGHTS:

TRA agrees that, with respect to any subject invention in which it has acquired title, the Federal agency has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency to require TRA, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if TRA, assignee, or exclusive licensee refuses such a request the Federal agency has the right to grant such a license itself if the Federal agency determines that--

1. Such action is necessary because TRA or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

2. Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by TRA, assignee, or their licensees;

3. Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by TRA, assignee, or licensees; or

4. Such action is necessary because the agreement required by Paragraph I of this article has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

K. SPECIAL PROVISIONS FOR CONTRACTS WITH NONPROFIT ORGANIZATIONS:

If TRA is a nonprofit organization, it agrees that--

1. Rights to a subject invention in the United States may not be assigned without the approval of the Federal agency, except where such assignment is made to an organization which has as one of its primary functions the management of inventions, provided, that such assignee will be subject to the same provisions as TRA;

2. TRA will share royalties collected on a subject invention with the inventor, including Federal employee co inventors (when the agency deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202(e) and 37 CFR 401.10;

3. The balance of any royalties or income earned by TRA with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions will be utilized for the support of scientific research or education; and

4. It will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms, and that it will give a preference to a small business firm when licensing a subject invention if TRA determines that the small business firm has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms; provided, that TRA is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal.

The decision whether to give a preference in any specific case will be at the discretion of TRA. However, TRA agrees that the Secretary of Commerce may review TRA's licensing program and decisions regarding small business applicants, and TRA will negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary's review discloses that TRA could take reasonable steps to more effectively implement the requirements of this Subparagraph K.4.

ARTICLE X
TECHNICAL DATA AND COMPUTER SOFTWARE

A. DEFINITIONS:

"Computer software," as used in this article, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this article, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to agreement administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data," as used in this article, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited rights," as used in this article, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of Subparagraph G.2 if included in this article.

"Limited rights data," as used in this article, means data (other than computer software) that embody trade secrets or are commercial or financial and confidential or privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications thereof.

"Restricted computer software," as used in this article, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software; including minor modifications of such computer software.

"Restricted rights," as used in this article, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of Subparagraph G.3 if included in this article, or as otherwise may be provided in a collateral agreement incorporated in and made part of this agreement, including minor modifications of such computer software.

"Technical data," as used in this article, means data (other than computer software) which are of a scientific or technical nature.

"Unlimited rights," as used in this article, means the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

B. ALLOCATIONS OF RIGHTS:

1. Except as provided in Paragraph C of this article regarding copyright, the Government shall have unlimited rights in-

(i) Data first produced in the performance of this agreement;

(ii) Form, fit, and function data delivered under this agreement;

(iii) Data delivered under this agreement (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this agreement; and

(iv) All other data delivered under this agreement unless provided otherwise for limited rights data or restricted computer software in accordance with Paragraph G. of this article.

2. TRA shall have the right to-

(i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by TRA in the performance of this agreement, unless provided otherwise in Paragraph D of this article,

(ii) Protect from unauthorized disclosure and use those data which are limited rights data or restricted computer software to the extent provided in Paragraph G of this article;

(iii) Substantiate use of, add or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with Paragraphs E and F of this article; and

(iv) Establish claim to copyright subsisting in data first produced in the performance of this agreement to the extent provided in Subparagraph C.1 of this article.

C. COPYRIGHT:

1. Data first produced in the performance of this agreement. Unless provided otherwise in Paragraph D of this article, TRA may establish, without prior approval of the ARPA Agreements Administrator, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this agreement and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the ARPA Agreements Administrator is required to establish claim to copyright subsisting in all other data first produced in the performance of this agreement. When claim to copyright is made, TRA shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including agreement number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software TRA grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, TRA grants to the Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

2. Data not first produced in the performance of this agreement. TRA shall not, without prior written permission of the ARPA Agreements Administrator, incorporate in data delivered under this agreement any data not first produced in the performance of this agreement and which contains the copyright notice of 17 U.S.C. 401 or 402, unless TRA identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in Subparagraph C.1 of this article; provided, however, that if such data are computer software the Government shall acquire a copyright license as set forth in Subparagraph G.3 of this article if included in this agreement or as otherwise may be provided in a collateral agreement incorporated in or made part of this agreement.

3. Removal of copyright notices. The Government agrees not to remove any copyright notices placed on data pursuant to this Paragraph C, and to include such notices on all reproductions of the data.

D. RELEASE, PUBLICATION AND USE OF DATA:

1. TRA shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by TRA in the performance of this agreement, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph of this article or expressly set forth in this agreement.

2. TRA agrees that to the extent it receives or is given access to data necessary for the performance of this agreement which contain restrictive markings, TRA shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the ARPA Agreements Administrator.

E. UNAUTHORIZED MARKING OF DATA:

1. Notwithstanding any other provisions of this agreement concerning inspection or acceptance, if any data delivered under this agreement are marked with the notices specified in Subparagraph G.2 or G.3 of this article and use of such is not authorized by this article, or if such data bears any other restrictive or limiting markings not authorized by this agreement, the ARPA Agreements Administrator may at any time either return the data to TRA, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The ARPA Agreements Administrator shall make written inquiry to TRA affording TRA 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If TRA fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the ARPA Agreements Administrator for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If TRA provides written justification to substantiate the propriety of the markings within the period set in Subdivision E.1.(i) of this article, the ARPA Agreements Administrator shall consider such written justification and determine whether or not the markings are to be canceled or ignored. If the ARPA Agreements Administrator determines that the markings are authorized, TRA shall be so notified in writing. If the ARPA Agreements Administrator determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the ARPA Agreements Administrator shall furnish TRA a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless TRA files suit in a court of competent jurisdiction within 90 days of receipt of the ARPA Agreements Administrator's decision. The Government shall continue to abide by the markings under this Subdivision E.1(iii) until final resolution of the matter either by the ARPA Agreements Administrator's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

2. The time limits in the procedures set forth in Subparagraph E.1 of this article may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

3. This Paragraph E does not apply if this agreement is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard agency subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

4. Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, TRA is not precluded by this Paragraph E from bringing a claim under the Contract Disputes Act, including pursuant to the Disputes article of this agreement, as applicable, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this agreement.

F. OMITTED OR INCORRECT MARKINGS:

1. Data delivered to the Government without either the limited rights or restricted rights notice as authorized by Paragraph G of this article, or the copyright notice required by Paragraph C of this article, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, TRA may request, within 6 months (or a longer time approved by the ARPA Agreements Administrator for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at TRA's expense, and the ARPA Agreements Administrator may agree to do so if TRA-

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the use of the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

2. The ARPA Agreements Administrator may also (i) permit correction at TRA's expense of incorrect notices if TRA identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

G. PROTECTION OF LIMITED RIGHTS DATA AND RESTRICTED COMPUTER SOFTWARE:

1. When data other than that listed in subdivisions B.1.(i), (ii), and (iii) of this article are specified to be delivered under this agreement and qualify as either limited rights data or restricted computer software, if TRA desires to continue protection of such data, TRA shall withhold such data and not furnish them to the Government under this agreement. As a condition to this withholding, TRA shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government are to be treated as limited rights data and not restricted computer software.

2. [Reserved]

3. [Reserved]

H. SUBCONTRACTING:

TRA has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill TRA's obligations to the Government under this agreement. If a subcontractor refuses to accept terms affording the Government such rights, TRA shall promptly bring such refusal to the attention of the ARPA Agreements Administrator and not proceed with subcontract award without further authorization.

I. Relationship to patents. Nothing contained in this article shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

ARTICLE XI
FOREIGN ACCESS TO TECHNOLOGY

This Article shall remain in effect during the term of the Agreement and for five (5) years thereafter.

A. DEFINITIONS:

1. "Foreign Firm or Institution" means a firm or institution organized or existing under the laws of a country other than the United States, its territories, or possessions. The term includes, for purposes of this Agreement, any agency or instrumentality of a foreign government; and firms, institutions or business organizations which are owned or substantially controlled by foreign governments.

2. "know-how" means all information including, but not limited to discoveries, formulas, materials, inventions, processes, ideas, approaches, concepts, techniques, methods, software, programs, documentation, procedures, firmware, hardware, technical data specifications, devices, apparatus and machines.

3. "Technology" means discoveries, innovations, know-how and inventions, whether patentable or not, including computer software, recognized under U.S. law as intellectual creations to which rights of ownership accrue, including, but not limited to, patents, trade secrets, mask works, and copyrights developed under this Agreement.

B. GENERAL: The Parties agree that research findings and technology developments in this Agreement may constitute a significant enhancement to the national defense, and to the economic vitality of the United States. Accordingly, access to important technology developments under this Agreement by Foreign Firms or institutions must be carefully controlled. The controls contemplated in this Article are in addition to, and are not intended to change or supersede, the provisions of the International Traffic in Arms Regulation (22 CFR pt. 121 et seq.), the DoD Industrial Security Regulation (DoD 5220.22-R) and the Department of Commerce Export Regulation (15 CFR pt. 770 et seq.).

C. RESTRICTIONS ON SALE OR TRANSFER OF TECHNOLOGY TO FOREIGN FIRMS OR INSTITUTIONS:

1. In order to promote the national security interests of the United States and to effectuate the policies that underlie the regulations cited above, the procedures stated in Subparagraphs C.2, C.3, and C.4 below shall apply to any transfer of Technology. For purposes of this paragraph, a transfer includes a sale of the company, and sales or licensing of Technology. Transfers do not include:

(a) sales of products or components, or

(b) licenses of software or documentation related to sales of products or components, or

(c) transfer to foreign subsidiaries of TRA for purposes related to this Agreement, or

(d) transfer which provides access to Technology to a Foreign Firm or Institution which is an approved source of supply or source for the conduct or research under this Agreement provided that such transfer shall be limited to that necessary to allow the firm or institution to perform its approved role under this Agreement.

2. TRA shall provide timely notice to ARPA of any proposed transfers from TRA of Technology developed with ARPA funding under this Agreement to Foreign Firms or Institutions. If ARPA determines that the transfer may have adverse consequences to the national security interests of the United States, TRA, its suppliers, and ARPA shall jointly endeavor to find alternatives to the proposed transfer which obviate or mitigate adverse consequences of the transfer but which provide substantially equivalent benefits to TRA.

3. In any event, TRA shall provide written notice to the ARPA Program Manager and Agreements Administrator of any proposed transfer to a foreign firm or institution at least sixty (60) calendar days prior to the proposed date of transfer. Such notice shall cite this Article and shall state specifically what is to be transferred and the general terms of the transfer. Within thirty (30) calendar days of receipt of TRA's written notification, the ARPA Agreements Administrator shall advise TRA whether it consents to the proposed transfer. In cases where ARPA does not concur or sixty (60) calendar days after receipt and ARPA provides no decision, TRA may utilize the procedures under Article VII, Disputes. No transfer shall take place until a decision is rendered.

4. Except as provided in Subparagraph C.1 above and in the event the transfer of Technology to Foreign Firms or Institutions is approved by ARPA, TRA shall (a) refund to ARPA funds paid for the development of the Technology and (b) negotiate a license with the Government to the Technology under terms that are reasonable under the circumstances.

D. LOWER TIER AGREEMENTS: TRA shall include this Article, suitably modified, in all subcontracts or lower tier agreements, for experimental, developmental, or research work.

ARTICLE XII
OFFICIALS NOT TO BENEFIT - ETHICS

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit arising from it. However, this Article does not apply to this Agreement to the extent that this Agreement is made with a corporation for the corporation's general benefit.

ARTICLE XIII
CIVIL RIGHTS ACT

This Agreement is subject to the requirements of Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C. 2000-d) relating to nondiscrimination in employment.

ARTICLE XIV
INSURANCE

TRA shall maintain the types of insurance listed in FAR 28.307-2(a), (b), and (c) with the minimum amounts of liability indicated, or commercial equivalent.

ARTICLE XV
GOVERNMENT FURNISHED EQUIPMENT, PROPERTY, INFORMATION, FACILITIES AND SERVICES

During Phase I, TRA may request Government assistance in identifying and/or obtaining Government-owned information. Such requests will be made within the appropriate Integrated Product Team (IPT). The Government IPT members will provide assistance, and where appropriate, formally request that the Government office with cognizance over the information release it to TRA.

ARTICLE XVI
SECURITY

The Program shall be provided protection as required by the appropriate security requirements set forth in the DD Form 254 (Attachment 3) which is an integral part of this Agreement. The highest level of classification involved in the performance of this Agreement is Top Secret. It is the Government's position that the highest security classification of any item deliverable as a result of this Agreement is SECRET. However, in order to interface the Tier II+ System with existing ground stations, and communications networks, it is anticipated that TRA may need capability to access and handle access to Sensitive Compartmented Information (SCI). This Agreement is unclassified.

ARTICLE XVII
SUBCONTRACTS

TRA is authorized to use best commercial practices under this Agreement. This authorization includes, but is not limited to, waiver from competitive bidding where appropriate and the relief from normal flow-down requirements to subcontractors where it impacts the Program.

ARTICLE XVIII
IRREVOCABLE OFFER

TRA is required at the completion of Phase II to provide an irrevocable offer under which the Government may buy 1 lot of 10 each air vehicles (Phase IV) as described in the System Specification developed in Phase II at a firm fixed price of $10 million each at FY 1994 Base Year Dollars.

INTEGRATED MASTER PLAN
ATTACHMENT 1

HIGH ALTITUDE ENDURANCE UAV (TIER II+) SYSTEM

PROGRAM SOLICITATION PS 94-33

PART 3
Proposed Agreement
Attachment 1 — Integrated Master Plan

REPORT NO. TRA 367-0000-75-01

14 JULY 1994

TO: Advanced Research Projects Agency
HAE-UAV Joint Program Office
3701 N. Fairfax Drive
Arlington, VA 22203-1714

TELEDYNE RYAN AERONAUTICAL
P.O. BOX 85311, SAN DIEGO, CALIFORNIA 92186-5311

TRACEABILITY MATRIX; WORK OUTLINE VERSUS PROPOSAL WITH SCD REFERENCE

WORK OUTLINE STRUCTURE		REFERENCE TO:					
Code	Level / Description 1 2 3 4	RFP SCD Paragraph	TAS Page	TDD Page	IMP Page	PSS Page	IMS Page
0000	HAE UAV (TIER II+) SYSTEM	0.0,0.2 4.2,4.3	2-1	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18 3/A1-22	3/A2-1, 3/A2-5	PhI 4-2 PhII 4-5 PhIII 4-8
1000	. Air Vehicle Segment	0.1,0.2,1.0	2-8,2-56	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18 3/A1-22	3/A2-7	PhI 4-2 PhII 4-5 PhIII 4-8
1100	. . Air Vehicle Integration		2-11,2-53	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18		PhI 4-2 PhII 4-5 PhIII 4-8
1200	. . Airframe	0.3,1.1	2-15	3-5 3-8 3-11	3/A1-6 3/A1-11 3/A1-18	3/A2-7, 3/A2-9	PhI 4-2 PhI 4-5 PhIII 4-8
1400	. . Payload Avionics	1.3,1.3.0	2-22,2-53	3-6	3/A1-6	3/A2-9	PhI 4-2
1410	. . . Payload Avionics Integration		2-24	3-9	3/A1-12	3/A2-9	PhII 4-5
1420	. . . Synthetic Aperture Radar	1.3.1	2-27	3-11	3/A1-18	3/A2-9	PhII 4-8
1430	. . . Electro Optical-Infra Red (EO IR)	1.3.2	2-27			3/A2-10	
1440	. . . Self-Defense Systems	1.3.5,1.3.6	2-29			3/A2-11	
1450	. Airborne Data Recording	1.3.4	2-29			3/A2-11	
1460	. . . Payload Management Subsystem		2-29			3/A2-11	
1470	. . . Growth Payloads		2-29			3/A2-11	
1480	. . . Data Links	1.3.3	2-24			3/A2-10	
1500	. . Avionics	1.4	2-31,2-53	3-6 3-9 3-11	3/A1-7 3/A1-13 3/A1-19	3/A2-11	PhI 4-3 PhII 4-6 PhIII 4-8
2000	. Ground Segment	2.0,2.1	2-36,2-53	3-6 3-9 3-11	3/A1-7 3/A1-13 3/A1-19 3/A1-22	3/A2-12	PhI 4-3 PhII 4-6 PhIII 4-8
2100	. . Ground Segment Integration		2-38,2-53	3-6 3-9 3-12	3/A1-7 3/A1-13 3/A1-19		PhI 4-3 PhII 4-6 PhIII4-8
2200	. Launch Recovery Element (LRE)	2.2	2-38	3-6 3-9	3/A1-8 3/A1-14	3/A2-12	PhI 4-3 PhII 4-6 PhIII 4-8
2300	. . Mission Control Element (MCE)	2.3	2-40	3-6 3-9	3/A1-8 3/A1-14	3/A2-13	PhI 4-3 PhII 4-6 PhIII 4-8
3000	. Support Segment	3.0	2-48	3-7 3-9 3-12	3/A1-8 3/A1-15 3/A1-19 3/A1-22	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8

TRACEABILITY MATRIX: WORK OUTLINE VERSUS PROPOSAL WITH SCD REFERENCE (Continued)

WORK OUTLINE STRUCTURE		REFERENCE TO:					
Code	Level / Description 1 2 3 4	RFP SCD Paragraph	TAS Page	TDD Page	IMP Page	PSS Page	IMS Page
3100	. Support Segment Integration		2-48	3-7 3-9 3-12	3/A1-8 3/A1-15 3/A1-19		PhI 4-3 PhII 4-6 PhIII 4-8
3200	. . Training	3.1	2-48	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8
3300	. . Support Equipment	3.2	2-50	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8
3400	. . Fault Tolerance, Reliability Effects Analysis	3-3		3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19		PhI 4-3 PhII 4-6 PhIII 4-8
3500	. . Transportability	3.4	2-50	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-20	3/A2-14	PhI 4-3 PhII 4-7 PhIII 4-8
3600	. Spare and Repair Parts	3.5	2-50	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-20	3/A2-14	PhI 4-4 PhII 4-7 PhIII 4-8
4000	. Systems Engineering/Program Management	4.0	2-1,2-50	3-7 3-10 3-12	3/A1-9 3/A1-16 3/A1-20	3/A2-6	PhI 4-4 PhII 4-7 PhIII 4-9
4100	. . Systems Engineering	4.1	2-1,-50	3-7 3-10 3-12	3/A1-9 3/A1-16 3/A1-20 3/A1-22	3/A2-6	PhI 4-4 PhII 4-7 PhIII 4-9
4200	. . Program Management			3-8 3-10 3-12	3/A1-9 3/A1-16 3/A1-20 3/A1-22		PhI 4-4 PhII 4-7 PhIII 4-9
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PART 3/ATTACHMENT 1

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PART 3

PROPOSED AGREEMENT

ATTACHMENT 1 — INTEGRATED MASTER PLAN

A. INTRODUCTION AND SUMMARY

The TRA Team Integrated Master Plan (IMP) delineates all activities necessary to develop, fabricate, integrate, test and demonstrate the Tier II+ System. The IMP is aligned with the Integrated Product Development approach which implements concurrent engineering and forms empowered product teams. The program-phased technical approach depicted in Figure 3/A1/A-1 summarizes our proposed Tier II+ Program tasks, allocating these tasks to the five product and process segments.

We have implemented an IPT structure which directly relates to our product work outline as shown in Figure 3/A1/B-1, Panel A. These teams were used to develop this IMP, as well as our Task Description Document (TDD), Integrated Master Schedule (IMS), Preliminary System Specification, Point of Departure design, UFP estimates and the man hour and material estimates for Phases I, II and III.

Phase I work consists of refining our proposed point-of-departure design. This will be accomplished by systematically performing trade studies, analyses, and conducting early demonstration testing as shown in Figure 3/A1/B-1, Panel B. Functional and performance allocations from these efforts will result in an updated Preliminary System Specification and in Preliminary Segment Specifications. These specifications will be reviewed at PSSR and delivered to ARPA at the end of Phase I.

Phase II work consists of the detail design, development and testing of a Tier II+ System, including the two prototype Air Vehicle Segments, one prototype Ground Segment, and one Support Segment. Full system performance will be demonstrated during this phase. The preliminary system and segment specifications will continue to be updated and system drawings will be provided to ARPA at the end of this phase.

Phase III work consists of finalization of design, manufacture, and assembly of eight preproduction flight UAVs, two Ground Segments, and two Support Segments. Training, handbooks, initial spares and pack-up kits are also produced. A two year, government-conducted, system demonstration will be accomplished in Phase III with the TRA Team providing operations and maintenance support.

B. PRODUCT IMP

The IMP, together with the TDD and IMS, defines how we will conduct the Tier II+ Program. To maximize the effectiveness of the IMP, TDD, and IMS, these documents will be used together. To facilitate simplified traceability between documents, each of these (as well as our TA&S and PSS) employs our common numbering system based on the Work Outline Structure. Similar to a statement of work, the TDD describes the tasks that will be performed during the program. The IMP expands on the tasks of the TDD. Through a series of tables, the Product IMP details how higher level TDD tasking is broken down into accomplishment criteria that must be satisfied before we claim a significant accomplishment, and in turn, completion of a major program event. The IMS places the tasks used as accomplishment criteria in the IMP into the time domain. In the IMS, it becomes clear how the significant accomplishments of the IMP serve as entrance criteria for the identified program events.

As we have done in the TDD and IMS, we have arranged our Product IMP by phase and then by work outline in contrast to the arrangement provided in the TDD Guidance in the Tier II+ Program Solicitation. We believe that this arrangement will help us and ARPA conduct and track the progress of the program. Since the program funding will be provided by phase, cost tracking and budget reallocations will be greatly simplified if the specific phase tasks are colocated. Additionally, as the program progresses through the initial three phases, the organization and skill mix of our IPTs will undergo change. Arranging the TDD, IMP, and IMS by phase simplifies our effort in assigning team responsibilities for the program tasks. Our IPTs have defined their tasks, accomplishments, and accomplishment criteria by performing an end-to-end product development analysis. We have elected to display the development plans and tasks by phase to simplify the execution of our program.

B.I PHASE I

Our IPTs have defined the events, significant accomplishments, and accomplishment criteria for the initial three phases of the Tier II+ Program in accordance with the guidance provided in the program solicitation. Table 3/A1/B-I provides these elements for Phase I. The Phase I IMP tasks supporting the "Accomplishment Criteria" can be found, plotted against time, in the IMS for Phase I, Figure 4/B I, Part 4 of the proposal. We have identified three key events for Phase I:

— Systems Objectives Review (SOR)
— Preliminary System Specification Review (PSSR)
— Phase I End

B.II PHASE II

Our IPTs have outlined the tasks for Phase II, and the associated events, significant accomplishments, and accomplishment criteria for this phase are presented in Table 3/A1/B-II. These elements are arranged by Work Outline Structure number and can be directly traced to the Phase II IMS, Figure 4/B-II. We have identified eight key events for Phase II:

— Initial Design Review (IDR)
— Phase II Design Review (P2DR)
— Third Program Design Review (P3DR)
— Subsystems Integration Complete (SIC)
— Flight Test Readiness Review One (FTTR1)
— First Flight (FF)
— Flight Test Readiness Review Two (FTTR2)
— Phase II End.

B.III PHASE III

Table 3/A1/B-III provides the events, significant accomplishments, and accomplishment criteria for Phase III of the program. Its corresponding IMS is shown in Figure 4/B-III in Part 4 of this proposal. We have identified five key events for Phase III:

— Initial Production (IP)
— Flight Demonstration Readiness Review (FDRR)
— Air Vehicle Acceptance
— Ground Segment Acceptance
— Phase III End.

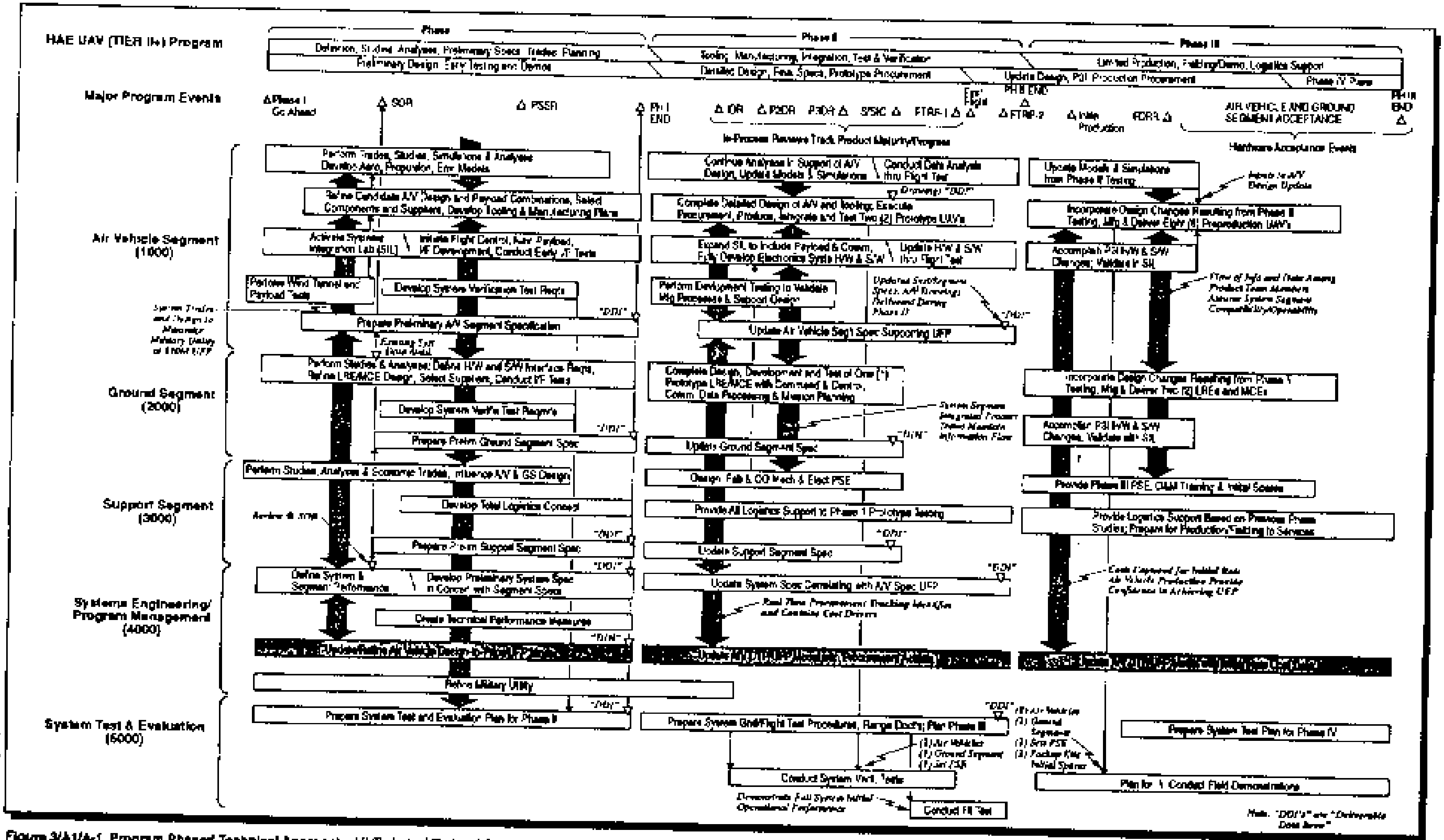

Figure 3/A1/A-1 Program Phased Technical Approach. *All Technical Tasks of the Tier II+ Program are Summarized by Phase and are Consistent with Our Work Outline Common Numbering System.*

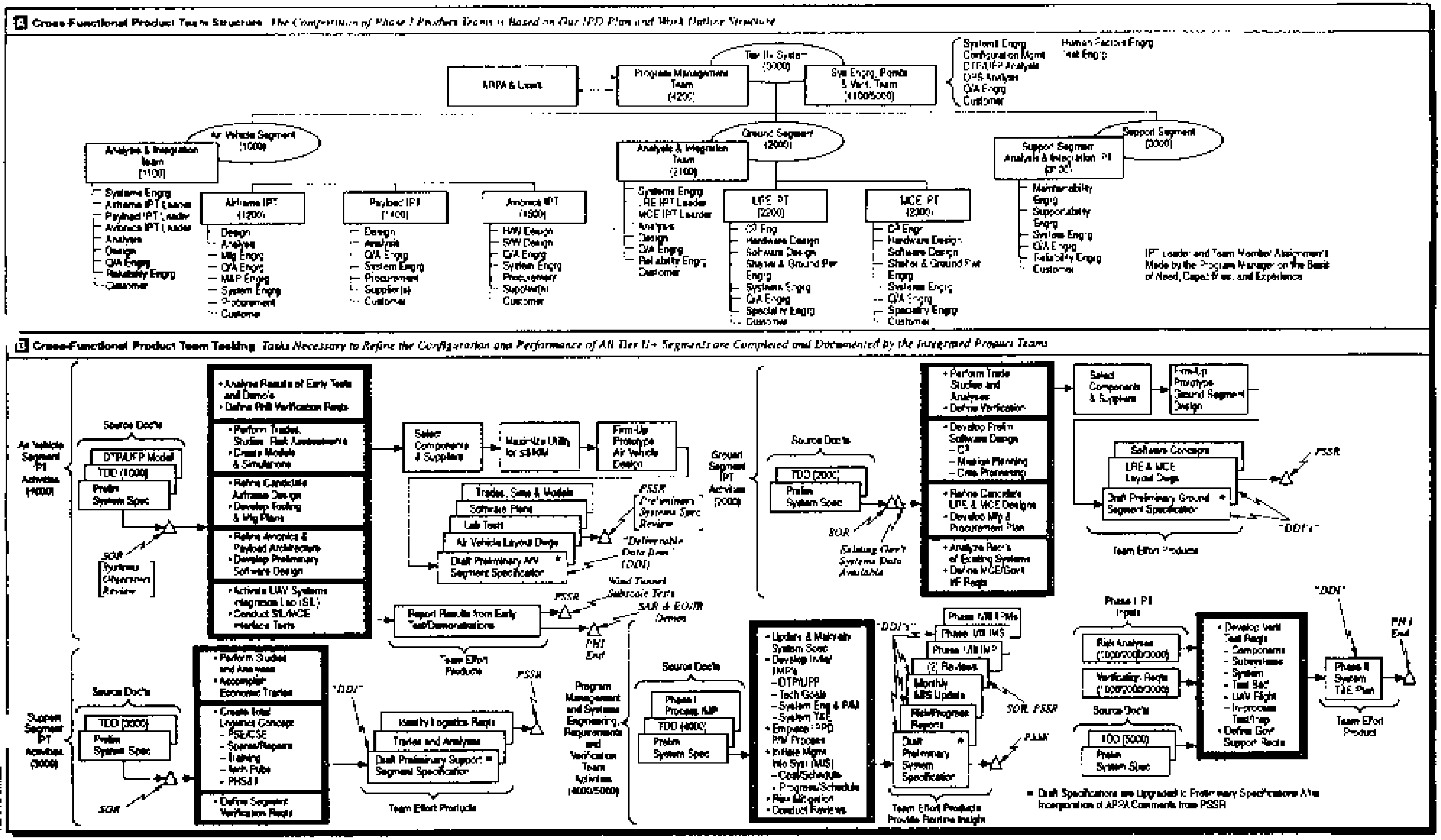

Figure 3/A1/B-1 Phase I Technical Approach. *Tier II+ Phase I IPT Structure and Task Assignments Are Organized and Well Defined.*

SIGNIFICANT ACCOMPLISHMENTS	EVENTS			ACCOMPLISHMENT CRITERIA
	SOR	PSSR	PHASE I END	
0000 HAE UAV (TIER II+) SYSTEM CONCEPT DEFINITION				
Accomplishment criteria listed below are assigned by Program Management to ensure maximized military utility at the $10M unit flyaway price. Overall integration of lower sections of the IMP is accomplished at the designated events within Sections 4000 and 5000.				
1000 AIR VEHICLE SEGMENT				
1110 Air Vehicle Final Integration				
1. Air Vehicle Configuration Defined		X		1a. Airframe/Payload/Avionics H/W and S/W Interfaces Defined b. Phase II TPMs Defined c. Preliminary Air Vehicle Segment Specification Defined d. Air Vehicle Cost Allocation Defined
2. Integration Test Plans Completed			X	2a. SIL Integration Test Plans Completed b. Air Vehicle Integration Test Plans Completed
1120 Air Vehicle Analysis				
1. Aerodynamics and Performance Trade Study Completed		X		1a. Landing Gear Requirements Defined b. Tail Incidence Requirements Defined c. Wind Tunnel Test Completed d. Wind Tunnel Test Data Analyzed e. Data Bases for Performance, Guidance & Control, and Simulation Provided f. Operational Missions Analyzed
2. Engine Trade Study Completed		X		2a. Inlet Designed b. Inlet Wind Tunnel Test Completed c. Nozzle Designed d. Data Base for Propulsion Provided
3. ECS Trade Study Completed		X		3a. Heat Loads and Temperature Limits Defined b. Energy Balance Performed c. Thermal Operating Environment Specified
4. Guidance and Control Trade Studies Completed		X		4a. Autopilot Control Laws Defined b. Guidance Laws Defined c. Takeoff Trade Study Completed d. Approach and Landing Trade Study Completed e. Actuator Performance Requirements Refined
5. Simulation Developed		X		5a. 6DOF Simulation Developed b. Performance Simulation Databases Updated
6. Loads Analyzed		X		6a. Preliminary Aerodynamic Loads Analyzed b. Preliminary Ground Loads Analyzed c. Preliminary Acoustic Loads Analyzed

Table 3/A1/B-I (Sheet 1 of 6) Phase I Accomplishment/Event Matrix.

WP94-3EN T2PLUS C:

SIGNIFICANT ACCOMPLISHMENTS	EVENTS			ACCOMPLISHMENT CRITERIA
	SOR	PSSR	PHASE I END	
1000 AIR VEHICLE SEGMENT (Continued)				
1120 Air Vehicle Analysis (Continued)				
7. Structural Dynamics Characterized		X		7a. Natural and Induced Environments Defined b. Preliminary Modal Characteristics Analyzed c. Preliminary Flutter Characteristics Analyzed
8. Electrical System Analyzed		X		8a. Electrical Loads Analyzed b. EMI/EMC Control Plan Completed c. Power System Trade Study Conducted
9. Phase II Test Requirements Defined			X	9a. Engine Test Requirements Defined b Ground Test Requirements Defined c. Takeoff and Landing Test Requirements Defined d. Flight Test Requirements Defined
1000 AIR VEHICLE SEGMENT				
1200 Airframe Element				
1. Preliminary Airframe Configuration Defined			X	1a. Preliminary 3-View A/V General Arrangement Drawing Complete b. Preliminary External Surfaces and Initial Inboard Profile Complete c. Wind Tunnel Model/Engine Inlet Design Complete d. Stress Analysis and Mass Properties Complete
2. Preliminary Manufacturing Plans Complete		X		2a. Baseline Manufacturing Approach Defined b. Preliminary Risk Assessment Complete c. Manufacturing Simulations/Modeling Complete
3. Subsystems Baseline Definition Complete		X		3a. Cost, Reliability and Producibility Trade Studies Complete b. Electrical/Fuel/Cooling/Hydraulic and Pneumatic Subsystems Schematics Complete c. COTS/MOTS and Long Lead Components Identified
4. Phase II and Phase III Labor/Material Estimates Complete			X	4a. TDD/IMP/IMS Revised for Phases II and III b. Labor Estimates Complete c. Airframe Bill of Materials Defined d. Material Estimates Complete
5. Airframe Interface Definition Complete			X	5a. Wing/Empennage to Fuselage Interfaces Defined
6. Initiate Landing Gear Procurement		X		6a. Trade Studies Complete b. Interface Design Complete c. Procurement Specification Complete
7. Preliminary Engine Interface/Installation Layouts Complete		X		7a. Electrical/Hydraulic/Pneumatic and Structural Interface Layouts Complete b. Preliminary Engine Exhaust Nozzle Layout Complete
1400 Payload Element				
1. Define Payload Interfaces			X	1a. Payload ICDs Completed

Table 3/A1/B-I (Sheet 2 of 6) Phase I Accomplishment/Event Matrix.

WP94-3631(T7PLUS C)

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: SOR	EVENTS: PSSR	EVENTS: PHASE I END	ACCOMPLISHMENT CRITERIA
1000 AIR VEHICLE SEGMENT (Continued)				
1400 Payload Element (Continued)				
2. SIL Payload Integration Setup Verified			X	2a. Payload Integration Plan Prepared b. First Test of Payload Hot Bench Complete
3. SAR Selected		X		3a. SAR Trade Study Performed b. SAR Source Control Drawing Completed c. SAR Specification Completed
4. SAR Demonstration Performed			X	4a. SAR Test Bed Flights Completed, Phase I TPM Goals Met
5. EO/IR Selected		X		5a. EO/IR Trade Study Performed b. EO/IR Source Control Drawing Completed c. EO/IR Specification Completed
6. EO/IR Early Demonstration Performed			X	6a. EO/IR Tests Completed, Phase I TPM Goals Met
7. TWR and ECM Selected		X		7a. TWR/ECM Trade Study Performed b. TWR/ECM Source Control Drawing Completed c. TWR/ECM Specifications Completed
8. Recorder Selected		X		8a. Recorder Trade Study Performed b. Recorder Source Control Drawing Completed c. Recorder Specification Completed
9. Surveillance Management Unit Selected		X		9a. SMU Trade Study Performed b. SMU Source Control Drawing Completed c. SMU Specification Completed
10. Payload Options Characterized			X	10a. Growth Payload Study Completed
11. Comm Elements Selected		X		11a Comm Trade Study Performed b. Comm Source Control Drawings Completed c. Comm Specification Completed
1500 Avionics Element				
1. System Integration Lab (SIL) Activated	X			1a. Hardware Available for VME Suitability Evaluation
2. Preliminary Avionics Subsystems Studies and Analysis Complete		X		2a. Integrated Flight Management Computer (IFMC) Requirements are Defined b. Avionics Interfaces Defined and Documented c. Flight Critical Subsystem Modes Identified d. Integrity Verification of Redundancy Management Concept Complete e. Preliminary Software Design for Phase II Complete f. Aircraft Command and Control Concepts Documented g. SIL Avionics Integration Plan Written h. Preliminary Software Development Plan Written
2000 GROUND SEGMENT				
2100 Ground Segment Integration				
1. Ground Segment Requirements Defined	X			1a. Ground Segment Baseline Reviewed/Refined

Table 3/A1/B-I (Sheet 3 of 6) Phase I Accomplishment/Event Matrix.

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: SOR	EVENTS: PSSR	EVENTS: PHASE I END	ACCOMPLISHMENT CRITERIA
2000 GROUND SEGMENT (Continued)				
2100 Ground Segment Integration (Continued)				
2. Preliminary Ground Segment Design Complete; Draft Preliminary Ground Segment Specification		X		2a. Element Functional Allocations Performed b. Component Trade Studies and Key TPM Analyses Completed c. Early SIL Testing On-going d. Preliminary MCE-LRE ICD and Integration and Test Plan Drafted e. PSS Updates and PGSS Drafted
3. Government Comments to Specifications Incorporated			X	3a. Incorporate Government Comments to Preliminary System Specification b. Incorporate Government Comments to Preliminary Ground Segment Specification
2200 Launch and Recovery Element				
1. LRE Requirements Defined	X			1a. LRE Baseline Reviewed/Refined
2. Preliminary LRE Design Complete. Draft LRE Portion of Preliminary Ground Segment Specification		X		2a. LRE Functional Allocation and Data Flow Complete b. LRE Component Trade Studies and Analyses Complete c. Early SIL Testing On-going d. LRE Updates to PSS and PGSS Drafted
2300 Mission Control Element				
1. MCE Requirements Defined	X			1a. MCE Baseline Reviewed/Refined
2. Preliminary MCE Design Complete. Draft MCE Portion of Preliminary Ground Segment Specification		X		2a. MCE Functional Allocation and Data Flow Complete b. MCE Component Trade Studies and Analyses Complete c. Early SIL Testing On-going d. MCE Updates to PSS and PGSS Drafted
3000 SUPPORT SEGMENT				
3100 Support Segment Integration				
1. Support Segment Objectives Complete	X			1a. Support Segment Functional and Performance Goals and Objectives Identified
2. Draft Preliminary Support Segment Specification Complete		X		2a. Draft Preliminary Support Segment Specification Published b. Preliminary Support Segment Requirements Incorporated in Preliminary System Specification
3. Preliminary Support Segment Specification Complete			X	3a. Government Comments on Draft Preliminary Support Segment Specification Incorporated b. Government Comments on Support Segment of Draft Preliminary System Specification Incorporated c. Preliminary Support Segment Specification Delivered
4. Support Segment Integration Requirements Complete			X	4a. Preliminary Support Segment Trade Studies Accomplished b. Preliminary Economic Analyses of Organic versus Contractor Support Accomplished c. Initial Support Concept Developed d. Initial Supportability Influence on Air Vehicle and Ground Segments Design Accomplished e. Results of Support Analyses and Trades Incorporated in Support Segment Specification

Table 3/A1/B-1 (Sheet 4 of 6) Phase I Accomplishment/Event Matrix.

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: SOR	EVENTS: PSSR	EVENTS: PHASE I END	ACCOMPLISHMENT CRITERIA
3000 SUPPORT SEGMENT (Continued)				
3200 Training				
1. Preliminary Training Requirements Analysis Complete			X	1a. Training Concept and Learning Objectives Established b. Training Requirements Incorporated in Preliminary Support Segment Specification
3300 Support Equipment				
1. Preliminary Support Equipment Requirements Analysis Complete			X	1a Support Equipment Concept Established b. Preliminary Support Equipment Candidate List Developed c. Support Equipment Requirements Incorporated in Preliminary Support Equipment Specification
3400 Fault Tolerance, Reliability and Maintainability				
1. Preliminary Reliability and Maintainability Requirements Analysis Complete			X	1a. Reliability and Maintainability Structure Established b. Quantitative R&M Allocations Made c. R&M Requirements Incorporated in Preliminary Support Segment Specification
3500 Transportability				
1. Preliminary Transportability Requirements Analysis Complete			X	1a. Preliminary Equipment Sizes and Weights Estimated b. C-130 Deck Space Allocated c. Transportability Requirements Incorporated in Preliminary Support Segment Specification
3600 Spare and Repair Parts				
1. Preliminary Spare and Repair Parts Requirements Analysis Complete			X	1a. Preliminary Spares and Repairable Parts Concept Established b. Initial Spares and Repair Parts Identified c. Preliminary Provisioning Requirements Identified d. Spare and Repair Parts Requirements Incorporated in Preliminary Support Segment Specification
4000 SYSTEMS ENGINEERING/PROGRAM MANAGEMENT				
1. Operational Concepts Defined	X			1a. OR Trade Studies Completed and Results Distributed b Connectivity Defined and Distributed for Inclusion in PSS c. Operational Scenarios Modeled in Preparation for SOR
2. Systems Effectiveness Optimized		X		2a. Military Utility Modeled and Results Distributed b. Threat Assessment Performed and Results Distributed c. Alternative Systems Effectiveness Evaluated/Optimized
3. Functional Analysis Completed		X		3a. Conflicting Requirements Resolved and Recorded in a New Source Document b. Associated and Derived Requirements Captured and Recorded as a Source Document c. Allocations Delivered to Teams as Functions to be Allocated to Components
4. Preliminary System Specification (Draft) Completed		X		4a. Verification Matrix Updated Utilizing Revised Requirements from SOR b. Updates from Teams Received c. Draft Reviewed by TRA Team Composed of Segment Representatives

Table 3/A1/B-I (Sheet 5 of 6) Phase I Accomplishment/Event Matrix.

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: SOR	EVENTS: PSSR	EVENTS: PHASE I END	ACCOMPLISHMENT CRITERIA
4000 SYSTEMS ENGINEERING/PROGRAM MANAGEMENT (Continued)				
5. Preliminary Segment Specifications Reviewed		X		5a. Specification Tree Generated and Distributed to Segment Teams b. Specification Formats Distributed to Teams c. Draft Specifications from Segment Teams Reviewed
6. Preliminary System Specification Delivered			X	6a. Government Comments Incorporated after PSSR Complete b. PSS Delivered to Customer
7. Trade Study Results and Decisions Captured in RDD-100 Data Base		X		7a. Trade Studies Tracked, Monitored, and Reviewed b. Decisions on Selected Options Recorded as a Source Document
8. Risk Management Plan Refined and Published			X	8a. Risk Management Plan Refined and Activities Documented b. Decision Points Incorporated and Status Reported to Customer
9. Interfaces at Systems Level Defined		X		9a. Preliminary System Level Interfaces Defined b. Interface Definitions Incorporated into Draft PSS
10. Reliability Requirements and Design Guidelines are Established	X			10a. Reliability Requirements Established and Allocated to Teams
11. IPT Process Implemented and Updated for Phase II				11a. IPD Process Manual Updated b. Configuration/Data Management Procedures Updated c. CM/DM Database Update
12. TPM Management Process Implemented			X	12a. Parameters Defined
13. Management of Reviews and Documentation Completed	X	X		13a. Review Format Published to Teams, Agenda Approved, and Pre-Review Complete b. Review Completed and Minutes Published
5000 SYSTEM TEST AND EVALUATION				
5000 System Test Plan				
1. System Test Plan Published			X	1a. Verification Test and Data Requirements Coordinated with Product Segment IPTs b. Risk Assessment and Closure Plans Reviewed c. Component Listing Updated d. System and Segment Specifications Reviewed e. System Test Plan Drafted

Table 3/A1/B-I (Sheet 6 of 6) Phase I Accomplishment/Event Matrix.

WP94-382;T2PLUS.C1

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	ACCOMPLISHMENT CRITERIA
0000 HAE UAV (TIER II+) SYSTEM PERFORMANCE DEMONSTRATION									
Accomplishment criteria listed below are assigned by Program Management to ensure successful demonstration of full system performance. Overall system integration and demonstration is accomplished within Sections 4000 and 5000.									
1000 AIR VEHICLE SEGMENT									
1100 Air Vehicle System Integration									
1. Test Requirements Reviewed	X								1a. System Ground Test Requirements Reviewed b. Takeoff and Landing Test Requirements Reviewed c. System Flight Test Requirements Reviewed
2. Prototype Air Vehicle Configuration Characterized		X							2a. Aero and Propulsion Databases Completed b. A/V Performance Characterized c. ECS Performance Characterized d. Flight Control and Guidance Laws Selected e. 6DOF Models Updated f. Loads and Structural Dynamics Analysis Complete g. Electrical Loads Analysis Complete h. EMI/EMC Controls Defined
3. Air Vehicle Segment Specification Updated			X						3a. Specification Revised and Published
4. Segment Integration Complete				X					4a. Airframe/Payload/Avionics Integration Completed b. Hardware-in-the-Loop Simulation Development Completed c. SIL Fully Operational d. Phase II TPMs Met
5. UAV 001 Complete				X					5a. Air Vehicle Assembly Comleted b. A/V Elements Integrated c. A/V Elements Tests Complete
6. UAV 002 FF						X			6a. Air Vehicle Assembled and Tested
7. Final Air Vehicle Configuration Characterized								X	7a. Post flight Simulation Correlation Completed b. Final Aerodynamic Performance Defined
8. Preparation for Phase III Complete								X	8a. TPMs Evaluated b. Final Prototype Baseline Documentation Updated c. P³I Incorporation Reviewed
1200 Airframe Element									
1. Final Airframe Configuration Complete	X								1a. Finalize 3-View A/V General Arrangement Drawing b. Finalize Inboard Profile and External Surface Drawing c. Long Lead Procurement Specifications Complete

Table 3/A1/B-II (Sheet 1 of 7) Phase II Accomplishment/Event Matrix.

W-94 3/A1T2PLUS-C1

SIGNIFICANT ACCOMPLISHMENTS	EVENTS								ACCOMPLISHMENT CRITERIA
	IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	
1000 AIR VEHICLE SEGMENT (Continued)									
1200 Airframe Element (Continued)									
2. Manufacturing Processes in Place	X								2a. Manufacturing Processes Selection Completed b. Producibility/Risk Assessment Complete c. "Critical Path" Tooling/Parts Fabrication Identified
3. Preliminary Critical Path Tooling Data Package Release	X								3a. Complete Sectioning of Applicable Loft Surfaces and Provide Layouts b. Identify Quality Requirements and Applicable Specs c. Complete Preliminary Tool Designs d. Procure Tooling Materials
4. Fabrication Start		X							4a. Initial Detail Design Complete b. Initial Manufacturing Instructions Complete c. Initial Quality Requirements and Specifications Identified d. Tool Designs Complete e. Materials Ordered and Requirements Released
5. UAV 001 Airframe Complete				X					5a. Airframe Assembly Complete b. Subsystems Integrated c. Airframe Subsystems Tests Complete d. Preliminary Tool Proof and First Articles Complete
6. UAV 002 Airframe Complete									6a. Airframe Assembled and Tested
1400 Payload Element									
1. Payload Integration Complete				X					1a. Complete Payload Test in SIL, Evaluate TPMs
2. SAR System Performance Characterized				X					2a. SAR System Performance Analysis Completed b. SAR Processor Evaluation Completed c. SCD, ICD, Specification Finalized d. SAR Tested, TPMs Verified
3. EO/IR System Performance Characterized				X					3a. EO/IR System Performance Analysis Completed b. SCD, ICD, Specification Finalized c. EO/IR Tested, TPMs Verified (NIIRS Rating)
4. TWR & ECM Performance Requirements Characterized				X					4a. TWR & ECM Performance Req Analysis Completed b. SCD, ICD, Specifications Finalized
5. DCR System Performance Characterized				X					5a. DCR System Performance Analysis Completed b. SCD, ICD, Specification Finalized c. DCR Tested (Supplier Test)

Table 3/A1/B-II (Sheet 2 of 7) Phase II Accomplishment/Event Matrix.

WP94 783.I.12(PLUS-C)

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	ACCOMPLISHMENT CRITERIA
1000 AIR VEHICLE SEGMENT (Continued)									
1400 Payload Element (Continued)									
6. SMU Software Complete				X					6a. SMU Software and Software Validation Completed b. SMU Software Documentation Completed c. SMU Tested in the SIL
7. SMU System Performance Characterized				X					7a. SMU System Performance Analysis Completed b. SMU Tested (Supplier Test) c. SCD, ICD, Specification Finalized
8. P^3I Payload and Comm Options Evaluated				X					8a. Complete Study of Processing for ATR/ESM/ Tracking b. Complete Study of Alternate Sensors c. Complete Study of Enhanced Communications
9. Comm System Performance Characterized				X					9a. Comm System Performance Analysis Completed b. SCD, ICD, Specification Finalized c. Comm System Tested, Phase II TPM Verified
1500 Avionics Element									
1. Avionics Hardware Specification Defined	X								1a. IFMC Specification Completed b. Avionics Item Specifications Completed
2. Avionics Hardware Integration		X							2a. IFMC ICD Completed b. Avionics Hot Bench/SIL Operational c. Avionics ICDs Completed
3. IFMC Software Design		X							3a. Software Requirements Specification Written b. Software Design Document Initiated
4. IFMC Integration Testing Complete				X					4a. Software Requirements Specification Released b. Software Design Document Completed c. Module Tests Completed d. H/W and S/W SIL Integration Testing Complete
5. IFMC Software Validation Testing Complete					X				5a. Software and Hardware SIL Integration Complete b. Software Validation Testing Complete c. Consolidated Test Document Released
6. Takeoff/Landing Testbed					X				6a. Testbed Design and Fabrication Completed b. Testbed Test Analyzed and Results Published
2000 GROUND SEGMENT									
2100 Ground Segment Integration									
1. Test Requirements Reviewed	X								1a. I&T Plan Update

Table 3/A1/B-II (Sheet 3 of 7) Phase II Accomplishment/Event Matrix.

SIGNIFICANT ACCOMPLISHMENTS	IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	ACCOMPLISHMENT CRITERIA
2000 GROUND SEGMENT (Continued)									
2100 Ground Segment Integration (Continued)									
2. Ground Segment Integration Complete			X						2a. Ground Segment Specification Updated b. SIL Testing Complete c. GSI&T/Acceptance Test Complete
3. Preparation for Phase III Complete								X	3a. TPMs Evaluated b. Final Prototype Baseline Documentation Updated c. P^3I Incorporation Reviewed
2200 Launch and Recovery Element									
1. Preliminary SIL Testing Complete		X							1a. C^2 Prototype (SIL) Testing Complete b. Differential GPS Prototype (SIL) Testing Complete c. Mux VHF LOS (SIL) Test Complete d. Full Datalink Prototype (SIL) Complete e. Mission Plan (SIL) Test Complete; LRE I&T Initiated
2. LRE I&T Complete				X					2a. LRE Portion of Ground Segment Specification Updated b. LRE SIL Testing Complete c. LRE Interface Testing Complete d. LRE (Prototype) Acceptance Test Complete
2300 Mission Control Element									
1. Preliminary SIL Testing Complete		X							1a. COMMS Prototype (SIL) Testing Complete b. UHF SATCOM (SIL) Test Complete c. Image Display Prototype Complete d. SAR Sensor/Telemetry Demux, Route, Display (SIL) Test Complete e. Mission Planner/C^2 Prototype Complete f. SMU Interface Test (SIL) Complete
2. MCE I&T Complete				X					2a. MCE Portion of Ground Segment Specification Updated b. MCE SIL Testing Complete c. MCE Interface Testing Complete d. MCE (Prototype) Acceptance Test Complete

Table 3/A1/B-II (Sheet 4 of 7) Phase II Accomplishment/Event Matrix.

SIGNIFICANT ACCOMPLISHMENTS	EVENTS IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	ACCOMPLISHMENT CRITERIA
3000 SUPPORT SEGMENT									
3100 Support Segment Integration									
1. Support System Integration Analysis Complete							X		1a. Phase I Trade Studies Refined and Updated b. Support Segment LCC Analyses c. Support Concept Updated d. Initial Design Accomplished e. Support Segment Specification Updated
3200 Training									
1. Training and Equipment Plan Complete		X							1a. Task, Skills, and Instruction Identified b. Training Equipment Analysis Complete c. O&M Procedures Identified
2. Training Program Developed					X				2a. Course Learning Objectives Developed b. Topic Learning Objectives and Topical Outlines Developed c. O&M Procedures Developed d. Preliminary Training Courses Developed
3. Conduct Initial Training for Flight Test Personnel					X				3a. Courses Conducted b. Training Requirements Incorporated in Support Segment Specification
3300 Support Equipment									
1. Preliminary Support Equipment Defined	X								1a. PSE/CSE Requirements Allocated
2. Support Equipment (SE) HW/SW Complete		X							2a. PSE Design Complete b. PSE Fabricated, Assembled, and Checkout Complete c. Preliminary I/F Tests Conducted d. Support Equipment Requirements Incorporated in Support Segment Specification
3400 Fault Tolerance, Reliability and Maintainability									
1. Reliability Effects Requirements Established	X								1a. Updated Reliability Effects Requirements Incorporated in Appropriate Segment Specification
2. Maintainability Effects Requirements Established	X								2a. Updated Maintainability Effects Requirements Incorporated in Support Segment Specification
3. Preliminary R&M Analysis Complete								X	3a. Phase II R&M Data Acquired b. R&M TPMs Updated
3500 Transportability									
1. Transportability Plans Updated		X							1a. Pack/Unpack Plan Complete b. C-130 Compatibility Analysis Complete c. Transportability Requirements Incorporated in Support Segment Specification

Table 3/A1/B-II (Sheet 5 of 7) Phase II Accomplishment/Event Matrix.

WP94 383(T2P) U.S.O

SIGNIFICANT ACCOMPLISHMENTS	IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	ACCOMPLISHMENT CRITERIA
3000 SUPPORT SEGMENT (Continued)									
3600 Spares and Repair Parts									
1. Preliminary Provisioning Data Complete					X				1a. Initial Spares Identified b. Spare and Repair Parts Identified c. Preliminary Pack Up Kits for Phase III Identified d. Spare and Repair Parts Requirements incorporated in Support Segment Specification
4000 SYSTEMS ENGINEERING/PROGRAM MANAGEMENT									
1. Operations and Signature Analyses Complete			X						1a. System Performance Demonstration Complete b. System Survivability Demonstration Complete c. Scenario Modeling Complete d. Military Utility Model Updated
2. System Specification Updated			X						2a. Critical Issue Decisions Captured and Allocated b. Specification Revised and Published c. Segment Specs (3) Reviewed for Content and Format
3. Risk Review Process Established	X								3a. Guidelines for Compositions and Conduct of a Risk Review Board Published
4. Progress on Risk Management Plan Published			X						4a. Risk Assessments, Mitigation Plans, Closure Status Updated
5. Inter-segment and External Interfaces Modeled				X					5a. RDO-100 Dynamic Verification Facility Model Refined
6. System I&T Complete					X				6a. Segments I&T Complete b. Interface Defined and ICD Published
5000 SYSTEM TEST AND EVALUATION									
5100 Ground Test									
1. Ground Test Procedures Developed		X							1a. System Level Test Procedures Complete
2. System Integration Ground Tests Complete (UAV 001)					X				2a. Air Vehicle, Ground, and Support Segments End-to-End Interface Tests Complete b. End-to-End Internal Communications Testing c. External Interface Testing Complete d. End-to-End Instrumentation Test Complete
3. Systems Integration Preflight Tests Complete (UAV 001)						X			3a. Tier II+ Prototype Assets Relocated to AFFTC b. Preflight Tests Including Taxi Tests Completed
4. System Integration Ground Tests Complete (UAV 002)							X		4a Acceptance Test and Simulated Flight Checks Performed b. Ground Test Results Analyzed and Documented
5. Phase III Demo Test Planning Complete								X	5a. Phase III Ground Test Plan Submitted

Table 3/A1/B-II (Sheet 6 of 7) Phase II Accomplishment/Event Matrix.

WP94 363 (12/1 US C)

SIGNIFICANT ACCOMPLISHMENTS	EVENTS								ACCOMPLISHMENT CRITERIA
	IDR	P2DR	P3DR	S/SIC	FTRR 1	FF	FTRR 2	PHASE II END	
5000 SYSTEM TEST AND EVALUATION (Continued)									
5200 Flight Test									
1. General Flight Test Plan Submitted		X							1a. Flight Test Instrumentation/Data Requirements Defined b. General Flight Test Plan Drafted and Submitted
2. Range Documentation Submitted					X				2a. Program Introduction (PI) Document and Operations Requirements (OR) Document Prepared and Submitted b. Flight Termination System Report Submitted/Approved c. Frequency Allocation Data (DD Forms 1494) Submitted and Approved
3. Flight Test Procedures Approved						X			3a. Initial Air Worthiness Flight Test Procedures Prepared, Reviewed, and Approved
4. Air Worthiness Test Flights Completed							X		4a. Up to six (6) Non-payload Air Worthiness Flights Completed on UAV-1 b. Flight Test Data Analyzed and Results Documented
5. Payload Flight Tests Complete								X	5a. Up to four (4) Payload Flights Completed on UAV 002 b. Flight Test Data Analyzed and Results Documented c. Wide Band Communications Links Verified
6. Instrumentation Design Complete				X					6a. Instrumentation and Data Requirements Defined b. System Components Procured
7. Instrumentation Installation Complete						X			7a. Systems Fabricated and Installed in UAV-1 and UAV-2 b. Instrumentation Systems Checked Out and Calibrated

Table 3/A1/B-II (Sheet 7 of 7) Phase II Accomplishment/Event Matrix.

WP94-302(T/P)US-C)

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: IP	FDRR	AV ACCEPT	GND SEG ACCEPT	PHASE III END	ACCOMPLISHMENT CRITERIA
0000 HAE UAV (TIER II+) SYSTEM OPERATIONAL DEMONSTRATION						
Accomplishment criteria listed below are assigned by Program Management to ensure successful demonstration of operational performance. Overall system integration and preparation for follow-on production is accomplished within Sections 4000 and 5000.						
1000 AIR VEHICLE SEGMENT						
1100 Air Vehicle System Integration						
1. Design Changes from Phase II Tests Incorporated	X					1a. Simulation Updated b. Guidance and Control Laws Updated c. Mission Planning and Performance Databases Updated d. SIL Updated to Phase III Configuration
2. Integration and Acceptance Tests Conducted			X			2a. Vehicle and Subsystem Integration Completed b. System Acceptance Tests Completed
3. Flight Demonstrations Supported					X	3a. Operational Flight Demo Completed
1200 Airframe Element						
1. Initial Pre-Production Start	X					1a. Phase II Revisions Incorporated b. Revised Data Packages Released c. Procurement Initiated d. Applicable Tooling Rework Complete
2. Product Data Package Revision Validation		X				2a. Reworked Tooling Proofing Complete b. First Articles Completed
3. Initial Pre-Production Complete					X	3a. Eight (8) UAVs Completed b. Subsystems Integration and Acceptance Tests Complete
1400 Payload Element						
1. Payload Documentation Update	X					1a. Revised Payload Specifications Based on Phase II Work b. Revised Payload ICDs Based on Phase II Work c. Revised Payload SCDs Based on Phase II Work
2. SMU Software Update		X				2a. Updated SMU Software Based on Phase II Work b. Updated SMU Documentation Based on Phase II Work
3. SMU Software Test		X				3a. Test SMU S/W Completed (Verified in SIL) b. SMU Test Documents Completed
4. ESM/Decoy Integration		X				4a. ICD, SCD, Specifications Updated b. ESM/Decoy System Performance Analysis Updated c. ESM/Decoy Integrated into SIL and the Air Vehicle
5. SAR Processor Upgrade		X				5a. SAR Processor Upgrade Installed in Air Vehicle b. SAR Software Test Report Published c. SAR Performance Measured In Flight

Table 3/A1/B-III (Sheet 1 of 4) Phase III Accomplishment/Event Matrix

WP94-304(T2P, US-C)

SIGNIFICANT ACCOMPLISHMENTS	EVENTS: IP	FDRR	AV ACCEPT	GND SEG ACCEPT	PHASE III END	ACCOMPLISHMENT CRITERIA
1000 AIR VEHICLE SEGMENT (Continued)						
1500 Avionics Element						
1. Avionics Update		X				1a. System Software Documentation Updated Based on Phase II Work b. Phase III Software Tests Completed and Documented
2. Software Product Specification					X	2a. Software Product Specification Released
2000 GROUND SEGMENT						
2100 Ground Segment Integration						
1. P³I Discussions (Ground Segment) Complete	X					1a. P³I for Phase III Identified and Presented to the Government b. I&T Plan Updated
2. Production Baseline Design Review	X					2a. Production Baseline Documentation Finalized and Presented to the Government b. Fabrication of LRE/MCE Initiated
3. Functional/Interface Test			X			3a. LRE/MCE #2 and #3 Fabrication Completed c. Ground Segment (LRE/MCE #2 and #3) I&T Completed
4. Formal Ground Segment #2 and #3 Acceptance				X		4a. Acceptance of Ground Segment Completed b. Key TPMs Evaluated
5. Preparation for Phase IV					X	5a. "As-Built" Baseline Documentation Update Completed b. P³I Discussions (Phase IV) Initiated
3000 SUPPORT SEGMENT						
3100 Support Segment Integration						
1. Support Segment Integration Complete					X	1a. Changes Required from Phase II Testing Incorporated b. Contractor Services Requirements for Production/Operation Developed c. Support of IPT Review Completed
3200 Training						
1. Update and Revise Training Courses		X				1a. Training Plan Updated b. O&M Procedures Updated
2. Conduct Update Phase III Training		X				2a. Training Courses Completed
3300 Support Equipment						
1. Support Equipment Requirements Documents Updated and Revisions Incorporated	X					1a. Support Equipment Requirements Finalized
2. Procure and/or Manufacture Support Equipment		X				2a. Support Equipment Design Finalized b. Support Equipment Procurement Specification Finalized c. PSE Fabrication, Assembly, Checkout and Delivery Completed
3400 Fault Tolerance, Reliability and Maintainability						
1. Reliability and Maintainability Tracking					X	1a. R&M Performance Monitored

Table 3/A1/B-III (Sheet 2 of 4) Accomplishment/Event Matrix

SIGNIFICANT ACCOMPLISHMENTS	EVENTS					ACCOMPLISHMENT CRITERIA
	IP	FDRR	A/V ACCEPT	GND SEG ACCEPT	PHASE III END	
3000 SUPPORT SEGMENT (Continued)						
3500 Transportability						
1. Transportability Plan Complete			X			1a. Final Pack/Unpack Plan Revised/Updated b. Final C-130 Pack-up Analysis Complete
2. Reusable Containers Complete			X			2a. Procure/Manufacture Reusable Containers b. Packing Instructions Complete
3600 Spares and Repair Parts						
1. Provisioning Requirements Updated and Spares List Ordered	X					1a. Provisioning Parts List Revised and Updated b. Revise and Update Initial Spares List c. Pack-up Kit Identification Complete
4000 SYSTEMS ENGINEERING/PROGRAM MANAGEMENT						
4100 Systems Engineering						
1. Observables CM Support during Manufacturing/ Assembly of Preproduction Units					X	1a. Field Operations/Demonstration and Evaluation by User Supported
2. System Verification and Design Changes Captured					X	2a. Changes to System Design are Evaluated
3. Reviews Complete	X	X	X	X		3a. Handouts and Minutes Prepared
5000 SYSTEM TEST AND EVALUATION						
5100 Ground Test						
1. Phase III Ground Test Plan Updated	X					1a. Deficiencies Found in Phase II Testing Reviewed b. Ground Test Plan Resubmitted with Changes Addressing Revised Testing Requirements
2. Subsystem and System Level Integration Tests Complete		X				2a. Test Procedures Reviewed and Approved by IPTs b. Tests Satisfactorily Completed and Data Acquired c. Test Data Analyzed and Results Documented
3. Initial Ground Acceptance Tests Complete			X			3a. Ground Acceptance Test Procedures Validated
4. Initial Production Hardware Deliveries Complete			X			4a. Ground Acceptance Tests of Remaining Air Vehicles Completed Providing ATP Cost Data for UFP Price H Model b. Ground Acceptance Testing Complete on Remaining Ground and Support Segment Assets
5. Phase IV System Test Planning Complete					X	5a. Phase IV Test Requirements Defined by TRA/Customer IPT b. System Ground Test Plan Prepared and Submitted

Table 3/A1/B-III (Sheet 3 of 4) Phase III Accomplishment/Event Matrix

SIGNIFICANT ACCOMPLISHMENTS	EVENTS					ACCOMPLISHMENT CRITERIA
	IP	FDRR	A/V ACCEPT	GND SEG ACCEPT	PHASE III END	
5000 SYSTEM TEST AND EVALUATION (Continued)						
5200 Flight Test						
1. Phase III Flight Test Plan Updated		X				1a. Deficiencies Found in Phase II Flight Testing Reviewed. Flight Test Plan Submitted with Appropriate Changes
2. First Acceptance Flight Test Complete			X			2a. Flight Acceptance Test Procedures Validated b. First Initial Production Flight Acceptance Test Completed
3. Initial Production Air Vehicle Acceptance Flight Tests Complete					X	3a. Acceptance Flight Tests of Production Air Vehicles Completed
4. Tier II+ System Demonstration Accomplished					X	4a. O&M Support Completed for 24-Month Government-conducted System Demonstration Program

Table 3/A1/B-III (Sheet 4 of 4) Phase III Accomplishment/Event Matrix

WP94-364(T2PLUS C)

C. PROCESS IMP

The objective of the processes described herein is to support the IPTs in the design refinement of the Tier II+ System. TRA's management approach for the Tier II+ Program will utilize an integrated product development (IPD) methodology that ensures all required disciplines are represented throughout all program phases. This IPD process has been formalized in our Tier II+ IPD Process Plan (Report No. TRA 367-0000-75-02) and is further discussed below. Only those processes applicable to Phase I are included in this plan.

C.1 IPD Implementation Our integrated product development process focuses on the use of cross-functional Integrated Product Teams (IPTs) in a concurrent engineering effort to develop a product that meets the Government's requirements and objectives. This IPT structure directly relates to our product work outline as shown in Figure 3/A1/B-1, Panel A. We are confident we can successfully implement this integrated product development process. For over seven years, programs at TRA have been operating using the product team approach. The highly successful Model 324 Scarab UAV program, and the more recent MR-UAV program were both managed using product oriented team approaches. In addition, TRA's manufacturing operations are aligned as individual team centers. These team centers include representation from manufacturing, quality, manufacturing and industrial engineering, and design engineering and are empowered with full responsibility for product compliance and manufacturing verification. Impressive results have been achieved with the creation of these product and manufacturing teams and we have built on this team experience in establishing our IPD process.

We have prepared an IPD Process Manual which will be used as the guide for implementing our IPD process. This manual defines the specific roles, responsibilities and interrelationships of our IPTs. A key feature of our IPD process is the active role of our subcontractors on the IPTs. Early in the development process, principal subcontractors will be asked to participate on our product teams to ensure that subsystem interfaces and design drivers are given proper attention. The TRA Team also recognizes the need for open communication with ARPA and the user community. Therefore, we invite active participation by the government on all of our IPTs. In addition to ensuring customer viewpoints are considered throughout the development process, this active role will expose ARPA and the users to development problems early in the process, making it more likely that problem resolutions will have minimal impact on technical, cost and schedule performance.

Each IPT receives schedule, budget, and other requirements (quality, TDDs, etc.) from the Program Management Team. This documentation fully empowers the IPT with matching authority and responsibility. The IPTs partition their effort into work planning packages containing detailed schedules, task descriptions, IMP significant accomplishments and accomplishment criteria and budgets. On a weekly basis, the work planning packages are statused and reviewed by the IPT leader and team members, who then develop action plans to correct any adverse trend which has been identified. Cost, schedule and performance measurement thresholds are set to identify trends, allowing them to be corrected before a process limit is breached. In this manner, the IPT leaders become proactive instead of reactive to ensure development, manufacturing, cost and schedule processes remain under control.

C.2 Program Status Reporting A key aspect of our IPD process is the inherent visibility of critical program information that will be available to all the teams. We have developed an integrated Management Information System (MIS) which will be partially implemented in Phase I and fully implemented for Phase II. This system will allow immediate on-line access of program information to both the Program Management Team and IPTs. The MIS consists of a PC-based network and utilizes common software tools as depicted in Figure 3/A1/C-1. When fully implemented in Phase II, critical program information and reporting will be downloaded to ARPA via the Internet.

While some level of formal written reporting is essential, the TRA Team proposes to minimize the number and frequency of formal report submittals. This is possible through the government participation on our product teams and the availability of information on our MIS. During Phase I, we will submit to ARPA a single monthly report detailing the program cost and schedule status, TPM and UFP status, along with a summary of the significant accomplishments and problems encountered throughout the month. Additional program documentation, as illustrated in Figure 3/A1/C-1, will be provided at program reviews and when significant changes occur.

To further facilitate information exchange and promote active government participation on our IPTs, we propose to make regular use of TRA's existing video conferencing facilities in San Diego and Washington D.C. These facilities will greatly reduce the time and cost associated with participation on our IPTs.

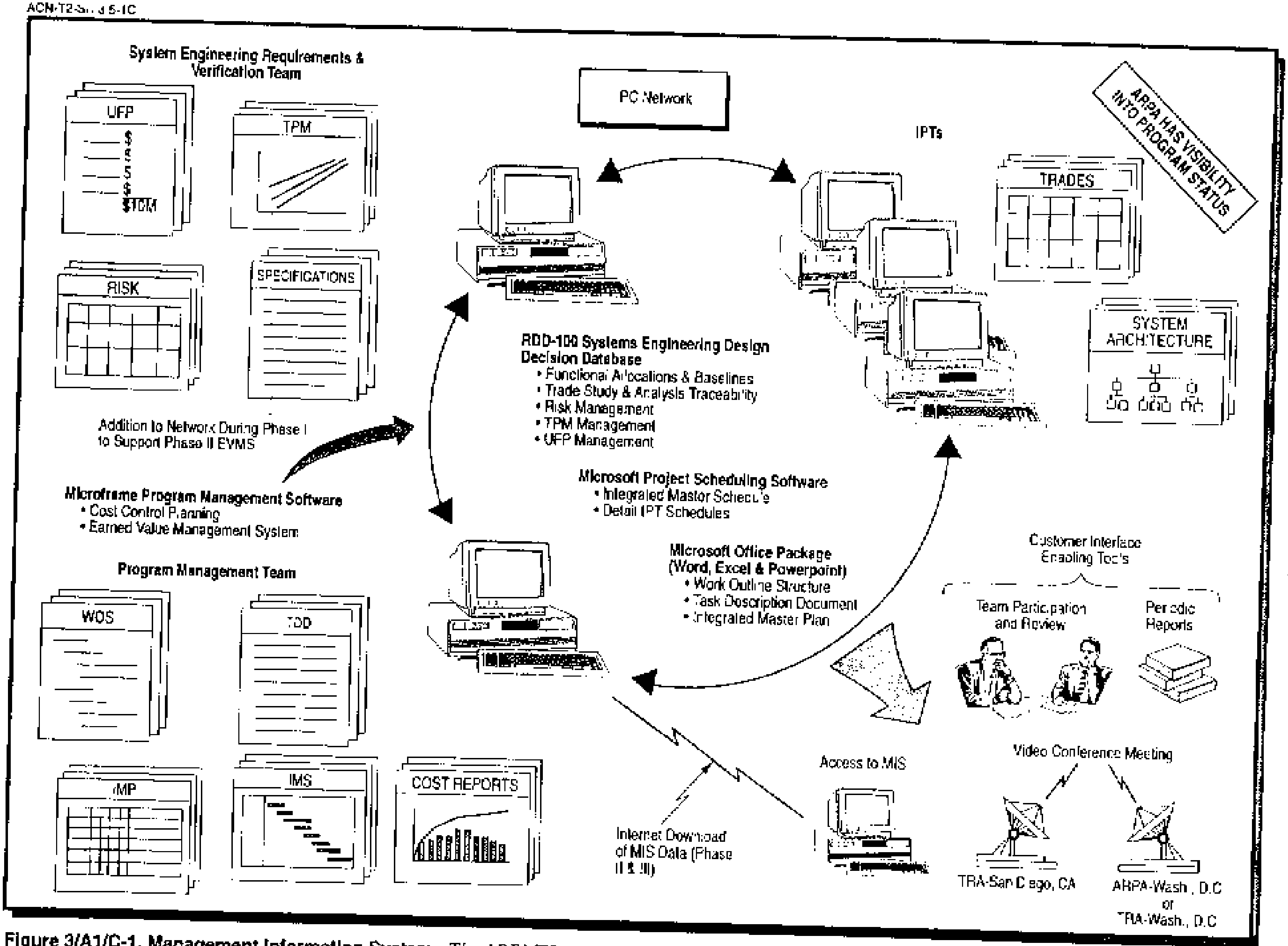

Figure 3/A1/C-1. Management Information System. *The ARPA/TRA Program Team is Provided with Direct Visibility into the Design, Technical Performance, Risk and Cost Status Over the Entire Program.*

C.3 Systems Engineering Process The Systems Engineering process is derived from Mil-Std-499B and TRA's Engineering Procedures Manual. This tailored process provides the details for systems management, requirements, architecture, design, analysis and verification and is documented in our Tier II+ IPD Process Plan (Report No. TRA 367-0000-75-02). The features of our systems engineering process include complete traceability of system and segment requirements/objectives, production of all necessary documentation, structured trade studies, detailed design at all levels of the system and segments, and incorporation and integration of the specialty engineering disciplines. See Figure 3/A1/C-2, Panel A. The products of this process during Phase I include a detailed functional analysis, a rigorous system synthesis based on well documented trade studies, and a documented design in the form of an updated Preliminary System Specification and Preliminary Air Vehicle, Ground and Support Segment Specifications.

This systems engineering process includes the identification and tracking of Technical Performance Measures (TPMs). We have identified an initial set of candidate system and segment level TPMs (Figure 3/A1/C 2, Panel B). We will refine this list and establish the goals and target levels after discussions with the ARPA at the SOR. Many of our TPMs are primary factors in our military utility characterization discussed in Section B.0.2.2 of Part 2. As we intend to optimize the military utility of our system at the $10M UFP, it is critical that continuous TPM tracking be performed.

The technical requirements for the program will be managed within a database established using Ascent Logic's RDD-100 tool, running on our PC-based MIS network. Using this tool, the team will develop and flowdown the requirements for the specifications and verification plans necessary for the development of the Tier II+ System. The deliverable specifications, procedures and reports will be generated using RDD-100, in conjunction with Microsoft Word. This tool enables any member of the Program Management Team or IPTs to access the requirements on-line via his/her desktop computer, improving productivity and reducing the costs of distributing paper documents. Requirements will be categorized and organized using object oriented techniques within the database enabling traceability between, configuration control of, and compliance to the system requirements/objectives. See Figure 3/A1/C-2, Panel C.

Cost estimating for the UFP requirement will be performed using the PRICE H and PRICE HL parametric modeling tools as well as detailed IPT estimates (Part 2, Figure 2/B-5). UFP status and tracking will be the responsibility of the Systems Engineering IPT and UFP data will be maintained within the RDD-100 database.

C.4 Other Management and Design Processes Summarized in Table 3/A1/C-1, below, are additional system and segment level technical and management processes that the TRA Team will apply to the Tier II+ Program for Phase I.

Table 3/A1/C-1. Phase I Tier II+ Processes

Process/ Procedure	Objective	References	Approach/Features
		Tier II+ System (0000)	
Procurement/ Subcontracting Procedures	• Provide a streamlined approach to subcontractor management. • Reduce costs by eliminating unnecessary supplier requirements and certifications	• TRA Procurement Manual	• Subcontractor selection will be the responsibility of the IPD teams. • Subcontractors will have direct representation on IPD teams. • FAR and DFARS clauses are not flowed down to subcontractors. • SF 1411 proposal requirements and supplier representations and certifications are eliminated. • Small and small disadvantaged business plans are not required. • Non-competitive subcontract agreements are authorized.
Configuration/ Data Management Procedures	• Provide configuration control of Tier II+ System elements. • Manage program data and database to ensure agreement compliance	• TRA Engineering Procedures	• CM/DM function integrated with IPD teams • Program wide CM/DM database is maintained by the Sys. Engrg. IPD team. • All DDIs in contractor format and no formal customer approval required. • A single releasable data package approach which brings together design , manufacturing, tooling and quality planning will be used throughout program.

Table 3/A1/C-1. Phase I Tier II+ Processes (Continued)

Process/ Procedure	Objective	References	Approach/Features
Tier II+ System (0000)			
Budget and Spend Plan	• Provide program management and customer with visibility into program budget and expenditure status.	• TRA Cost Accounting Policies and Procedures	• Program budgets are allocated and tracked to Level 3 of the WOS • IPD team leaders are responsible for budget allocation and tracking within their teams. • Budgets are released via program Work Order Authorizations • Actual costs are collected and reported at the work order level. • The program management team will prepare a monthly report statusing the budget versus actual data. • Program EACs will be completed on a periodic basis to assist in monitoring program status
Risk Management Planning (Part 2, Section C.)	• Provide guidelines and ground rules for risk assessment, mitigation and closure.	• DOD Directive 4245.7-M • NAVSO P-6071	• Risk management task team(s) are established to monitor risk mitigation and closure. • Risk management activities are documented and tracked via RDD-100 database. (Figure 3/A1/C-1) • Risk management actions and status are reported to customer on a periodic basis. (Figure 3/A1/C-1)
P^3I / Innovation Planning (Part 2, Section D.)	• Provide guidance to IPT's for consideration of future system growth		• Guidelines for IPD teams to consider architectures/designs which will support P^3I integration are established. • Potential P^3I candidates are identified and will be refined during Ph. I and Ph. II activities. • Candidates will be evaluated based on cost and impact on military utility • P^3I design concepts, implementation schedules and funding requirements will be submitted to the customer for approval as required. • IPD teams have been assigned to monitor applicable technology progress.
Air Vehicle Segment (1000)			
UFP Estimating Process (Part 2, Section B.1.1.1)	• Provide an optimized design at the $10M UFP requirement.	• TRA 367-0000-75-02	• Follow Tier II+ Systems Engineering process • Use Rand, PRICE H & HL Parametric Models • Perform detailed IPT estimates based on competitive supplier quotes and historical data • Refine design concept based on military utility
Ground Segment (2000)			
External Comm Interface Planning (Part 2, Section B.2.4.2)	• Provide a robust design compatible with existing exploitation systems		• Early identification of critical external system interfaces • Develop System Specific Interface (SSI) modules for existing exploitation systems
Support Segment (3000)			
Supportability Integration Process (Part 2, Section B.3.0)	• Influence and integrate support considerations into system design	• TRA 367-0000-75-02	• Direct participation of Support IPT on Air Vehicle, Ground and System level IPTs • Perform tailored supportability analysis

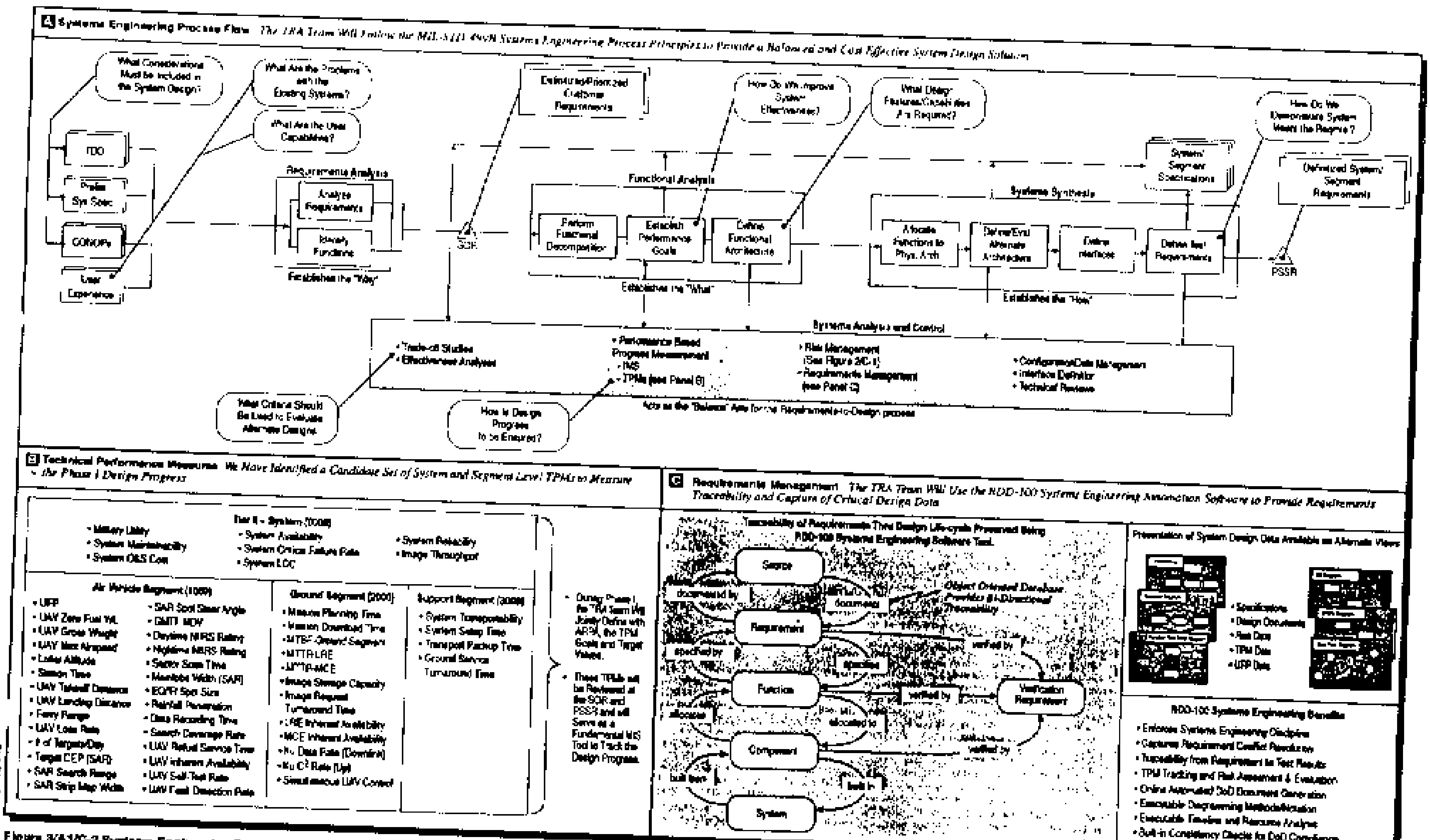

Figure 3/A.1/C-2 Systems Engineering Process. *Our Systems Engineering Process is an Essential IPT Team Enabler for the Phase I Tier II+ Design Definition*

PRELIMINARY SYSTEM SPECIFICATION
ATTACHMENT 2

HIGH ALTITUDE ENDURANCE UAV (TIER II+) SYSTEM

PROGRAM SOLICITATION PS 94-33

PART 3
Proposed Agreement
Attachment 2 — Preliminary System Specification

REPORT NO. TRA 367-0000-59-01

14 JULY 1994

TO: Advanced Research Projects Agency
HAE-UAV Joint Program Office
3701 N. Fairfax Drive
Arlington, VA 22203-1714

TELEDYNE RYAN AERONAUTICAL
P.O. BOX 85311, SAN DIEGO, CALIFORNIA 92186-5311

TRACEABILITY MATRIX: WORK OUTLINE VERSUS PROPOSAL WITH SCD REFERENCE

WORK OUTLINE STRUCTURE		REFERENCE TO:					
Code	Level / Description 1 2 3 4	RFP SCD Paragraph	TAS Page	TDD Page	IMP Page	PSS Page	IMS Page
0000	HAE UAV (TIER II+) SYSTEM	0.0.0.2 4.2.4.3	2-1	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18 3/A1-22	3/A2-1, 3/A2-5	PhI 4-2 PhII 4-5 PhIII 4-8
1000	. Air Vehicle Segment	0.1 0.2.1.0	2-8 2-56	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18 3/A1-22	3/A2-7	PhI 4-2 PhII 4-5 PhIII 4-8
1100	. Air Vehicle Integration		2-11,2-53	3-5 3-8 3-11	3/A1-5 3/A1-11 3/A1-18		PhI 4-2 PhII 4-5 PhIII 4-8
1200	. . Airframe	0.3.1.1	2-15	3-5 3-8 3-11	3/A1-6 3/A1-11 3/A1-18	3/A2-7, 3/A2-9	PhI 4-2 PhI 4-5 PhIII 4-8
1400	. . Payload Avionics	1.3.1.3.0	2-22,2-53	3-6 3-9 3-11	3/A1-6 3/A1-12 3/A1-18	3/A2-9	PhI 4-2 PhII 4-5 PhII 4-8
1410	. . . Payload Avionics Integration		2-24			3/A2-9	
1420	. . . Synthetic Aperture Radar	1.3.1	2-27			3/A2-9	
1430	. . . Electro Optical-Infra Red (EO IR)	1.3.2	2-27			3/A2-10	
1440	. . . Self-Defense Systems	1.3.5,1.3.6	2-29			3/A2-11	
1450	. . . Airborne Data Recording	1.3.4	2-29			3/A2-11	
1460	. . . Payload Management Subsystem		2-29			3/A2-11	
1470	. . . Growth Payloads		2-29			3/A2-11	
1480	. . . Data Links	1.3.3	2-24			3/A2-10	
1500	. . Avionics	1.4	2-31,2-53	3-6 3-9 3-11	3/A1-7 3/A1-13 3/A1-19	3/A2-11	PhI 4-3 PhII 4-6 PhIII 4-8
2000	. Ground Segment	2.0.2.1	2-36,2-53	3-6 3-9 3-11	3/A1-7 3/A1-13 3/A1-19 3/A1-22	3/A2-12	PhI 4-3 PhII 4-6 PhIII 4-8
2100	. . Ground Segment Integration		2-38,2-53	3-6 3-9 3-12	3/A1-7 3/A1-13 3/A1-19		PhI 4-3 PhII 4-6 PhIII4-8
2200	. . Launch Recovery Element (LRE)	2.2	2-38	3-6 3-9	3/A1-8 3/A1-14	3/A2-12	PhI 4-3 PhII 4-6 PhIII 4-8
2300	. . Mission Control Element (MCE)	2.3	2-40	3-6 3-9	3/A1-8 3/A1-14	3/A2-13	PhI 4-3 PhII 4-6 PhIII 4-8
3000	. Support Segment	3.0	2-48	3-7 3-9 3-12	3/A1-8 3/A1-15 3/A1-19 3/A1-22	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8

TRACEABILITY MATRIX; WORK OUTLINE VERSUS PROPOSAL WITH SCD REFERENCE (Continued)

WORK OUTLINE STRUCTURE		REFERENCE TO:					
Code	Level / Description 1 2 3 4	RFP SCD Paragraph	TAS Page	TDD Page	IMP Page	PSS Page	IMS Page
3100	. . Support Segment Integration		2-48	3-7 3-9 3-12	3/A1-8 3/A1-15 3/A1-19		PhI 4-3 PhII 4-6 PhIII 4-8
3200	. . Training	3.1	2-48	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8
3300	. . Support Equipment	3.2	2-50	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19	3/A2-14	PhI 4-3 PhII 4-6 PhIII 4-8
3400	. . Fault Tolerance, Reliability Effects Analysis	3.3		3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-19		PhI 4-3 PhII 4-6 PhIII 4-8
3500	. . Transportability	3.4	2-50	3-7 3-10 3-12	3/A1-9 3/A1-15 3/A1-20	3/A2-14	PhI 4-3 PhII 4-7 PhIII 4-8
3600	. . Spare and Repair Parts	3.5	2-50	3-7 3-10 3-12	3/A1-9 3/A1-16 3/A1-20	3/A2-14	PhI 4-4 PhII 4-7 PhIII 4-8
4000	. Systems Engineering/Program Management	4.0	2-1,2-50	3-7 3-10 3-12	3/A1-9 3/A1-16 3/A1-20	3/A2-6	PhI 4-4 Ph II 4-7 PhIII 4-9
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PART 3

PROPOSED AGREEMENT

ATTACHMENT 2 — PRELIMINARY SYSTEM SPECIFICATION

A. INTRODUCTION AND SUMMARY

The Preliminary System Specification (PSS) as a part of the Agreement defines the performance that the System will exhibit in its proposed form entering Phase I. The means by which the design and its requirements were achieved and derived may generally be found in the Technical Approach and Substantiation Volume. This specification codifies the baseline engineering definition which has been constructed by TRA and its team members. These are the requirements for the point-of-departure system.

The Specification acknowledges the System Capability Document (SCD) enclosure to the solicitation by submitting a compliance analysis. This analysis quantifies the specific differences between the goals of the SCD and the contractor defined requirements of the PSS.

The scope of this document is a direct and complete response to the SCD. The structure of the SCD is maintained in the PSS in that the System and its segments are specified in Part B. A System Verification section is added as Part C.

TABLE 3/A2/A-1. TIER II+ COMPLIANCE MATRIX

SCD SECTION	CAT	REQUIREMENT (Objective or Desired)	COMPLY	COMMENTS/APPROACH	PSS REF
0.1	R	Design to Price $10 M UFP	Y	Mixed Fleet; competitive bids	0.1
0.2	O	Direct tasking; near-real-time imagery support to military combatant forces; wide area, all weather, day/night surveillance; continuous 24 hour coverage of an area; and very high quality imagery.	Y	Mission plan around the weather to minimize down time	
0.3	O	Fly the standard mission profile. No more than 1 loss in 200	Y	Less than 1 loss in 200. 42-hour missions	3.3
1.1.1	O	24 hours on station; operating radius of 3000 nmi; full payload; initial cruise loiter at 50k feet with a climb to 65Kft.	Y	24-hour mission; 63,200 feet start of loiter, cruise-climb profile to 65Kft	1.1.1
1.1.2	O	Improved 5000-foot runways; self contained gear; 20 knot crosswind, auto takeoff and landing without man in the loop.	Y	Supported by takeoff performance analysis. Autolanding via Differential GPS system.	1.1.2
1.1.3	O	Carry all prime mission equipment simultaneously. SAR and/or EO/IR and DCR and TWR and ECM and data link.	Y	System designed to carry and operate all elements simultaneously	1.1.3
1.1.4	O	No persistent icing; moderate turbulence; FAA-ADS-53 used to define turbulence and load.	Y	Rate of climb consistent with minimizing ice formation.	1.1.4
1.1.5	O+	Flight safety shall not be sacrificed; Worldwide deployment, analysis and design life/structural strength analysis. Safe operations over populated areas; complete air-worthiness	Y	High flight critical reliability and flight control redundancy resulting in graceful degradation. System works within the air traffic control system.	1.1.5

Category Key. O+ = Primary Objective; O = Objective; D = Desired; R = Requirement

TABLE 3/A2/A-1. TIER II+ COMPLIANCE MATRIX (Continued)

SCD SECTION	CAT	REQUIREMENT (Objective or Desired)	COMPLY	COMMENTS/APPROACH	PSS REF
1.2	O	Existing engine. 65Kft loiter: initial 50K feet loiter with growth to 65Kft. 300 to 400-knot cruise	Y	Initial loiter at 63K, cruise climb to 65Kft. Growth to 70Kft. Existing Allison AE3007 Engine used. 350-knot cruise	1.1.2
1.3.0.1	O	Carry both SAR and EO/IR simultaneously	Y	Both sensors can be carried and operated simultaneously	1.1.3
1.3.0.2	O+	Sensors capable of remote dynamic retasking	Y	AFMSS A/W/E module and command control system will support dynamic retasking of vehicle and sensors.	1.4.0.2
1.3.0.3	O	40,000 sq. nmi per day in WAS; 1900 spots/24 hours	Y	45,000 sq. nmi per day at 350 KTAS, 1,900 spots/24 hours	1.4.0.3
1.3.0.4	O	20m CEP SAR pointing accuracy at 100 Km	Y	High accuracy INS	1.4.0.4
1.3.1	O+	SAR strip map, GMTI, spotlight; X or Ku band.	Y	X band, all modes	
1.3.1.1	O	20 to 200 Km range in wide area search mode; significant. 2mm rainfall at 25 Km.	Y	200 Km range. 2mm/hour at 25 Km.	1.4.1.1
1.3.1.1.2	O	20 to 200 Km range in spotlight mode; 2 Km by 2 Km spot size.; beam steerable over 90° azimuth each side; multi view and multi-polarization.	Y	Multi-polarization, 200 Km range	1.4.1.1
1.3.1.2	O	1m in strip mode, 0.3m in spot at -3 dB level.; 2.5m in strip and 0.75m in spotlight at -15 dB level; sidelobe compliant.	Y	Based on IPR of .075m in WAS. 0.25m in spot	1.4.1.2
1.3.1.3	O	90° scan in 120 seconds or less with 10m or less range resolution; sigma zero = -10 dB; MDV = 4 kt.	Y	MDV < 4 kt	1.4.1.3
1.3.1.4	O+	SAR performance achieved with radome in place	Y	Less than 0.5 dB loss	1.4.1.4
1.3.2.1	O+	Environmental Constraints; during the day, use solar reflected energy, at night, use thermal emitted energy.	Y	Silicon EO detector (1024 x 1024) and InSb MWIR detector (640 x 480)	1.4.2.1
1.3.2.2	O+	Wide area search, spot collection, point target collection, and stereo collection. Use on-board image processing to minimize B/W and cost.	Y	All modes supported. Image processing and compression is on board.	1.4.2.2
1.3.2.2	O	Two spectral bands; 0.5 to 1.0 micron and 3.0 to 5.0 microns	Y		1.4.2.2
1.3.2.3	O	Daytime NIIRS rating >= to 6.0 at 45° and nighttime NIIRS rating >= to 5.0 and 45°	Y		1.4.2.3
1.3.2.4	O	4 sq Km spot size with NIIRS >=6.5 at 45° and nighttime NIIRS >=5.5 at 45°.	Y		1.4.2.4
1.3.2.5	O	Continuously produce spot images of a fixed point on the ground.	Y	Selectable through mission planning.	1.4.2.5
1.3.2.6	O	Produce stereo images based on overlapping spot images.	Y	Selectable through mission planning.	1.4.2.6
1.3.2.7	O+	Optical window will be consistent with preceding EO/IR requirements and objectives.	Y	Multispectral ZnSe/ZnS	1.4.2.7
1.3.3.1	O+	Provide full duplex satellite C², simplex satellite sensor data, and full duplex LOS comm; all systems to be encryptable.	Y	48" antenna adequate to support 50 Mb/sec rate.	1.4.3.1
1.3.3.1	O	Minimize susceptibility to jamming and interception.	Y	Baseline system incorporates AJ and Encryption.	1.4.3.1
1.3.3.2.1	O+	C&C uses military UHF satellite channels. LRE and MCE will have terminal equipment C&C comm to be continuous and full duplex.	N	Baseline system will be half-duplex FLEETSATCOM. Both MCE and LRE will have terminal equipment. FLEETSATCOM is half-duplex.	1.4.3.2

Category Key: O+ = Primary Objective; O = Objective; D = Desired; R = Requirement

TABLE 3/A2/A-I. TIER II+ COMPLIANCE MATRIX (Continued)

SCD SECTION	CAT	REQUIREMENT (Objective or Desired)	COMPLY	COMMENTS/APPROACH	PSS REF
1.3.3.2.2	D	Untethered world wide operation using satellite link for A/C to MCE sensor comm.	Y	Accomplished with Ku Band SATCOM system (full duplex).	1.4.3.2
1.3.3.2.2	O	50 Mbits per second capable. Operate with commercial Ku Band satellite. Government to provide lease.	Y	System compatible with commercial Ku Band SATCOM system, e.g. PANAMSAT or INTELSAT.	1.4.3.2
1.3.3.3.1	O+	Direct wide-band link between A/C and MCE. CDL at a minimum of 137 Mbits/sec.	Y	Baseline system is existing and will meet all requirements. 274 Mb/sec	1.4.3.3
1.3.3.3.2	D	Provision for future growth to an airborne relay.	Y	Baseline system contains interfaces to support relay	1.4.3.3
1.3.4	D	2-hour on-board recording of SAR or EO/IR. Capable of downlink on command from MCE.	Y	System can record 2 hours of SAR and EO/IR data. Playback through comm system	1.4.4
1.3.5	R	Provide TWR; Downlink data to MCE for presentation to the operator.	Y	System include an ESM system for threat warning and threat database analysis by the operator.	1.4.5
1.3.6	D	Limited ECM/IRCM system to enhance survivability against selected threats: Decoys, expendables, or on-board jammers.	Y	System will include a towed decoy for self-protection	1.4.6
1.4.1	O+	Automated flight without man-in-the-loop; Capable of safe taxiing (automatic or manual). Automatic return-to-base recovery mode will be incorporated.	Y	Automatic taxiing from run-up area to runway.	1.5.1
1.4.2	O+	Navigate by waypoints and accept changes to waypoints at any time during mission; accuracy consistent with targeting requirements.	Y	AFMSS and C&C system will support dynamic waypoint changes. A/C will work within controlled airspace and coordinate with ATC.	1.5.2
1.4.3	O+	Operate within FAA/ICAO airspace under full IFR; MODE 4 IFF required.	Y	A/C will work within controlled airspace and coordinate with ATC.	1.5.3
1.4.4	O+	Air vehicle will include non-explosive flight termination system for range safety and operation.	Y	Flight termination via controlled spiral-to-destruct command.	1.5.4
1.4.5	O+	System status reported to MCE and LRE continuously.	Y	C^2 system readily supports this requirement.	1.5.5
2.0.1	O	Self Sustaining, including power generation and environmental control.	Y	Generators and ECS included.	2.1.1
2.0.2	O+	ECS consistent with requirements of all equipment in shelter. Use MIL-STD-210B as a guide.	Y	The LRE and MCE comply. MIL-STD-210B used as a guide.	2.1.2
2.0.3	O	Maximum use to be made of existing off the-shelf hardware and software.	Y	Existing workstations, comm equipment and shelters have been used. 94% software reuse	2.1.3
2.0.3	O	Design will maximize open systems standards for future growth and ease of software development.	Y	UNIX, X-Windows, FDDI have been employed.	2.1.3
2.0.3	O	LRE and MCE each to be enclosed within its own C-130 transportable ISO type shelter, either 8' X 8' X 10' or 8' X 8' X 20'	Y	LRE in 8' X 8' X 10'. MCE in 8' x 8' x 20'.	2.1.3
2.1	O+	Ground system will include CDL transceiver, SATCOM receive equipment, and UHF C^2.	Y		2.1.4
2.1	O	Receive interface to TRIX, TIBS, TRAP/TADIX-B for current threat information.	Y	All input tasking supported.	2.1.4
2.2	O+	LRE receives mission plan and loads plan into A/C. LRE monitors upload of mission plan if from another source. Monitors A/C until hand-off to MCE.	Y	Land-lines used for ops comm and voice. LRE able to change flight path plan during approach/ departure for R-T-B.	2.2

Category Key: O+ = Primary Objective; O = Objective, D = Desired; R = Requirement

TABLE 3/A2/A-1. TIER II+ COMPLIANCE MATRIX (Continued)

SCD SECTION	CAT	REQUIREMENT (Objective or Desired)	COMPLY	COMMENTS/APPROACH	PSS REF
2.3	O+	MCE handles mission planning, sensor processing, all ground comm, and will handle ATC interfaces.	Y		2.3
2.3.1	O	Mission Planning: Construct flight path, sensor and communications plans based on mission tasking requirements. Minimize attack by known hostile air defenses. Maximize use of U-2R TRUMPS, AFMSS, TAMPS and Tactical UAV mission planning system.	Y	Mission Planner is based on AFMSS, with a Tier II+ specific A/W/E	2.3.1
2.3.1.1	D	Control up to three or more aircraft using same UHF SATCOM link, with only one UAV transmitting sensor data	Y	Using a TDMA Protocol.	2.3.1
2.3.1.2	D	Communications planning including scheduling between ground elements and satellites	Y	MCE mission planner	2.3.1
2.3.1.3	D	Integrate sensor collection requirements. Monitor sensor during mission.	Y	Waterfall displays allow continuous monitoring of sensor data. AFMSS A/W/E will merge tasks into sensor plan.	2.3.1
2.3.2	O	Perform sensor processing which is not done on UAV for (a) sensor health and status monitoring, (b) calibration, (c) image formation, (d) image decompression, (e) data description.	Y	SAR data processing in the air.	2.3.2
2.3.2	D	Selectively display and screen sensor output	Y	Waterfall display on SGI workstations.	2.3.2
2.3.3	O	Support JSIPS, MIES, CARS, TRAC, ETRAC, System 3 Imagery Transmission System, MCP, and NITFS without modifications to exploitation systems.	N	Use of SSIs will facilitate connectivity with minimal changes to exploitation systems	2.3.3
2.3.3.1	D	Product to include (a) full sensor output, (b) subset images, (c) "quicklook" voice or text.	Y	Full sensor output to any exploitation system.	2.3.3
2.3.3.2	D	Image storage to support 24 hours of full mission collection at highest data rate. Rapidly disseminate stored imagery.	Y	Redundant Array of Inexpensive Disks (RAID). Provides 24-hour storage and rapid access to imagery.	2.3.3
2.3.3.3	D	Communicate sensor data to external systems via TCP/IP, public switched networks, commercial SATCOM, wide-band fiber optic networks using SONET/ATM, military communications networks e.g. DISN.	Y	Connectivity achieved via theater comms interface	2.3.3
3.1	O+	Develop training techniques for field operation and maintenance.	Y	Classroom instruction for familiarization. Interactive programs for MCE and LRE operators and maintainers proficiency.	3.1
3.2	O+	Minimize use of special test and support equipment; support equipment will include H/W and S/W necessary to setup, support, and maintain the system; use common test and support equipment.	Y	P-BIT, C-BIT, and I-BIT for O level checkout using commercial PC for BIT initiation and response monitoring. Common OTS support equipment for handling, service, test, and repair.	3.2
3.3	O+	The system will be reliable, maintainable, and fault tolerant. Contractor personnel will maintain the system during phases I, II, and III. Military may operate during phase III.	Y	Top down reliability allocation and fail-safe redundancy used. Qualified maintenance technicians assigned and trained to perform all tasks necessary.	3.3
3.3	D	System overall loss rate due to critical or subsystem failure less than 1 per 200 standard endurance missions.	Y	Survival reliability of 0.996 allocated to system elements	1.1.5 3.3

Category Key: O+ = Primary Objective; O = Objective; D = Desired; R = Requirement

TABLE 3/A2/A-I. TIER II+ COMPLIANCE MATRIX (Continued)

SCD SECTION	CAT	REQUIREMENT (Objective or Desired)	COMPLY	COMMENTS/APPROACH	PSS REF
3.4	D	Ground and support segments be transportable via four C-130s. Total system set up and operating within 24 hours. Entire system including spares and personnel capable of being made ready for transport within 24 hours.	Y	System elements packaged in C-130 dimension-compatible units. MCE, LRE, SE packaged for rapid transport. SE readable to air base Use MIL-M-8010 as guidance.	3.4
3.5	O+	Spare and repair parts will meet original equipment specs. Pack up kits for 30 days continuous operations will be designed for Phase III.	Y	Spares and repair parts are interchangeable. MSK planned for Phase III.	3.5
4.1	O+	Man machine interfaces to be considered; Common terminology and symbology with existing mission planning and exploitation systems	Y	Existing mission planning software and hardware elements will insure commonalty. A/V is designed with ease-of-use and maintenance as a high priority.	0.3.3 2.3
4.2	O+	EMI / EMC do not adversely affect the system.	Y	Design of sub-systems and interconnects minimize EMI/EMC risk. TRA Team has many years of EMC experience and TRA has an EMI/EMC commercial test laboratory.	0.3.5
4.3	O+	Software development using innovative techniques, modified 2167 and a minimum of formal paperwork	Y	Use of a tailored 498 for the up front system design and a spiral approach for the software development.	0.3.8
APP1	O+	Threat warning requirements.	Y	An ESM System will allow the UAV to identify threats early, and take action before the UAV is endangered. Operator will also be warned of threats and may take appropriate actions.	1.4.5
APP1	O+	Takeoff, Climb to 50 Kft within 200 nmi, cruise climb to ceiling, cruise to loiter position, loiter, return, landing.	Y	Initial performance analysis indicates that vehicle meets this objective.	1.1.1
APP1	O	Seamless interface with any of DOD's deployable processing and exploitation systems (CARS, JSIPS, ETRAC, SENIOR BLADE).	N	Using system specific interfaces (SSI). SSI provides connectivity with minimal changes to exploitation systems.	2.3.3
APP1	O+	Aircraft ferried and ground segment C-130 deployable; 24 hours A/V on station. More extended ferry and MOB to target ranges may be required.	Y	Max ferry range of the A/V is 15,500 nmi. Ground segment elements packaged in C-130 compatible dimensions.	1.1.1

B. SYSTEM REQUIREMENTS

0.0 (0000) HAE UAV (Tier II+) System. The HAE UAV (Tier II+) System shall be capable of overt, continuous, all weather, day/night, wide area reconnaissance and surveillance in direct support of the Joint Task Force Commander. The system is composed of an Air Vehicle Segment, Ground Segment, and Support Segment.

0.1 Design to Price. The air vehicle segment will be designed to sell at an average unit price of $10M (FY94 dollars) to the government in Phase IV. A mixed fleet complement of vehicle subsystems may be included in the Phase IV outfit of aircraft.

0.2 Mission Description. The capabilities of the Air Vehicle Segment that allow it to perform the mission are described in Section 1.0. The mission described in the Appendix of the Tier II+ System Capability Document is applicable to the requirements for all segments.

0.3 Performance Requirements The Tier II+ System shall satisfy the performance requirements specified herein.

0.3.1 Environmental Conditions. The Tier II+ System shall be designed to perform its required functions during and following exposure to the climatic conditions documented by the commercial practices in RTCA DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment."

0.3.2 Mission Reliability. The Tier II+ System mission reliability design goal of 0.90 shall be used for the segment reliability allocations. Mission reliability is defined as the probability of accomplishing all mission essential performance requirements throughout the design mission profiles specified in Appendix 1 of the SCD.

The storage reliability design goal of 0.95 for the Tier II+ System shall be based on placing the system in a sheltered, uncontrolled environment for a period of 180 days. Upon removal of the system segment elements, the system shall perform to the requirements specified herein without unscheduled maintenance.

0.3.3 Maintainability. The Tier II+ System shall be designed to meet the quantitative maintainability goals specified below.

As a design goal the Tier II+ System shall be capable of being serviced and turned around to support a mission in 6 hours. This time shall include all servicing and checkout. This design goal does not include the replacement of an air vehicle engine or replanning/download of a different mission.

The Tier II+ System shall have an MTTR goal of 1 hour and an $M_{max_{ct}}$ goal of 2.5 hours for 90 percent of all failures, where $M_{max_{ct}}$ is defined as the mean of all maximum corrective maintenance times.

0.3.4 Availability. The Tier II+ System shall have an operational availability (A_0) goal of 0.98. A_0 is defined as the probability that the Tier II+ System is operable to mission essential performance levels when a mission is requested at a random time. Operational availability shall include the down time resulting from maintenance, supply, and administrative delays.

0.3.5 Design and Construction. The requirements contained herein pertain to the development and production of the Tier II+ System and are considered a minimum standard.

Best commercial practices may be used as guidelines and are acceptable, so long as performance, flight safety, reliability, and availability are not affected.

The Tier II+ System shall comply with the EMI design requirements of RTCA DO-160C.

0.3.6 Human Factors Engineering. MIL-H-46855 and MIL-STD-1472 will be used as a guide in the design and development of the Tier II+ System.

0.3.7 Logistics. The principles of logistics as set forth in DOD Guide 4100.35, AFR 800-8, and MIL-STD-1388 shall be used as the basis for the ILS concept for Tier II+ System. This guidance has, as a goal, achievement of the best balance of systems performance and low life cycle costs.

The organizational level maintenance support system for the Tier II+ System operations will provide inspection, servicing, and checkout support. Built-in test capability shall be used to check and verify system operational readiness.

0.3.8 Software Development. The Tier II+ System software development shall be based on best commercial practices and will use MIL-STD 498 as a guide.

0.4 System Connectivity. Functional interconnects between the Air Vehicle Segment, and interfacing elements of the Ground Segment are summarized in Table 0.4-1. In Table 0.4-2 are the interconnects between the MCE and the external agencies such as the Joint Task Force, the existing exploitation systems, and the Threat Information Service. The existing exploitation systems are used as the conduit for transfer of image products to the tactical customer as well as CONUS and notional recipients. The MCE receives threat information, tasking orders, and dynamic re-tasking direction as inputs from the external agencies. Commercial satellite links are redundant and will be implemented using in-theater assets as available.

Table 0.4-1. Internal Connectivity Summary

Transfers	From	To	Via
Imagery, Threat Info, UAV Status	UAV	MCE	Ku Band Satellite
Threat Info, UAV Status	UAV	MCE	UHF Satellite
Imagery, Threat Info, UAV Status	UAV	MCE	CDL
Maint Data	UAV	LRE	Local Control Data Link
UAV Status	UAV	LRE	UHF Satellite
Data	UAV	LRE	Wireline
Mission Plans, C²	MCE	UAV	UHF Satellite
Mission Plans, C²	MCE	UAV	CDL
Mission Plans, C²	MCE	UAV	Ku Band Satellite
Ops Comm, Mission Plans, Voice	MCE	LRE	Existing Land Line ATC
Ops Comm, Mission Plans	MCE	LRE	Commercial Satellite
Diff GPS Corrections, C²	LRE	UAV	Local Control Data Link
Mission Plans, C²	LRE	UAV	UHF Satellite
Ops Comm, Voice	LRE	MCE	UHF Satellite
Mission Plans, Maint Commands	LRE	UAV	Wire line

Table 0.4-2. External Connectivity Summary

Transfers	From	To	Via
Processed Imagery	MCE	Exp Systems	Land Line
Processed Imagery	MCE	Exp Systems	Commercial Satellite
Dynamic Re-Tasking	Exp Systems	MCE	Commercial Satellite
Air Tasking Order	JTF	MCE	Autodin
Dynamic Re-Tasking	Exp Systems	MCE	Land Line
Current Threat Information	Threat Service	MCE	TRIX, TIBS, TRAP, TADIX-B

1.0 (1000) Air Vehicle Segment

1.1 Air Vehicle

1.1.1 Flight Characteristics. The UAV shall be capable of meeting the following performance requirements with a full mission payload (as defined in Section 1.4) on an ICAO Standard Day.

a. The maximum operating radius including climb shall be 3,200 nautical miles, not including the loiter radius.

b. The UAV shall be capable of climbing to an altitude greater than 50,000 feet within the first 200 nautical miles of the mission.

c. The service ceiling (100 foot/minute capability) shall not be less than 55,000 feet.

d. The UAV endurance for mission loiter shall not be less than 24 hours at 63,000 feet initial altitude at the maximum operating radius. Endurance at 65,000 feet is a function of return to base range and shall be as follows:

Time on Station, Hours	Return to Base Range, nmi
24	0
21.7	1,200
16.7	3,200

e. The UAV speed during loiter shall be at least 300 knots true airspeed.

f The UAV fuel allowance shall be not less than that required for:

25 minutes @ ground idle power and
5 minutes @ takeoff power and
1 hour reserve for flight @ sea level following mission.

1.1.2 Takeoff and Landing. The UAV shall be capable of meeting the takeoff and landing requirements for atmospheric conditions consistent with ICAO Standard ± 20°C days and for a full payload

a The UAV shall be capable of operating from improved sea level runways of 5,000 feet in length. The UAV shall be capable of clearing an obstacle 50 feet high situated 350 feet beyond the end of the runway

b. The UAV shall have self contained takeoff and landing gear.

c. The UAV shall be capable of takeoff and landing in steady crosswinds not to exceed 20 knots.

1.1.3 Payload Capacity. The air vehicle shall be capable of carrying 2,000 pounds of payload throughout the entire flight regime of Section 1.1.1. That capacity includes SAR, EO/IR, recorder, TWR, ECM, SMU, and data links.

1.1.4 Operating Environment. The UAV shall operate in the environmental conditions shown in Table 1.1.4-1.

Table 1.1.4-1. Operating Environment

Environmental Condition	Takeoff and Landing	Free Flight
Altitude	0 to 6,000 ft	0 to 35,000 ft or 75,000 ft(1)
Gust		Mission Analysis Criterion
Relative Humidity	100% @ 84°F	100% @ 84°F

Notes:
(1) 35,000 feet for equipment in pressurized payload and avionics compartments. 75,000 feet for all other equipment.

1.1.5 Air Worthiness. The system design shall avoid single point failures modes and failure modes from which the aircraft cannot recover or safely terminate flight. The aircraft shall have a non-explosive flight termination system which can be activated by ground control elements or by the aircraft flight management system. The system shall be designed to prevent the aircraft from becoming a hazard to other aircraft or to prevent it from penetrating prohibited or controlled airspace.

Reliable, predictable performance shall characterize the air vehicle and all onboard systems such that the probability of loss of control (PLOC) occurring is less that 1 in 200 missions.

Within FAA controlled airspace, the vehicle shall address FAR 91 and FAA Orders 7400.2 and 7610.H, which discuss the safety of UAV operations. The UAV shall be capable of autonomous takeoff and landing without external guidance yet retain the capability for real-time flight plan reprogramming. When coordinated through ground facilities such as the launch and recovery element (LRE), the aircraft shall readily accommodate changing air traffic conditions, conflicts with other aircraft in the area, and events on the ground recovery site.

1.2 (1200) Airframe Characteristics

1.2.1 **Configuration** The UAV shall be a conventional, straight wing and fuselage design with tricycle landing gear.

1.2.2 **Weight**. The UAV Maximum Gross Weight shall not exceed 25,000 pounds

1.2.3 **Airframe Modularity**. The air vehicle shall be configured for global ferry. The UAV shall include provisions for installation and removal of mission payloads by organization level maintenance personnel in operational environments.

1.2.4 **Power Systems**. The electric power systems shall be driven by the propulsion system. The capacity of the electric power system shall be sufficient to drive all avionics and payload subsystem loads.

1.2.5 **Environmental Control**. An active environmental control system shall be employed to maintain the avionics and payload bay temperatures to less than 55°C in steady-state operation. A pressurization system shall maintain the forward and aft equipment compartments to a pressure altitude of 35,000 feet

1.2.6 **Propulsion**. The propulsion system shall consist of one or more turbofan engines capable of providing sufficient thrust to propel the air vehicle to airspeeds of 300 to 400 knots above 55,000 feet. The engine(s) shall be capable of using JET A conforming to ASTM-D-1655, JP-4, or JP 5 conforming to MIL-T-5624, or JP-8 fuel conforming to MIL-T-83133.

1.3 Not Used.

1.4 (1400) Payload

1.4.0 Generic Payload Characteristics

1.4.0.1 **Payload Installation**. The air vehicle shall be capable of simultaneously carrying all payload equipment over the full flight regime of Section 1.1.1. A mixed fleet analysis supports not carrying all payload equipment on every mission.

1.4.0.2 **Sensor Dynamic Replanning**. The command and control facilities of Section 1.4.3 in concert with the mission planning and command and control capabilities of the MCE shall be able to redirect the aircraft and its payload. In addition to real time control of the UAV flight control and avionics systems, real time control and retasking of payloads shall be provided.

1.4.0.3 **Area Coverage**. Both SAR and EO/IR shall be capable of a wide area search rate no less than 40,000 square nautical miles per day. Similarly, the spot acquisition rate shall be no less than 1,900 per day for both sensors. The payload communication subsystem shall be capable of compressing, multiplexing and delivering the imagery from both sensors simultaneously to the MCE.

1.4.0.4 **Geo-Location Accuracy**. The SAR shall tag every image with the position solution of a GPS/INS mission navigator. When imaging a strong reflector target in a diffuse background at broadside at 100 km slant range from 65,000 feet altitude, the geolocation accuracy of the image shall not exceed 20m CEP. CEP of 25m shall be exhibited under the same conditions when imaging at ±45 degree azimuth offset.

1.4.1 Synthetic Aperture Radar Sensor

1.4.1.1 **SAR Functions**. The SAR, an X-band instrument, shall have four modes of operation. These are wide area search, target, Ground Moving Target Indicator (GMTI), and test. Image formation processing shall be completely contained on board the air vehicle. The field of regard shall include a 90° sector switchable to left or right of the flight path.

The SAR search mapping range in clear air shall be 200 km. In the presence of 2 mm/hr rainfall, the range shall be 200 km. The swath shall be a minimum of 10 km and may be commanded anywhere within 20 to 200 km.

The spotlight range of 200 km shall be achieved over the span of ±45 degrees of antenna squint. The spot size shall be 2 km square for all antenna directions and may be placed anywhere within 20 to 200 km of ground range.

1.4.1.2 SAR Image Quality. The 3 dB ground resolution beamwidths shall be less than 1 meter and 0.3 meter for search and spotlight modes, respectively. The 15 dB ground resolution beamwidths shall be less than 1.5 meter and 0.75 meter for search and spotlight modes, respectively. The sidelobes shall be below -35 + 20*log[1+(3/u)^2] dB where "u" shall be the distance from the peak response in resolution units. Multiplicative noise shall be less than -13 dB and the receiver dynamic range shall be at least 55 dB.

1.4.1.3 Ground Moving Target Indication (GMTI) Mode. The GMTI mode shall be an independent mode which is not concurrent with mapping. The minimum detectable velocity shall be 4 knots against a 10 dBsm target with -10 dB clutter in clear air at 200 km. The detection range under 2 mm/hr rainfall shall be 200 km. These detection ranges shall be met when the air vehicle ground speed equals 350 knots. The GMTI range shall be 20 to 200 km. The scan time shall be 120 seconds and shall consist of 5 raster scan elevation bars. Range resolution shall be 10 meters.

1.4.1.4 Radome. Radome loss shall be accounted for in the performance of the SAR.

1.4.2 EO/IR Imaging Sensor

1.4.2.1 Environmental Constraints. The performance design point for the EO/IR system will be mid latitude summer, rural target locations, target reflectivity of 15 percent, background reflectivity of 7 percent, target temperature of 302 degrees Kelvin, background temperature of 300 degrees Kelvin, and a meteorological range of 23 km. The sun is assumed to be 60 degrees from zenith in the along-track direction. The turbulence is defined by Fried's parameter R_0 = 0.8m at a wavelength of 0.75 microns and R_0 = 7.5m at a wavelength of 4 microns. During the day, the system will use solar reflected energy. At night the system will use thermal emitted energy.

1.4.2.2 EO/IR Functions. The sensor shall operate in four modes in the 0.5 to 1.0 micron visible region and four modes in the 3 to 5 micron thermal region. The four modes shall be wide area search, spot target, continuous and stereo. The gimbal range of authority shall be ±45 degrees in pitch and ±80 degrees in roll.

1.4.2.3 Wide Area Search Mode. The wide area mode shall have the following characteristics:

Parameter	Daytime Value	Nighttime Value
Image quality	NIIRS 6.5 at 32 km ground range	NIIRS 5.5 at 42 km ground range
Aperture diameter	0.2m	0.2m

1.4.2.4 Spot Collection Mode. The spot mode shall have the following characteristics:

Parameter	Daytime Value	Nighttime Value
Image quality	NIIRS 6.5, 45 degrees from nadir	NIIRS 5.5, 45 degrees from nadir
Aperture diameter	0.2m	0.2m
Spot rate	100/hour	100/hour
Spot size	2 km x 2 km	2 km x 2 km

1.4.2.5 Point Target Mode. In conjunction with the UAV flight control, the sensor shall be capable of continuous coverage of a single spot target using overlapping spot target acquisition.

1.4.2.6 Stereo Mode. The sensor shall support stereo imaging for orthogrammetric purposes.

1.4.2.7 Optical Window. The optical window shall provide an unobstructed for view of ± 45° in pitch and ± 80° in roll with minimum vignetting. At normal incidence, transmittance shall be a minimum of 85% across the 0.5 to 1.0 and 3.0 to 5.0 micron spectral region. Wavefront error shall not exceed λ/10 in the above bands.

1.4.3 Communications Payload

1.4.3.1 Functions. The air vehicle segment shall be outfitted with satellite command and control, satellite imagery delivery, and terrestrial microwave communications equipment as required by the demands of mission connectivity. All links shall be capable of being secured by physical, NSA approved COMSEC equipment.

1.4.3.2 Satellite Communications. The principal means of command and control over long distances shall be UHF satellite communications. The system shall include a half-duplex UHF terminal compatible with FLEETSATCOM. This link shall deliver air vehicle navigation state, status, and telemetry to the LRE and MCE.

A wideband satellite communications earth terminal capable of image delivery to the MCE shall be fitted to the air vehicle. The terminal shall have sufficient bandwidth and transmit power to deliver a data stream up to 50 Mbps to a commercial Ku band communications satellite transponder in geosynchronous orbit. The lower bound of the data rate shall be 10 Mbps and the terminal modem shall be rate variable. A 48 inch, two axis, circular, steerable antenna shall be the aperture.

This resource shall be fully compatible with commercial satellites over the entire range of data rates. The antenna shall use steered polarization accurate to 1 degree.

A 200 Kbps command channel shall be implemented over the Ku band satellite earth terminal.

1.4.3.3 Line-of-Sight Communications. The communications payload shall include a fully compatible Common Data Link (CDL) Class I terminal which is capable of selectable data return link rates up to 274 Mbps. The error coding shall be convolutional at rate 1/2. A two-axis steerable antenna and provisions for COMSEC shall be provided. A 200 Kbps command channel shall be provided.

1.4.4 On-Board Recorder. A digital cassette recorder capable of two hours of recording shall be included. The recorder shall be capable of storing the compressed imagery of both sensor simultaneously as well as threat warning, aircraft navigation state, and status information. Under avionics system control, the recorder shall be able to replay the recorded data via satellite Ku band or LOS downlink.

1.4.5 Threat Warning Receiver. An ESM subsystem capable of providing radar threat warning shall be integrated into the payload and avionics system. Mission programmability and 2-18 GHz frequency coverage shall be provided.

1.4.6 Electronic Countermeasures. The air vehicle system shall be equipped with a RF towed decoy self defense subsystem. The deployment of the decoy shall be controlled by the avionics system.

1.4.7 Sensor Data Multiplexing and Routing. The payload shall include a data multiplexing, and routing function. The sequencing of the sensor data and aircraft system data flowing to the wideband satellite downlink and Common Data Link shall be managed by this function.

1.5 (1500) Avionics

1.5.1 Automatic Control. The air vehicle shall be capable of automatic flight throughout the mission, including takeoff and landing, without benefit of a man-in-the loop. The air vehicle shall be capable of safe taxiing from the runup area to the takeoff end of the runway without benefit of a man in-the loop. The air vehicle shall incorporate a return to base recovery mode.

The flight control system shall provide for the necessary control and guidance modes. These are Ground taxi mode, Takeoff mode, Landing mode, Go-around landing, Approach mode, Climb and descent mode, Cruise mode, Loiter mode, Abort takeoff mode, and Automatic return to base. Flat turns, rudder turns and coordinated aileron turns shall be implemented.

1.5.2 Navigation System. The avionics system shall be designed to permit control by navigation way points throughout the mission, and be capable of accepting changes to the way points at any time during the mission. System accuracy shall support automatic landing.

1.5.3 Air Traffic Control and IFF. The air vehicle shall be capable of operating in FAA/ICAO controlled airspace under full IFR flight rules. The identify friend or foe (IFF) shall be capable of all Mk XII modes including 1, 2, 3, 4, and mode C altitude reporting operation.

1.5.4 Flight Termination. The air vehicle shall include a non-explosive flight termination system for range safety if loss of all flight control occurs, or to prevent the aircraft from becoming a hazard or penetrating prohibited airspace.

1.5.5 System Status Reporting. The air vehicle shall report air vehicle and payload subsystem health and status to the Launch and Recovery Element (LRE) continuously during local area operations, and the Mission Control Element (MCE) continuously during all flight operations. The air vehicle shall have a pair of line of sight digital modems and radios for use by the LRE for local area control

2.0 (2000) Ground Segment.

2.1 (2100) Ground Segment. The Ground Segment shall contain a Launch and Recovery Element (LRE) and a Mission Control Element (MCE), each with integrated communication subsystems.

2.1.1 Power Generation. The ground segment shall be self sustaining in electric power. The generator shall consume diesel fuel, produce 208 volt, 3 phase AC power, and not be larger than 120 by 50 by 75 inches and 12,000 pounds.

2.1.2 Environmental Control. Environmental control for the ground segment shall be consistent with the environmental requirements of the sheltered equipment and personnel. The control equipment capacities shall be 60,000 BTU/hour for cooling and 40,000 BTU/hr for heating. The environmental control equipment shall be not larger than 50 by 90 by 100 inches and shall weigh no more than 3500 pounds.

2.1.3 Design. Use of open architectures and open systems standards shall prevail

2.1.4 Ground Communications Subsystems. The ground communications subsystems shall provide for communications functions including a CDL compliant surface terminal, and a deployable wideband satellite earth station. A management unit which processes and routes link data and UHF SATCOM facilities shall also be part of these subsystems.

2.2 (2200) Launch and Recovery Element

2.2.1 LRE Functions. The LRE shall perform the following functions:

a. Mission plan delivery to the UAV.

b. Departure and approach path modification

c. Path displays

d. Local UAV control

e. UAV preflight checkout

f. Control handoff to and from the MCE

2.2.2 LRE Interfaces. The LRE shall support the following interfaces:

a. Air traffic control via voice radio

b. Local control data link to UAV

c. Differential GPS corrections to UAV

d. UHF SATCOM digital data to MCE and UAV for mission control

e. Wireline to UAV for checkout and run up

2.2.3 LRE Physical Characteristics. An 8 by 8 by 10 foot ISO standard shelter shall contain the LRE and shall be C-130 transportable. A view port shall be included with a closed circuit video camera.

2.3 (2300) Mission Control Element. The Mission Control Element (MCE) shall provide planning, sensor processing, and ground communications interfaces for the UAV. At any time during the mission, the MCE shall be able to exercise control over the aircraft, except when the LRE is controlling takeoff and landing.

The MCE interface requirements shall encompass the following.

a. Land line and UHF SATCOM to the LRE for mission plan download

b. UHF SATCOM to and from the UAV

c. Common Data Link and Ku band SATCOM for imagery from the UAV

d. Image tasking and image exploitation

e. Common Data Link and Ku band SATCOM for command and control to the UAV

f. Tasking

The MCE shall not occupy more than one 8 by 8 by 20 foot ISO standard shelter, and shall be C-130 transportable.

2.3.1 Mission Planning and Control. The MCE shall accomplish overall planning and control of mission and en route flight operations. The mission plan may include the flight trajectory plan, the sensor deployment plan, and the communications plan.

The trajectory plan shall be generated in a topographic map display context and shall assess mission survival based on threats and weather. The sensor plan shall define the events of image collection. The scene intervisibility from the aircraft path shall be assessed and made interactive with the user. The communications plan shall assess and define which telecommunications assets will be used when and where. The plans shall be collectively modifiable and incrementally delivered to the UAV for execution.

After the UAV control is acquired by the MCE, the UAV shall join a UAV pool of no more than three under MCE control. The MCE shall accept sensor data from only one UAV at a time.

2.3.2 Sensor Data Processing and Monitoring. The MCE shall provide the following functions in support of the UAV delivering imagery:

a. Sensor health and status display

b. Image decompression

c. Link error detection and correction

d. Image display including scroll, pan, zoom

e. Image and report dissemination

2.3.3 Product Generation, Storage and Dissemination. The imagery products shall include simultaneous SAR and EO/IR sensor data. Reformatting shall be performed on the products prior to delivery to prospective exploitation systems such as:

a. Joint Service Image Processing System (JSIPS)

b. Modernized Imagery Exploitation (MIES)

c. U-2R Contingency Airborne Reconnaissance System (CARS)

d. Tactical Radar Correlator (TRAC)

e. Enhanced TRAC (ETRAC)

f. System 3 Imagery Transmission System

g. Marine Corps Processor (MCP)

h. National Imagery Transmission Format Standards

The output products shall be raw images, channel tailored images, subset images and quick look voice and text messages. The MCE shall catalog and store all UAV delivered imagery for 24 hours in a continuous loop.

3.0 (3000) Support Segment

3.1 Training System. The training system shall include provisions for initial contractor and Government familiarization training and continuing proficiency training. The training system shall provide the knowledge and skills necessary to enable personnel to operate and maintain the system elements at principal and deployed operating locations

3.2 Support Equipment. Support equipment shall include all hardware and software required to set up, checkout, ground test, service, handle, transport, repair, and otherwise support and maintain the system elements, including UAV, MCE, LRE, and support equipment.

3.3 System Fault Tolerance, System Reliability and Maintainability. The system shall use redundancy and reconfigurability to achieve fault tolerance. The system overall loss rate due to critical failure shall be less than 1 loss per 200 standard endurance missions. The system shall be designed to facilitate the potential evolution from contractor to military maintenance and operation. The system shall be designed to enable fault tolerant graceful degradation of system performance.

3.4 Transportability. Transportability shall include processes, materials, equipment and procedures required to transport the system elements and components. The Ground Segment and Support Segment, including all support equipment, spare parts and personnel, shall be transportable via four C-130s. The Ground Support Segment shall be capable of being made ready for shipment in no greater than 24 hours. The Ground and Support Segments shall be capable of commencing operations in less than 24 hours after arrival at the operating location. Elements of the support segment that must be frequently moved over roadways, taxiways or flight line aprons shall be equipped with two or four wheel running gear. Roadable support elements shall be mobile over generally level and firm terrain within the perimeter of an airbase or airfield.

3.5 Spare and Repair Parts. Spare and repair parts shall include Long Lead Items, Interim Spares and Repair Parts, and Provisioning requirements. Spare and repair parts shall meet all original equipment specifications. A Pack-up Kit shall include a sufficient quantity of spares and repair parts to support continuous system operations at a deployed location for a period of 30 days.

PART C SYSTEM VERIFICATION

4.0 (5000) System Verification

4.1 General. The system verification provisions specified in this section include responsibilities, categories, and methods of verifying the requirements described in Part B to assure overall system quality. There is no independent Quality Assurance Program. Quality conformance will be assured by empowering accountability for conformance to the Integrated Product Teams (IPTs). In general, military and commercial specifications and standards will be used as guides to assure consistency in the performance of the verification methods. Verification requirements will be tailored to the requirements of the Tier II+ Program as refined during Phase I.

4.2 Responsibility for Verification. Unless otherwise specified in the agreement, the contractor is responsible for performing the analysis, tests, or demonstrations required to verify that the system meets the requirements of Part A of the system specification.

4.2.1 Responsibility for Compliance. The system specification will be a "living document" throughout the Tier II+ Program, and as such will be subject to continuous improvement. A revision will be published at the conclusion of each phase of the program. The contractor is responsible for compliance with the latest version of the system specification to ensure that all requirements are verified as defined.

4.2.2 Verification Categories The verification categories are defined as System Development Verification, First Article Verification, Customer Acceptance Verification, and Operational Verification.

4.2.3 Verification Procedures. The scope, content and application of verification methods identified in this Part will be further defined in program plans to be developed or refined during Phase I. The System Test Plan will consolidate all of the program's test verification methods not related to software development. The Software Development Plan will consolidate all verification methods related to software development. Verification methods will be further defined and accomplished in accordance with individual plans and procedures prepared and adopted by the Integrated Product Teams. Military and commercial specifications and standards will be used as guides to assure consistency in the performance of the verification procedures. The program agreement and program plans will identify government furnished equipment and facility requirements.

4.2.4 Verification Reports. Results of the execution of verification methods will be published in reports when required by the governing program plan. Results of the execution of verification methods will be stored in a requirements verification data base.

4.2.5 Presubmission Verification. No configuration items, including software, materials, and parts shall be submitted to the government for final acceptance unless they have been subjected to the verification methods deemed necessary by the prime contractor, and found to comply with the specification and the program agreement.

4.3 Categories of Verification

4.3.1 System Development Verification. The requirements verification program includes development tests, component environmental and Electromagnetic Interference (EMI) tests, subsystem level tests, system level tests, preflight tests, and flight tests. The requirements verification program is divided into two subcategories, ground and flight test.

4.3.2 First Article Verification. First article verifications shall be conducted by the prime contractor on configuration items including software that is representative of the production items to be supplied under the agreement. Design approval of the first article samples will be by the procuring activity upon satisfactory completion of all verification events. First article verifications shall include all methods deemed necessary by the prime contractor to determine that the configuration items, including software, meet all the requirements of this specification, other applicable specifications, and the agreement. First article verifications shall include the following subcategories which may include any or all of the verification methods.

a. Computer Software Tests

b. Qualification Tests:
   - Performance Tests
   - Environmental Tests

c. Reliability Tests

4.3.3 Customer Acceptance Verification. Customer acceptance verification events shall be conducted on each deliverable unit. The prime contractor shall furnish all equipment and facilities and shall be responsible for accomplishing all customer acceptance verification events, as noted herein. Each configuration item submitted for acceptance shall demonstrate compliance with requirements for material, workmanship, and operational performance. As a minimum, each deliverable configuration item shall pass the following customer acceptance verification events which may include any or all of the verification methods specified in paragraph 4.4:

a. Examination of product

b. Functional acceptance tests

4.3.4 Operational Verification. During Phase III of the agreement, the contractor shall provide operations and maintenance support to the Government during a two year operational demonstration period. The operational test and evaluation will be conducted by the Government. The contractor shall provide field support including maintenance and preparation of the elements of the system, assistance in mission planning, complete logistics support, and continued training of Government personnel. This Phase of the agreement will be defined in detail during Phases I and II. Verification of system requirements will be conducted in accordance with Part B of the System Specification revision published at the conclusion of Phase II.

4.4 Methods of Verification. The following verification methods are defined:

Inspection - Operation performed on an item to critically examine it and verify its physical conformance to an established and measurable criteria.

Analysis - Operation performed on an item to break down and examine its parts and study related data, so as to determine the item's function and interrelationships; and in so doing verify the item's ability to perform in accordance with established and measurable criteria

Simulation - Operation performed on a simulated representation of an item under controlled conditions, using well defined procedures to verify the item's performance in accordance with established and measurable criteria.

Demonstration - Operation performed on an item under controlled conditions, using well defined procedures to verify the item's response in accordance with a predicted manner

Test - Operation performed on an item under controlled conditions, using well defined procedures to verify the item's performance in accordance with established and measurable criteria.

In addition to the methods listed above, the contractor will consider the following methods to control cost while meeting the verification requirements throughout the program:

a. Performing and submitting similarity analyses in lieu of testing. Items of similar design must have met all functional and performance requirements in an analogous operational environment.

b. Submitting previous test results in lieu of duplicating testing.

c. Combining tests whenever possible.

Requirements Verification Matrix

Reference Paragraph	Verification Method				
	Ins	Anal	Sim	Dem	Test
0.1 Design to Price	X				
0.3.1 Environmental Conditions		X			X
0.3.2 Reliability		X			
0.3.3 Maintainability				X	
0.3.4 Availability		X			
0.3.5 Design and Construction		X			
0.3.6 Human Factors Engineering		X		X	
0.3.7 Maintenance				X	
0.3.8 Software Development	X				
0.4 System Connectivity	X			X	X
1.1.1 Flight Characteristics		X	X	X	
1.1.2 Takeoff and Landing	X	X	X	X	
1.1.3 Payload Capacity		X			
1.1.4 Operating Environment	X			X	
1.1.5 Air Worthiness		X		X	
1.2.1 Configuration	X				
1.2.2 Weight	X				
1.2.3 Airframe Modularity					
1.2.4 Power Systems	X			X	
1.4.0 Generic Payload Characteristics	X			X	X
1.4.1 Synthetic Aperture Radar Sensor	X				
1.4.2 EO/IR Imaging Sensor	X			X	X
1.4.3 Communications Payload					
1.4.4 On-Board Recorder				X	
1.4.5 Threat Warning Receiver	X				
1.4.6 Electronic Counter Measures	X				
1.4.7 Sensor Data Multiplexing and Routing			X	X	X
1.5 Avionics					
1.5.1 Flight Control System	X		X		X
1.5.2 Navigation System Functional	X				X
1.5.3 Air Traffic Control and IFF Function	X			X	
1.5.4 Flight Termination Function	X	X			
1.5.5 System Status Reporting				X	X
2.1.1 Power Generation	X			X	
2.1.2 Environmental Control	X			X	
2.1.3 Design	X				
2.1.4 Ground Communications Element				X	
2.2 Launch and Recovery Element					
2.2.1 LRE Functions				X	
2.2.2 LRE Interfaces	X				X
2.2.3 LRE Physical Characteristics	X				
2.3 Mission Control Element	X			X	
2.3.1 Mission Planning and Control					X
2.3.2 Sensor Data Processing and Monitoring					X
2.3.3 Product Generation, Storage and Dissemination					X
3.1 Training System		X			
3.2 Support Equipment		X			
3.5 Spare and Repair Parts		X			
3.4 Packaging ,Handling, Storage, Transportability				X	
3.3 System Fault Tolerance and System Reliability		X			

SOURCE SELECTION SENSITIVE

CONTRACT SECURITY CLASSIFICATION SPECIFICATION (DD254)
ATTACHMENT 3

HIGH ALTITUDE ENDURANCE UAV (TIER II+) SYSTEM

PROGRAM SOLICITATION PS 94-33

PART 3
Proposed Agreement
Attachment 3 — Contracts Security Classification Specification (DD254)

REPORT NO. TRA 29308-101

14 JULY 1994

TO: Advanced Research Projects Agency
HAE-UAV Joint Program Office
3701 N. Fairfax Drive
Arlington, VA 22203-1714

TELEDYNE RYAN AERONAUTICAL
P.O. BOX 85311, SAN DIEGO, CALIFORNIA 92186-5311

ATTACHMENT NO. 3

DD 254, dated OCT 18, 1994 to CONTRACT No. MDA972-95-3-0013
with 3 attachments:

(1) ARPA TECHNICAL INFORMATION PROCEDURES

(2) ARPA POLICY ON RELEASE OF CLASSIFIED INTELLIGENCE MATERIAL TO U.S. CONTRACTORS - COLLATERAL

(3) ARPA SCI PROCEDURES

ARPA CG-154 "HIGH ALTITUDE ENDURANCE UNMANNED AERIAL VEHICLE (TIER II+)" SECURITY CLASSIFICATION GUIDE *(to be provided under separate cover)*

DEPARTMENT OF DE[illegible]SE

CONTRACT SECURITY CLASSIFICATION SPECIFICATION

(The requirements of the DoD Industrial Security Manual apply to all security aspects of this effort.)

1. CLEARAN[illegible]ND SAFEGUARDING

a. FACILITY CLEARANCE REQUIRED
TOP SECRET

b. LEVEL OF SAFEGUARDING REQUIRED
TOP SECRET

2. THIS SPECIFICATION IS FOR: *(X and complete as applicable)*

X	a. PRIME CONTRACT NUMBER: MDA972-95-3-0013	
	b. SUBCONTRACT NUMBER	
X	c. SOLICITATION OR OTHER NUMBER: PS94-33	Due Date (YYMMDD): 940601

3. THIS SPECIFICATION IS: *(X and complete as applicable)*

X	a. ORIGINAL *(Complete date in all cases)*		Date (YYMMDD): 941018
	b. REVISED *(Supersedes all previous specs)*	Revision No.	Date (YYMMDD)
	c. FINAL *(Complete Item 5 in all cases)*		Date (YYMMDD)

4. IS THIS A FOLLOW-ON CONTRACT? [ ] YES [X] NO. If Yes, complete the following:

Classified material received or generated under ____________ *(Preceding Contract Number)* is transferred to this follow-on contract.

5. IS THIS A FINAL DD FORM 254 ? [ ] YES [X] NO. If Yes, complete the following:

In response to the contractor's request dated ____________, retention of the identified classified material is authorized for the period of ____________

6. CONTRACTOR *(Include Commercial and Government Entity (CAGE) Code)*

a. NAME, ADDRESS, AND ZIP CODE
TELEDYNE RYAN AERONAUTICAL
P.O. BOX 85311 (MAILING)
SAN DIEGO, CA 92186-5311
2701 N. HARBOR DRIVE (PHYSICAL)
SAN DIEGO, CA 92101-5311

b. CAGE CODE
78022

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*
PACIFIC REGION, DIS
NORTHERN SECTOR
BUILDING 35, ROOM 114
THE PRESIDIO
SAN FRANCISCO, CA 94129-7700

7. SUBCONTRACTOR

a. NAME, ADDRESS, AND ZIP CODE

b. CAGE CODE

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*

8. ACTUAL PERFORMANCE

a. LOCATION

b. CAGE CODE

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*

9. GENERAL IDENTIFICATION OF THIS PROCUREMENT

HIGH ALTITUDE ENDURANCE UNMANNED AERIAL VEHICLE (TIER II+) (HAE UAV) DESIGN AND DEVELOPMENT CONTRACT
TIER II+ PROGRAM MANAGER: DR. JOHN ENTZMINGER
ESTIMATED COMPLETION DATE (PHASE I): APRIL 1995

10. THIS CONTRACT WILL REQUIRE ACCESS TO:	YES	NO
a. COMMUNICATIONS SECURITY (COMSEC) INFORMATION	X	
b. RESTRICTED DATA		X
c. CRITICAL NUCLEAR WEAPON DESIGN INFORMATION		X
d. FORMERLY RESTRICTED DATA		X
e. INTELLIGENCE INFORMATION:		
(1) Sensitive Compartmented Information (SCI)	X	
(2) Non-SCI	X	
f. SPECIAL ACCESS INFORMATION		X
g. NATO INFORMATION		X
h. FOREIGN GOVERNMENT INFORMATION		X
i. LIMITED DISSEMINATION INFORMATION		X
j. FOR OFFICIAL USE ONLY INFORMATION	X	
k. OTHER *(Specify)*		

11. IN PERFORMING THIS CONTRACT, THE CONTRACTOR WILL:	YES	NO
a. HAVE ACCESS TO CLASSIFIED INFORMATION ONLY AT ANOTHER CONTRACTOR'S FACILITY OR A GOVERNMENT ACTIVITY		X
b. RECEIVE CLASSIFIED DOCUMENTS ONLY		X
c. RECEIVE AND GENERATE CLASSIFIED MATERIAL	X	
d. FABRICATE, MODIFY, OR STORE CLASSIFIED HARDWARE	X	
e. PERFORM SERVICES ONLY		X
f. HAVE ACCESS TO U.S. CLASSIFIED INFORMATION OUTSIDE THE U.S., PUERTO RICO, U.S. POSSESSIONS AND TRUST TERRITORIES		X
g. BE AUTHORIZED TO USE THE SERVICES OF DEFENSE TECHNICAL INFORMATION CENTER (DTIC) OR OTHER SECONDARY DISTRIBUTION CENTER	X	
h. REQUIRE A COMSEC ACCOUNT	X	
i. HAVE TEMPEST REQUIREMENTS	X	
j. HAVE OPERATIONS SECURITY (OPSEC) REQUIREMENTS	X	
k. BE AUTHORIZED TO USE THE DEFENSE COURIER SERVICE	X	
l. OTHER *(Specify)*		

12. PUBLIC RELEASE. Any information (classified or u[...]ied) pertaining to this contract shall not be released for public dissem[...]xcept as provided by the Industrial Security Manual or unless it has been approved for public release by appropria[...] Government authority. Proposed public releases shall be submitted for [...]al prior to release

[ ] Direct [X] Through (Specify):

ARPA/TIO, 3701 N. FAIRFAX DRIVE, ARLINGTON, VA 22203-1714

NO PUBLIC RELEASE OF SCI AUTHORIZED

to the Directorate for Freedom of Information and Security Review, Office of the Assistant Secretary of Defense (Public Affairs)* for review.
* In the case of non-DoD User Agencies, requests for disclosure shall be submitted to that agency.

13. SECURITY GUIDANCE. The security classification guidance needed for this classified effort is identified below. If any difficulty is encountered in applying this guidance or if any other contributing factor indicates a need for changes in this guidance, the contractor is authorized and encouraged to provide recommended changes; to challenge the guidance or the classification assigned to any information or material furnished or generated under this contract; and to submit any questions for interpretation of this guidance to the official identified below. Pending final decision, the information involved shall be handled and protected at the highest level of classification assigned or recommended. (Fill in as appropriate for the classified effort. Attach, or forward under separate correspondence, any documents/guides/extracts referenced herein. Add additional pages as needed to provide complete guidance.)

CLASSIFIED DOCUMENTS GENERATED BY THIS CONTRACT MUST BE MARKED IN ACCORDANCE WITH THE DOD 5220.22-S-2, "MARKING SUPPLEMENT TO THE INDUSTRIAL SECURITY MANUAL FOR SAFEGUARDING CLASSIFIED INFORMATION"".

10a. COMSEC information required for STU-III, network interfaces, and communications links.

10e. (1) ARPA SCI guidance (attached).

10e. (2) ARPA Policy on Release of Classified Intelligence Material to U.S. Contractors - Collateral (attached).

11c. Classification guidance will be provided in the ARPA Security Classification Guide No. 154 "High Altitude Endurance Unmanned Aerial Vehicle (Tier II +)"(provided under separate cover). ARPA Technical Information Procedures (TIP) (attached).

11d. Classified equipment and COMSEC equipment will be modified, stored, and/or used.

11.i. TEMPEST maybe required for SCI. See ARPA SCI Guidance (attached).

11j. OPSEC requirements will be identified as necessary during the contract performance.

14. ADDITIONAL SECURITY REQUIREMENTS. Requirements, in addition to ISM requirements, are established for this contract. (If Yes, identify the pertinent contractual clauses in the contract document itself, or provide an appropriate statement which identifies the additional requirements. Provide a copy of the requirements to the cognizant security office. Use Item 13 if additional space is needed.) [X] Yes [ ] No

DIAM 50-5, Volumes I and II.

15. INSPECTIONS. Elements of this contract are outside the inspection responsibility of the cognizant security office. (If Yes, explain and identify specific areas or elements carved out and the activity responsible for inspections. Use Item 13 if additional space is needed.) [X] Yes [ ] No

DIAM 50-5, Volumes I and II. See ARPA SCI guidance attached. See Item 13.

16. CERTIFICATION AND SIGNATURE. Security requirements stated herein are complete and adequate for safeguarding the classified information to be released or generated under this classified effort. All questions shall be referred to the official named below.

a. TYPED NAME OF CERTIFYING OFFICIAL	b. TITLE	c. TELEPHONE (Include Area Code)
Kathleen Pulzone	Contracting Officer for Security Matters	(703) 696-2389

d. ADDRESS (Include Zip Code)
Advanced Research Projects Agency (ARPA)
3701 N. Fairfax Drive
Arlington, VA 22203-1714

e. SIGNATURE
Kathleen Pulzone

17. REQUIRED DISTRIBUTION
[X] a. CONTRACTOR
[ ] b. SUBCONTRACTOR
[X] c. COGNIZANT SECURITY OFFICE FOR PRIME AND SUBCONTRACTOR
[ ] d. U.S. ACTIVITY RESPONSIBLE FOR OVERSEAS SECURITY ADMINISTRATION
[ ] e. ADMINISTRATIVE CONTRACTING OFFICER
[X] f. OTHERS AS NECESSARY ARPA S&IO

ATTACHMENT TO DD FORM 254 FOR CONTRACT NO. MDA972-95-3-0013

SUBJECT: Technical Information Program (TIP) Procedures

The following procedures have been designed to assist contractor organizations in obtaining necessary classified information input to support the work being performed under the contract as well as expediting the publication and distribution of the results of their work.

I. INPUT

Actions involving access to classified information, whether oral, visual or documentary, require establishment and certification of need-to-know and are considered to be part of the input process:

a. Visits to Government and contractor installations.[1]

b. Field of Interest Registers (e.g., DTIC, RAND, Lincoln Laboratory, etc.).

c. Access to DoD Information Analysis Centers (e.g., DMSTTIAC, etc.).

d. Access to the intelligence community (e.g., DIA).

e. Access to the Department of Energy (DOE) and its contractors (e.g., visits or mail channels - DOE F5631.20, formerly DP-277).

f. Attendance at classified technical meetings and symposia.

g. Certification for Special Access Programs.

h. Requests for classified documents from all sources (e.g., DTIC Form 55).

All of the foregoing actions must be submitted to the following office for certification of need-to-know:

Advanced Research Projects Agency
ATTN: TIO
3701 North Fairfax Drive
Arlington VA 22203-1714

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[1]Visits between the prime contractor and their subcontractors, or between subcontractors working on the same program, do not need to be submitted through ARPA for certification of need-to-know.

The contractor is responsible for determining their own need for classified information input. To assist in selecting needed material, the use of DoD sponsored Information Analysis Centers is encouraged.

II. OUTPUT

The following procedures apply to technical reports produced under the contract:

a. Whenever a technical report has been generated, the contractor should submit one DRAFT copy to ARPA/TIO, together with a tentative security classification for authentication, a recommended Distribution Statement and notices per DoD 5230.24, and a recommended distribution list.

b. All UNCLASSIFIED information intended for publication in the open literature must be submitted to ARPA/TIO, in five (5) copies. Please allow at least four weeks for review for open publication. Viewgraph presentations must be accompanied by a written text. Whenever a paper is to be presented at a meeting, please indicate the title of the meeting, the dates of the meeting and deadline for submitting the material.

c. All written material, whether classified or unclassified, must carry a Distribution Statement per DoD 5230.24.

d. After written approval has been received from ARPA/TIO, the information may be published and distributed to the approved distribution list. Unless otherwise specified, two (2) copies of all technical reports should be deposited in the Defense Technical Information Center (DTIC), Alexandria VA 22314 for secondary distribution. The contractor should maintain a reasonable supply of documents on hand to fill secondary requests until DTIC announcement and availability. Thereafter, all excess copies may be destroyed.

e. All technical reports should contain a completed SF 298 (Report Documentation Page).

ATTACHMENT TO DD FORM 254 FOR CONTRACT NO: MDA972-95-3-0013

SUBJECT: Policy on Release of Classified Intelligence Material to U.S. Contractors - (Collateral)

References: (a) DIAR 50-1, Release of Classified Intelligence Material to U.S. Contractors, 24 August 1976

(b) DIAR 50-20, Visits of Contractor Personnel to Defense Intelligence Agency (DIA), 27 August 1982

(c) DoD 5220.22-M, DoD Industrial Security Manual for Safeguarding Classified Information, January 1991

This attachment to DD Form 254 sets forth DoD policy and procedures governing the disclosure of visual, oral, or documentary classified intelligence material to eligible ARPA sponsored contractors as follows:

1. Requests for visits to Defense Intelligence Agency (DIA) and release of classified material to contractors should be submitted through ARPA Technical Information Officer (TIO) to DIA/S-03C as early as possible after the contract has been awarded. The recipient should be prepared to receive and use microfiche copies in lieu of hard copy documents. All requests for services must contain the following information:

   a. Document title (full and short), number and date.

   b. Document classification.

   c. Identification of the contractor, contract number, expiration date, purpose of the contract and justification (advantage to the government, relevancy of the contract, etc.) for release.

   d. Identification and address of the accredited facility authorized to receive and store the material.

   e. Name of responsible official document custodian.

   f. Name of person(s) to whom the material is to be released.

   g. Whether or not the material is on hand or will have to be forwarded.

   h. Current DD Form 254.

   i. Statement of Work (only the scope and applicable task required).

j. Contracting Officer's Representative appointment letter to include organization and phone number.

2. The security procedures for visitor authorization are as follows:

a. DIA Point of Contact.

b. Contract number.

c. Contractor's name

d Date of visit.

e. Need-to-know/justification.

f. Requests for visits require 10 working days prior notification to DIA/OS (Visitor Control)

3. The following DIA/S-03C services are available in support of contracts:

a. Preliminary consultation.

b. Bibliography of applicable publications.

c. Document loans:

(1) 30-day loans.

(2) Duration of Contract loans (10 months or longer).

d. Routine documents should be ordered thru ARPA Account A015.

e. Assistance in obtaining release authority on documents marked:

(1) Dissemination and Extraction of Information Controlled by Originator (ORCON).

(2) Not releasable to Contractors or Contractor/Consultants (NONCONTRACT).

(3) Caution - Proprietary Information Involved (PROPIN).

(4) Top Secret/SI/GAMMA Intelligence Data.

e. Prearranged disclosure of documents to contractors:

(1) Personal visits are authorized only through ARPA/TIO

(2) Contractors should be instructed to call ARPA/TIO instead of DIA/S-03C or DIA's analytical offices for guidance

(3) Special mailing instructions.

(4) Contractors cannot have access to the Library.

ARPA/TIO can give permission to mail directly to the contractor's facility providing proper facility clearances are provided. This should appear in the contractor's letter of request.

4. It is the responsibility of the ARPA/TIO to maintain records of all classified information provided to a contractor and to retrieve and/or ensure proper disposition of the material upon completion and/or expiration of the contract.

5. Requirements on termination of the contract:

a. All intelligence information furnished by the contractor remains the property of the originating agency. Unless retention or destruction is authorized by DIA, all material will be returned by ARPA/TIO or the contractor to DIA upon completion of the contract.

b. Copies of the disposition instructions provided by the ARPA/TIO on completed contracts will be maintained by the user agency for record purposes. If disposition instructions are not received within 60 days of contract completion or it retention is not authorized by the DD Form 254 for a follow-on contract, the Contractor Security Officer will initiate a request to the ARPA/TIO for disposition instructions.

6. In addition to the requirements set forth in reference c. the following controls must be maintained <u>by the contractor</u>

a. The contractor will maintain accountability for all intelligence material released to their custody.

b. The contractor may not reproduce intelligence material without written permission from ARPA/TIO. If permission is granted, all copies will be controlled in the same manner as the originals.

c. The contractor will not destroy any intelligence information without the permission of ARPA/TIO.

d. The contractor must restrict access to only those individuals who possess the necessary security clearance and who are actually providing services under the contract. Further dissemination, to include subcontractors, or other Government agencies, is prohibited unless authorized in writing by ARPA/TIO.

e. Intelligence information will not be released to foreign nationals or to immigrant aliens, regardless of their level of security clearance, without written permission of the originator.

f. The contractor will assure that each individual having access to intelligence information is fully aware of the special security requirements involved.

g. Reports produced by contractors incorporating intelligence information will not be distributed prior to written approval obtained from the ARPA/TIO. A DRAFT copy of the report, together with a tentative security classification and a suggested distribution list, will be submitted to ARPA/TIO.

h. Reports produced by contractors, incorporating intelligence information will not be deposited in the Defense Technical Information Center (DTIC). If practicable, a separate annex containing the intelligence information should be considered so that the basic study may be placed in DTIC.

7. Questions regarding the foregoing should be referred to ARPA/TIO (703) 696-2301.

MOA972-95-3-0013

Continuation from Item 13

Ref. Item14: DIAM 50-5
Ref. Item 15: The cognizant security authority for SCI is SSO/DIA through the Special Security Contact Officer (SSCO), Advanced Research Projects Agency (ARPA), 3701 North Fairfax Drive, Room 910, Arlington, VA 22203-1714.

Item 10. e. (1):

This contract requires access to Sensitive Compartmented Information (SCI). The Advanced Research Projects Agency has exclusive security responsibility for such information released to the contractor or developed under this contract. DCID 1/21 Implementation Manual, and DIAMs 50-4 and 50-5 provides the necessary guidance for physical, personnel, and information security measures and is a part of the security specifications for this contract. Defense Investigative Services is relieved of responsibility for all SCI material/information released to the contractor under this contract. SCI will not be released to contractor employees without specific release approval of the originator. Prior approval and certification of need-to-know shall be obtained from the appropriate Contract Monitor on all such releases of SCI material furnished in support of this contract. All SCI material remains the property of the releasing Government User Agency. Upon completion or cancellation of the contract, SCI materials previously furnished will be returned to the direct custody of the SSCO/ARPA (unless other disposition instructions have been issued through the SSCO/ARPA). The contractor will submit all final reports produced at the SCI level as follows: One (1) copy to the ARPA SSCO (unless contract monitor indicates additional copies); and one (I) copy will be provided to the SSO/DIA, Attn: SLV2, Washington, DC 20340-3342.

Item 11. i.: TEMPEST requirements for SCI must be approved by the DIA Certified TEMPEST Authority (CTA) prior to any type of employment.

Matt T. Donlon
SSCO/ARPA

Date

AMENDMENT NO. 002

AGREEMENT

BETWEEN

TELEDYNE RYAN AERONAUTICAL
A DIVISION OF TELEDYNE INDUSTRIES, INC.
2701 HARBOR DRIVE
P.O. BOX 85311
SAN DIEGO, CALIFORNIA 92186-5311

AND

THE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203-1714

CONCERNING

HIGH ALTITUDE ENDURANCE (HAE) UNMANNED AERIAL VEHICLE (UAV)
TIER II PLUS, PHASE II

AGREEMENT NO: MDA972 95 3 0013

AMENDMENT NO: 0002

ARPA ORDER NO: C727 and C727/01

TOTAL CPIF TARGET PRICE OF THE PHASE II AGREEMENT: $ 157,348,000

TOAL CPFF ESTIMATED COST AND FIXED FEE OF THE PHASE II AGREEMENT: $640,315

TOTAL INCREMENTAL FUNDS OBLIGATED BY THIS AMENDMENT: $ 39,000,000

EFFECTIVE DATE OF THIS ACTION: 6 April 1995

AUTHORITY: 10 U.S.C. 2371 AND SECTION 845 OF THE 1994 NATIONAL DEFENSE AUTHORIZATION ACT

LINE OF APPROPRIATION: AA 9750400 11ED C727 P5154 2525 DPAC 5 5162 503733: AUTHORITY $39,000,000

This Amendment is entered into between the United States of America, hereinafter called the Government, represented by The Advance Research Projects Agency (ARPA), and Teledyne Industries, Inc. a California corporation, acting by and through its Teledyne Ryan Aeronautical Division (TRA) pursuant to and under U.S. Federal law.

FOR TELEDYNE RYAN AERONAUTICAL
A DIVISION OF TELEDYNE INDUSTRIES, INC.

(Signature)

R.A.K. Mitchell, President 8/3/95
(Name, Title) (Date)

FOR THE UNITED STATES OF AMERICA
THE ADVANCED RESEARCH PROJECTS AGENCY

(Signature)

Ron H. Register, Dep Dir, Management 8/4/95
(Name, Title) (Date)

WP95-331.MSW(T2PH2-01)

AGREEMENT

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ATTACHMENTS

PURPOSE OF AMENDMENT

The purpose of this amendment is (i) to award the High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAV), TIER II Plus, Phase II effort which encompasses System Design, Development and Initial System Performance Testing, and (ii) to establish an option for the award of Phase III, System Operational Field Demonstration. This amendment revises, updates and adds Agreement ARTICLES and ATTACHMENTS for the Phase II effort and Phase III option. Except as provided herein, all terms and conditions of the Agreement, as amended, remain in full force and effect.

TIER II PLUS VISION STATEMENT

"The New Way of Doing Business"

The TIER II PLUS vision is TRA, ARPA and the ultimate Customer functioning as a team in an environment of collaboration and creativity to develop an affordable and very capable High Altitude Endurance UAV System.

ARTICLE I
SCOPE OF THE AGREEMENT

A. In performance of the Tier II Plus Program, the TRA Team pledges to:

- Dedicate its resources and energy to achieving the single program requirement of providing the war fighter with the most capable, High Altitude Endurance Reconnaissance Unmanned Air Vehicle that can be produced for a unit flyaway price (UFP) of $10 million (FY94 dollars).
- Build upon and expand the partnership formed between the Government and Industry to use the best collective efforts of the partners in accomplishing common goals.
- Foster the new way of doing business under the Other Agreements Authority by streamlining the procurement process and effectively using commercial processes and products.
- Perform the program segments on time and within available funding by minimizing program risk and maintaining cost reasonableness.

B. TRA has established strategic alliances with proven leaders from industry who possess the experience and expertise to make a significant contribution to the success of the Tier II Plus Program. This group of highly motivated companies includes E-Systems, Allison, GDE Systems, Heroux, Hughes, Rockwell International and Loral, who with other companies that offer these qualities, form the TRA Team.

C. In the performance of this program segment, the TRA Team will continue to work closely with ARPA and the User community utilizing the Integrated Product Development process and Integrated Product Teams to insure continuous involvement with, and full visibility into, all aspects of the Tier II Plus Program.

D. Phases II and III of the Tier II Plus Program will be performed as follows:

PHASE II – SYSTEM DESIGN, DEVELOPMENT AND INITIAL PERFORMANCE TESTING

1. The objective of Phase II is to successfully (i) complete the design and develop the Tier II Plus System; (ii) define the System Specification and all interfaces; (iii) produce a developmental system consisting of two (2) air vehicles, a ground segment, and support segment capable of demonstrating system performance; and (iii) complete initial flight and performance testing.

2. System development will be guided by the Integrated Master Plan (IMP) and Preliminary System Specification (PSS) attached hereto. All proposed changes to the Preliminary System Specification must be submitted to and approved by ARPA in accordance with Article XXI of this Agreement. The System Segment Specifications will be baselined during the Phase II Final Design Review. The Air Vehicle Segment, Ground Segment, Support Segment, Systems Engineering/Program Management and System Test will be performed in accordance with Task Description Document (TDD) detailed in Article III of this Agreement.

3. A common Ground Segment for operation of the Tier II Plus and Tier III Minus Air Vehicle Segments will be developed. Initially, the TRA Team will prepare a preliminary design for integration of the Tier III Minus capability based on information provided by ARPA. When sufficient detailed information becomes available to fully define the Tier III Minus command and control, and data processing interfaces and objectives, TRA will provide a firm proposal for the full integration and demonstration of the Tier III Minus capability as an integral part of the Phase II Ground Segment. Successful integration of the Tier III Minus capability will be highly dependent upon the timely exchange of information between TRA's Ground Segment subcontractor (E-Systems) and the Tier III Minus Contractor. Accordingly, TRA's proposal will contain provisions for this contractor to contractor relationship. This proposal will be subject to negotiation by the parties and ARPA may, at its sole discretion, exercise an option to incorporate this effort into the Agreement pursuant to the Changes clause contained in Article XXIV.

4. The Integrated Master Schedule (IMS) reflects the planned dates for attainment of significant criteria, accomplishments and events as described in the IMP. The IMP and IMS will be used to measure Phase II significant accomplishments. The period of performance for Phase II is approximately thirty-two (32) months.

5. Government-owned property required to produce the Air Vehicle and Ground Segments, and to conduct initial flight and performance testing, will be furnished by the Government in accordance with Article XV of this Agreement.

PHASE III – SYSTEM OPERATIONAL FIELD DEMONSTRATION (OPTION)

1. Phase III is an unpriced option that may be exercised by ARPA in accordance with Article XXV of this Agreement. This phase will be conducted under a modified Agreement which will include appropriate terms and conditions, and TRA's irrevocable offer to supply ten (10) Air Vehicle Systems under Lot 1 of Phase IV, for the recurring Unit Flyaway Price (UFP) of $10 million in FY 1994 Base Year Dollars.

2. The objective of Phase III is to conduct a successful operational demonstration of the Tier II Plus System. During this phase, the TRA Team will update the Phase II Air Vehicles and Ground Segment and produce and deliver up to eight (8) pre-production Air Vehicle Systems fully integrated with all subsystems; up to two (2) Ground Segments capable of supporting the Tier II Plus and Tier III Minus Air Vehicle Segments; and provide logistics support and planning for a User conducted two (2) year field demonstration of the Tier II Plus System (if the option is exercised). This effort will be performed in accordance with the System Specification and System Segment Specifications approved during Phase II and the updated IMP. Specific tasks related to each of the Program Segments will be accomplished as described in the Task Description Document contained in Article III of this Agreement.

3. The Integrated Master Schedule (IMS) reflects the planned dates for performance of significant events and accomplishments as described in the IMP. The IMP and IMS will be used to measure Phase III significant accomplishments. The period of performance for Phase III is approximately thirty (30) months.

4. Government-owned property required to produce the Air Vehicle and Ground Segments, and to support the User field demonstration program, will be furnished by the Government in accordance with Article XV of this Agreement.

ARTICLE II
TERM

A. TERM OF THIS AGREEMENT: This Amendment commences on the effective date specified above and continues for the duration of Phase II, 28 February 1998, through Phase III, provided the Phase III option is awarded.

B. TERMINATION PROVISIONS: (UNCHANGED)

ARTICLE III
TASK DESCRIPTION DOCUMENT (TDD)

The TDD, together with the IMP and IMS, defines how TRA will conduct the Tier II Plus Program. To maximize effectiveness and facilitate traceability among these documents, each employs TRA's common numbering system based on the work outline. Similar to a statement of work, the TDD describes the tasks and work effort that will be performed during the program. The Product IMP abstracts key accomplishments and their associated criteria for accomplishment from the TDD task and work description. Each accomplishment is related to a program event. The TDD and corresponding IMP sections are combined in Attachment 1 for ease of understanding. The IMS (separate document) places the tasks identified as accomplishment criteria in the product IMP into the time domain. The Process IMP describes the processes the team will implement to effectively conduct and manage the work of the TDD.

Approach. The TRA Team will execute the work efforts to meet or exceed the SCD objectives at the $10M UFP requirement consistent with sound military utility and risk decisions. To guide us in this effort, TRA has established a list of guidelines and processes to ensure the entire team adheres to the tenets of low risk and high military utility.

- Test Early
- Be Compatible with Existing Military Systems
- Integrated Product Development Philosophies
- Trade to Maximize Military Utility
- Build in Growth Path
- Maximize use of Off-the-Shelf Equipment
- Maximize use of Open Architectures
- Minimize System Life Cycle Cost
- Require Supplier Participation in the IPT Structure
- Invite Customer Participation in the IPT Structure

ARTICLE IV
PAYMENT SCHEDULE

A. PAYMENT OF ALLOWABLE COST: As work progresses, TRA may submit invoices for payment of allowable cost as defined by FAR clause 52.216-7, ALLOWABLE COST AND PAYMENT (JUL 1991), except that with respect to paragraphs (b)(i) and (b)(iii), TRA may include as reimbursable costs the amount of subcontractor delivery, progress or reimbursement payment invoices that have been recorded by TRA but are not delinquent in being paid in the ordinary course of business under similar cost standards." Such invoices will be certified in the manner prescribed in Article XX. Any interest accured by TRA as a result of its failure to make timely payments to Subcontractors will be credited to the Government. Final indirect costs will be established in accordance with the Quick-Close-out Procedure set forth in Article XX. Allowable cost for the CPIF and CPFF elements of this Agreement will be separately identified on each invoice.

B. PAYMENT OF INCENTIVE FEE: Invoices for allowable cost may include an incentive fee equal to 6.19 percent of allowable cost. The ARPA Agreements Administrator may increase or decrease the percentage of billable incentive fee in the manner described in FAR 52.216-10, INCENTIVE FEE (APR 1984). In no event will the percentage of billable incentive fee be less than the minimum fee nor greater than the maximum fee specified in Article VI.

C. PAYMENT OF FIXED FEE: Invoices which include allowable cost for the CPFF element of this Agreement may include fixed fee in an amount equal to the percentage of estimated cost set forth in Article XXVIII of this Agreement. Payment of fixed fee will be subject to the conditions set forth in FAR clause 52.216, FIXED FEE (APR 1984).

Allowable cost and fee will be paid by the Government in accordance with the payment terms set forth in Article VI.

ARTICLE V
AGREEMENT ADMINISTRATION

(UNCHANGED)

ARTICLE VI
OBLIGATION AND PAYMENT

A. OBLIGATION (INCREMENTAL FUNDING): The Phase II effort authorized by this Amendment will be subject to incremental funding by the Government. The Government's liability to make payments to TRA is limited to funding in the amount of $39 million which is presently obligated to cover performance under this Amendment through 31 October 1995. TRA will notify the ARPA Agreements Administrator in writing, when the costs it expects to incur in the next 60 days, when added to the costs previously incurred, will exceed eighty percent (80%) of the total amount obligated. TRA will continue performance up to the point at which the total amount paid and payable by the Government is equivalent to the amount obligated to this Agreement. In the event that additional funds are not provided by the Government, TRA will not be obligated to continue performance or incur costs under this Agreement that would exceed the amount obligated by the Government.

B. PAYMENTS: TRA will submit an original and five (5) copies of all duly certified invoices to the ARPA Agreements Administrator for payment approval. The ARPA Agreement Administrator will approve or disapprove all invoices within thirty (30) calendar days after receipt and forward approved invoices for payment to: AFDW/WF, Attn.: Commercial Services, 170 Luke Ave., Suite 280, Bolling Air Force Base, Washington, DC 20332-5113. Payments will be made to TRA pursuant to the electronic funds transfer payment method set forth in FAR Clause 52.232-28 within thirty (30) calendar days of ARPA's transmittal. The address to which EFT payments will be made by the Government is as follows:

Bank of America - San Francisco, CA
ABA No: 12100358
Account Adminstration No. 5693
1850 Gateway Blvd.
Concord, CA 94520

Teledyne Ryan Aeronautical
Bank Account No. 04415-00015
Teledyne Division No. 001-153-01

C. FINANCIAL RECORDS AND REPORTS: TRA's relevant financial records for each Program Phase, are subject to examination or audit on behalf of ARPA for a period not to exceed three (3) years after completion of that Phase. TRA will provide the ARPA Agreements Administrator or designee direct access to sufficient records and information of TRA to ensure full accountability for all funding under this Agreement. Such audit, examination, or written access will be performed during business hours upon prior written notice and will be subject to the security requirements of TRA.

ARTICLES VII THROUGH XIII

(UNCHANGED)

ARTICLE XIV
INSURANCE

TRA will maintain the types of insurance listed in FAR Clause 52.228-7, INSURANCE LIABILITY TO THIRD PERSONS (APR 1984).

ARTICLE XV
GOVERNMENT-FURNISHED EQUIPMENT, PROPERTY, INFORMATION, FACILITIES AND SERVICES

A. GENERAL: Property furnished by the Government, or acquired by TRA and its suppliers in performance of this Agreement, will be subject to the provisions of FAR clause 52.245-5, GOVERNMENT PROPERTY (JAN 1986), except that FAR Subpart 45 will not apply. Accountability and control of Government property will be accomplished in accordance with sound industrial practice, as set forth in TRA's Tier II Plus Customer Property Manual. The proposed Customer Property Manual will be available for ARPA's review and comments during the Phase II Initial Design Review.

B. GFP: The Government furnished property required for performance of Phases II and III will be supplied on a rent-free basis in accordance with the listings contained in Attachment 4. TRA will prepare requisitioning documentation for this GFP in accordance with DoD 4000.25-1-M, Military Standard Requisitioning and Issue Procedures (MILSTRIP). GFP will be provided FOB destination.

C. GOVERNMENT FURNISHED INFORMATION: TRA may request Government assistance in identifying and/or obtaining Government-owned information. Such requests will be made within the appropriate Integrated Product Team (IPT). The Government IPT members will provide assistance and, where appropriate, formally request that the Government office with cognizance over the information release it to TRA.

ARTICLE XVI
SECURITY

The Program shall be provided protection as required by the appropriate security requirements set forth in the DD Form 254 (Attachment 3) which is an integral part of the Agreement. The highest level of classification involved in the performance of this Agreement is Top Secret. It is the Government's position that the highest security classification of any item deliverable as a result of this Agreement is SECRET. However, in order to interface the Tier II Plus System with existing ground stations and communications networks, it is anticipated that TRA may need capability to access and handle access to Sensitive Compartmented Information (SCI). This Agreement is unclassified.

ARTICLES XVII THROUGH XVIII

(UNCHANGED)

ARTICLE XIX
PHASE II INCENTIVE PROVISIONS

A. APPLICIABILITY: This article applies to the Cost-Plus-Incentive-Fee portion of this Agreement and is subject to the provisions of FAR clause 52.216-7, ALLOWABLE COST AND PAYMENT, as modified by Article XX, and FAR clause 52.216-10, INCENTIVE FEE. The negotiated Target Cost, Target Fee and Total CPIF amount are as follows:

Target Cost:	$148,177,000
Target Fee:	$9,171,000
CPIF Amount:	$157,348,000

B. INCENTIVE FEE: The incentive fee payable by the Government will be based on total cost and technical performance incentives described below. The incentive fee payable will be established by multipling the earned cost incentive fee by the Earned Performance Factor to determine the final incentive fee. The total incentive fee will be subject to the following fee structure:

Target Fee:	6.19%	of Target Cost	$9,171,000
Maximum Fee:	15.00%	of Target Cost	$22,227,000
Minimum Fee:	1.19%	of Target Cost	$1,762,000

EARNED COST INCENTIVE FEE: Earned cost incentive portion of the incentive fee is based on total cost incurred during the performance of Phase II of the Agreement. At completion of Phase II, the target earned cost incentive portion of the incentive fee will be increased or decreased by $50 for every $100 the total cost is under or over the estimated target cost. The total costs will be determined in accordance with Article XX.

Target Earned Cost Incentive Fee:	$9,171,000
Maximum Earned Cost Incentive Fee	$14,818,000
Minimum Earned Cost Incentive Fee:	$3,524,000

Share Ratio: Government share, 50% of cost over or under target cost.
TRA share, 50% of cost over or under target cost.

EARNED TECHNICAL PERFORMANCE INCENTIVE: At completion of Phase II and upon final determination of the earned cost incentive fee as described above, that earned value will be adjusted upward or downward by a maximum of 50 percent based on achievement of the technical performance objectives and the incentive criteria detailed below.

Performance Objectives and Incentive Criteria

Earned Technical Performance incentive will be based on performance of the below listed technical parameters as determined during the Phase II Initial System Performance Test Program. The Technical Incentives and Payload Incentives will be measured in accordance with the criteria set forth in Attachment No. 5 to this Agreement..

Group "A"
TECHNICAL INCENTIVES

1. Unit Flyaway Price (UFP)
2. Air Vehicle Time On Station (*)
3. SAR Target Geo-Location CEP
4. EO/IR Target Geo-Location CEP
5. Number of Exploitation System Interfaces
6. Number of Simultaneous MCE Dissemination Paths
7. Dynamic Timeline for DSAR Sensor Retasking
8. Dynamic Replanning

(*) Double Point Value Items

Group "B"
PAYLOAD INCENTIVES

1. SAR Search Mode IPR
2. SAR Spot Mode IPR
3. SAR Search Mode MNR
4. SAR Spot Mode MNR
5. SAR Spot Mode Image Rate
6. SAR Search Mode Area Coverage
7. GMTI Search Rate
8. Minimum Detectable Velocity
9. EO Spot Mode NIIRS Rating (*)
10. IR Spot Mode NIIRS Rating (*)
11. EO Search Mode Area Coverage
12. IR Search Mode Area Coverage

Earned Performance Factor will be determined as follows:

Group "A" Technical Incentives Each Technical Incentive has a potential value of 5-15 points with the exception of Incentive No. 2, Air Vehicle Time On Station, which has a potential point value of 10-30 points.

Group "B" Payload Incentives - The 12 Payload Incentives are equivalent in value to six (6) Technical Incentives. Each Payload Incentive has an initial potential value of 5-15 points except Incentives 9, EO Spot Mode NIIRS Rating and 10, IR Spot Mode NIIRS Rating, which have a potential value of 10-30 points. The earned value of the Payload Incentives will be determined by totaling the points for all payload incentives, dividing the total by 14 which will then be multiplied by six (6).

Earned Performance Factor - At the conclusion of the Test Program, the points earned for all eight (8) parameters in Group "A" will be totaled and added to the Group "B" total to determine the Earned Performance Factor of between 0.5 and 1.5. The Earned Performance Factor will be determined by adding the sum of the points earned under Groups "A" and "B" and dividing that sum by 150.

C. EXAMPLES. Examples of the final fee calculation are provided below.

Example Fee Calculation A:		Example Fee Calculation B:	
Cost at Completion	$136.9M	Cost at Completion	$159.5M
Earned Cost Incentive	$14.8M	Earned Cost Incentive	$3.5M
Earned Performance Factor	1.35	Earned Performance Factor	0.55
Actual Fee Earned	$ 19.98M	Actual Fee Earned	$ 1.92M
Price to Government	$156.88M	Price to Government	$161.42M

ARTICLE XX
COST ACCOUNTING STANDARDS AND AUDIT PROCESS

A. COST ACCOUNTING STANDARDS: In performance of Phase II, TRA will maintain an accounting system and faithfully follow the cost accounting practices set forth in its existing CASB Disclosure Statement for its Aircraft Strategic Business Unit (SBU) in San Diego and its Tier II Plus Management Accounting statement for the newly established Tier II Plus SBU. TRA will consistently follow such accounting practices in accumulating and reporting cost data under this Amendment. TRA will comply with the intent of all Cost Accounting Standards contained in Appendix B of the FAR, including any modifications thereto. In the event the Cost Accounting Standards are modified and such modification requires a change to disclosed cost accounting practices which affects the cost of performance under this Amendment, it is agreed that an equitable adjustment will be made pursuant to the Changes clause contained in Article XXIV.

B. AUDIT PROCESS:

1. INVOICES – TRA's Internal Auditor will audit invoices in accordance with the Internal Audit Guide for Tier II Plus Unit (Routine No. T-1) effective July 1995, to insure accuracy and that only reasonable, allocable and allowable costs are included. A certification, duly signed by the Internal Auditor, will be placed on each invoice stating that the costs have been reviewed and determined to be allowable as defined in the reimbursement provisions of FAR clause 52.216-7, ALLOWABLE COST AND PAYMENT (JUL 1991). At a frequency of twice annually, or more often if warranted, staff auditors from Teledyne, Inc. and Arthur Andersen LLP (an independent public accounting firm), will review the invoices and books and records pertaining to performance of the Phase II Agreement to insure the interests of the Government and Teledyne are protected.

2. QUICK CLOSE-OUT PROCEDURE, FINAL INDIRECT COST DETERMINATION – Within 180 days following completion of the Phase II effort and dispositioning of Government Property, TRA will submit to the ARPA Agreements Administrator, a statement of final indirect costs allocated to this Agreement, which will be subject to audit by Arthur Andersen LLP, or another independent accounting firm if requested by ARPA. The statement will be based on allowable cost in accordance with FAR Subpart 31.2 and contain sufficient accounting data to validate the indirect cost settlement. This statement of indirect costs will serve as the basis for final cost and incentive fee determination as required under Article XIX. This procedure supersedes and replaces the final close-out procedure specified in FAR 52-216-7(d).

3. AUDIT REPORTS - Audit reports prepared by Arthur Anderson LLP which pertain to the activities described in paragraphs B.1 and B.2 above, will be submitted to the ARPA Agreement Administrator.

ARTICLE XXI
SYSTEM SPECIFICATION

Proposed changes to the Preliminary System Specification (Attachment 2) will be submitted to the ARPA Program Office with a copy to the ARPA Agreements Administrator for review and approval. If approved, this Agreement will be amended to reflect the change.

ARTICLE XXII
GOVERNMENT ACCEPTANCE AND FLIGHT RISK

A. GOVERNMENT ACCEPTANCE: Government acceptance of the two (2) Air Vehicle Segments and the Ground Segment will be made by the ARPA Program Office at the conclusion of Phase II or Phase III if the Phase III option is exercised.

B. FLIGHT RISK: The Government's liability for risk of loss or damage to Air Vehicles during the initial flight and performance testing at Edwards Air Force Base, will be subject to the provisions of DFARS clause 252.228-7002, AIRCRAFT FLIGHT RISKS (DEC 1991). With respect to paragraph (e) of this clause, TRA will be bound by the operating procedures in effect at Edwards Air Force Base during performance period of the initial flight and performance testing.

ARTICLE XXIII
DATA

It is the intent of TRA and ARPA to freely exchange technical data created under this Agreement. The ARPA Program Office may select such data from a Data Accession List to be provided by TRA in the Management Information System (MIS). The Data Accession List will be updated, at a minimum, every 30 days and reflect the title, date, security classification and IPT that generated the data. Data provided to ARPA will be subject to the provisions of Article X, Technical Data and Computer Software. It is agreed that data requested by ARPA will be furnished in the "as prepared" form and format.

ARTICLE XXIV
AGREEMENT CLAUSES

The FAR clauses cited below are incorporated herein by reference with the same force and effect as if they were given in full text.

FAR 52.243-2	CHANGES COST-REIMBURSEMENT (AUG 1987) AND ALTERNATIVE V (APR 1984)
FAR 52.215-30	FACILITIES CAPITAL COST OF MONEY (SEP 1987)
FAR 52.242-10	F.O.B. ORIGIN – GOVERNMENT BILLS OF LADING OR PREPAID POSTAGE (APR 1984)

ARTICLE XXV
PHASE III OPTION

A. PROPOSAL/NEGOTIATIONS: At such time as may be requested by the ARPA Agreements Administrator, TRA will prepare and provide a firm proposal for implementation of the Phase III option as described in Article I of this Amendment. It is contemplated that the Air Vehicle Segments will be provided under a Fixed-Price type Agreement and the Ground Segments and the logistics support for the field demonstration will be provided under a Cost-Reimbursement type Agreement. The proposal will (i) be based on mutually agreed upon updates to the Preliminary System Specification, Integrated Master Plan, Integrated Master Schedule and Task Description Document, (ii) contain realistic, reasonable and complete cost data in the form and format provided for Phase II, and (iii) include proposed terms and conditions. The parties agree to good faith negotiations in arriving at a mutually acceptable Agreement Amendment for the Phase III effort.

B. GOVERNMENT OPTION: The Government may, at its sole discretion, exercise its unilateral right to authorize performance of Phase III under this option. Exercise of this option must be in writing by the ARPA Agreements Administrator in sufficient time to allow TRA to comply with the Phase III schedule requirement identified in the Integrated Master Schedule.

ARTICLE XXVI
INTEGRATED PRODUCT TEAM (IPT) CHARTER

In an effort to create a new way of doing business, the Tier II Plus Program hereby establishes the Charter for the Integrated Product Teams for Teledyne Ryan Aeronautical (TRA) and ARPA.

TRA is responsible for the execution of the program in accordance with this Phase II Agreement and its Statement of Work (SOW). The only Government requirement is the unit flyaway price (UFP) of $10 million in FY94 Then-Year dollars per Air Vehicle Segment (including the Payload Segment) if the Government exercises an option for production of ten (10) Air Vehicle Segments. TRA must accept this obligation at the beginning of Phase III. During Phase II, TRA is responsible for providing its best efforts to perform in accordance with the Agreement.
Because of the unique acquisition experiment, normal program management oversight is not appropriate. The Government does not plan to utilize Defense Contract Management Command nor Defense Contract Audit Agency resources in their normal roles. The Program Office is limited in organization. However, there is a need for the Government Program Office to stay informed of technical, cost and schedule processes and to provide an interface with the potential military user of the resulting systems. This experiment gives the contracting parties a unique opportunity to establish new relationships within the statutory authority 10 USC 2371, and Section 845 of the National Defense Authorization Act of 1994.

This agreement gives extraordinary responsibility and authority to TRA. The Government will not unilaterally direct performance within or outside the scope of the work. Thus, the government must be able to convince TRA of the need for change.

The parties must always remember the contractor and the Program Office are entering a joint obligation to provide the best system possible that will meet the military user's needs within the UFP. The parties' interests are separate, because TRA is required to support their corporation's profitability, and the Program Office needs to provide oversight of the taxpayer's funds.

The Integrated Product Team (IPT) process within the Tier II Plus Program gives both parties the opportunity to perform both functions.

Under the IPT structure, TRA is managing the process by empowering the team to perform tasks, and resolve issues that may arise within specific areas. The areas are Program Management, Air Vehicle, Payload Ground Segment, System Engineering, Test and Support Segment. There are sub-IPTs within the Air Vehicle Segment. Issues that have broader applicability must be raised to a higher level if they impact costs, schedule or any other IPT. TRA's IPT Lead Person is responsible for making these judgments.

The HAE UAV Program Office is also structured along IPT functional areas. The HAE UAV Program Office contains expert, knowledgeable and experienced technical and program personnel. HAE UAV Program IPT members may be support employees under contract with the HAE UAV Program Office. HAE UAV Program IPT members' focus is to assist TRA by using that knowledge and expertise to make the Tier II Plus program a success. The HAE UAV Program IPT members are also part of TRA's IPT with the same goals and responsibilities to the program. As a team member, they have no more or less authority or responsibility than any other member of TRA's IPT. While they are Government representatives, their opinions do not represent the government's view until presented by written statements from the HAE UAV Program Manager or Agreements Administrator.

ARTICLE XXVII
CPFF WORK OUTSIDE SCOPE OF ARTICLE XIX

TRA will perform the tasks described in this article on a Cost-Plus-Fixed-Fee (CPFF) basis. All costs associated with these tasks will be separately accounted and reported under ARTICLE XXVII.

0001 MANAGEMENT INFORMATION SYSTEM (MIS) AND EARNED VALUE MANAGEMENT SYSTEM (EVMS). TRA will provide a MIS and EVMS as described in the TDD, paragraph 42200A and 42500A.

FY95 - FY97:
CPFF amount: $190,315
Estimated Cost and CFCCM: $178,700
Fixed Fee: $11,615 (6.5%)

0002 TECHNICAL STUDIES AND ANALYSIS SUPPORT (LEVEL OF EFFORT)

0002A AIRBORNE IMAGERY TRANSMISSION (ABIT) SUPPORT, WO 41191, TRA will provide support to the Air Force ABIT program that will develop a Common Data Link compatible system for airborne relay of both U-2 and Tier II Plus imagery. This support will include providing space, weight, power, system interfaces and working interoperability issues for both the case of sensor platform as well as relay platform.

0002B COMMUNICATION NODE SUPPORT, WO 41992. TRA will provide support to ARPA study for a Communication Node Payload for Tier II Plus. This support will include providing space, weight, power, system interfaces and working interoperability issues.

0002C WARBREAKER SIMULATION AND ANALYSES SUPPORT, WO 41193. TRA will provide to the ARPA WARBREAKER Simulation and Analyses to properly model the Tier II Plus system and analyze the simulation and analysis results for potential system impact.

FY95 and FY96:
CPFF Amount: $450,000
Estimated Cost and CFCCM: $422,535
Fixed-Fee: $27,465 (6.5%)

The level of effort (LOE) is defined as the estimated cost and CFCCM. Should the LOE be exceeded, the parties will determine if additional effort is needed and negotiate a new CPFF arrangement.

TIER II PLUS
HIGH ALTITUDE ENDURANCE
UAV SYSTEM

ARPA • DARO

TELEDYNE RYAN AERONAUTICAL

TIER II PLUS

E-SYSTEMS

Attachment 1 — Task Description Document and Integrated Master Plan (TDD/IMP)

AGREEMENT MDA972-95-3-0013
31 JULY 1995

IPT 00000 HAE UAV SYSTEM

PHASE II EVENTS

00000 HAE UAV (Tier II Plus) System. The TRA System IPT will develop, fabricate, assemble, test and deliver for flight test two (2) developmental Air Vehicle Segments and one developmental Ground Segment capable of demonstrating complete systems performance. The Team will prepare for and conduct a 12-month flight test program to include initial airworthiness flights and conclude with full system demonstration including Ground Segment Tier III Minus interoperability. The flight test program will be designed and executed to substantiate predicted levels of system maturity. The team will develop and implement a logistics system to support Phase II flight testing. Iterative refinements and rationale for improvements will be developed and submitted for implementation throughout the development and testing of the system. The system will continue to be documented in a system specification and in segment specifications as well as product data packages required to produce the developmental system and prepare for future phases. The Team will prepare for follow-on, Phase III production.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
00000 HAE UAV (TIER II PLUS) SYSTEM																	
1a. System/Segment Design Requirements Baselined	X																a. Design Requirements Bulletins (DRBs) Released b. Interface Control Documents (ICDs) Released c. Procurement Specifications Updated d. Risk Analysis Updated e. Draft System Integration Plan Released f. UFP Analysis Updated
1b. IMF Process Implemented	X																a. IMP/IMS Baselined b. Initial TPMs/Metrics Defined c. MIS Architecture Defined d. EVMS Implemented
2. System/Segment Preliminary Design and Analyses Completed		X															**SYSTEM** a. Preliminary System Performance Analyzed b. System Risk Analysis Updated c. System Integration Plan Released d. System Software Development Plan Updated **AIR VEHICLE SEGMENT** a. CFD Analysis Complete b. Scale Model Aero Testing Complete c. Final Loft Lines Established d. UAV Structural Design 95% Complete e. Flutter Analysis Complete f. Center Fuselage Structure Assembly Started g. IMMC S/W Build No. 1 Complete and Tested h. UAV SIL Operational and Supporting H/W and S/W Integration **GROUND SEGMENT** a. Ground Segment Design Trades Complete b. Ground Segment OTS Software Licenses Procured **PAYLOAD SEGMENT** a. Integrated Sensor System (ISS) H/W and S/W Design and Test Documents Complete b. ISS Detail Design Initiated **SUPPORT SEGMENT** a. Maintenance and OPS Task Analysis Complete b. Technical Data Requirements Identified

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
00000 HAE UAV (TIER II PLUS) SYSTEM (Continued)																	
2. System/Segment Preliminary Design and Analyses Completed (continued)		X															**SYSTEM TEST** a. RCC/UDS Test Range Documentation Submitted b. General Flight Test Plan Drafted
3. System/Segment Design Matured			X														**SYSTEM** a. UFP Analysis Updated b. Baseline System Performance Estimated **AIR VEHICLE SEGMENT** a. Air Vehicle Subsystems and Equipment Installation Design 90% Complete b. UAV Forward Fuselage Structural Assembly Started c. IMMC S/W Build No. 2 Complete and Tested d. UAV SIL Supporting H/W and S/W Integration **GROUND SEGMENT** a. Ground Segment H/W and S/W Design Complete **PAYLOAD SEGMENT** a. ISS and Survivability System Emulators Delivered and Integrated into UAV SIL **SUPPORT SEGMENT** a. UAV, LRE and MCE Support Task Analyses Complete b. Support Segment Specification Updated c. Support Technical Data Source Material Identified **SYSTEM TEST** a. SIL Hot Bench Fully Operational b. Frequency Data Requested
4. Segment Hardware Ready for System Level Testing				X													**AIR VEHICLE SEGMENT** a. UAV-1 Integration, Acceptance and Design Verification Tests Complete b. Flight Critical Component Environmental Verifications Complete c. UAV-1 Instrumentation Calibrated **GROUND SEGMENT** a. LRE and MCE Version 1 and 2 Integration and Test Complete **SUPPORT SEGMENT** a. PSE Integration and Acceptance Testing Complete **SYSTEM TEST** a. Coast-to-Coast C^2/Status Connectivity Tests Accomplished b. UAV-1/LRE Functional Integration Test Plan Approved c. Mobile Telemetry Van Programmed and Operational
5. Ready to Start Airworthiness Flight Testing					X												**SYSTEM** a. System Software Verified **AIR VEHICLE SEGMENT** a. Avionics Test Bed Takeoff and Landing Tests Complete b. 6DOF Simulation Completed for First Flight **GROUND SEGMENT** a. Ground Segment Hardware and Software Testing Accomplished

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
00000 HAE UAV (TIER II PLUS) SYSTEM (Continued)																	
5. Ready to Start Airworthiness Flight Testing (continued)																	**SYSTEM TEST** a. UAV-1/ LRE Segment Functional Integration Tests Complete b. Technical and Safety Review Board Approvals Received c. General Flight Test Plan Approved d. Preliminary Detailed Flight Test Procedures for Airworthiness Flights Released
6. Clearances for First Airworthiness Flight Received						X											**SYSTEM TEST** a. FTRR-1 Completed b. Taxi, Steering and Braking Tests Complete c. Preflight System Acceptance Tests Complete d. Flight Clearance Documentation Complete e. Air Range Coordination Accomplished f. Approvals for Flight Granted by the Test Range
7. Ready to Start Payload Flight Testing							X										**SYSTEM** a. System Software Verified b. System Performance Statused **AIR VEHICLE SEGMENT** a. UAV-2 Functional Integration Tests Complete b. UAV-2 Instrumentation Installed, Calibrated and Checked Out **SYSTEM TEST** a. Connectivity and Product Dissemination Tests Complete b. Mobile Telemetry Van Programmed for UAV-2 Instrumentation Configuration c. UAV-2/Ground Segment Functional Integration and Test Complete d. FAA Approval for Off-Range Flight Received e. Preliminary Detailed Flight Test Procedures for Payload Flights Released f. Payload Integration and Element Tests Completed g. Ground Segment Hardware and Software Testing through Version 3 Accomplished
8. Clearance for First Payload Flight Test Received								X									**AIR VEHICLE SEGMENT** a. 6DOF Simulation Updated **SYSTEM TEST** a. FTRR-2 Completed b. Preflight Acceptance Test Complete c. Flight Clearance Documentation Updated d. Approvals for Flight Granted
9. Ready for Phase III Production Go-Ahead									X								**SYSTEM** a. UFP Analysis Updated b. System Performance Analysis Updated c. System Design Stabilized d. Product Data Packages Updated e. Risk Reduction Plans Updated f. Cost and Schedule Impact Evaluation Complete

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
00000 HAE UAV (TIER II PLUS) SYSTEM (Continued)																	
9. Ready for Phase III Production Go-Ahead (Continued)																	**SUPPORT SEGMENT** a. Training Program Plan Completed b. Parts List Finalized c. Maintenance Procedures and Checklists Developed d. Repair Processing Defined **SYSTEM TEST** a. Stage 4 Frequency Allocation Granted by Government b. Airworthiness Quick Look Reports Available
10. Phase II Tasks Complete										X							**AIR VEHICLE SEGMENT** a. Final UAV Software Build Complete b. Final Air Vehicle Performance Model Completed **GROUND SEGMENT** a. Ground Segment Final Software Documentation Complete **SUPPORT SEGMENT** a. All Support Segment Planning and Analysis Complete **SYSTEM TEST** a. System End-to-End Capabilities Demonstrated b. Phase II Flight Tests Completed c. Tier III Minus Interoperability Ground and Flight Tests Complete d. All Phase II Reports Complete

II.A 10000 AIR VEHICLE SEGMENT

PHASE II EVENTS

10000 Air Vehicle Segment. The Air Vehicle IPTs will design, fabricate, assemble, integrate, test and deliver two developmental air vehicles for system testing. The final air vehicle design will be documented in the Segment Specification and product data packages (PDPs), and presented during the review process of this program phase. The Air Vehicle IPT will perform segment, subsystem and component hardware and software tests to demonstrate that the performance of this segment will meet the system and segment specification requirements.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
10000 AIR VEHICLE SEGMENT																	
1. UAV Design Requirements Established	X																a. Design Requirements Bulletins (DRBs) Released b. Procurement Specifications Updated c. UFP Analysis Updated
2. Air Vehicle H/W and S/W Designs Finalized			X														a. Product Data Packages Updated b. Segment Specification Updated c. Tooling Designed, Fabrication Progressing d. UAV SIL Supporting Hardware and Software Integration
3. First Air Vehicle Ready for System Ground Tests				X													a. UAV-1 Integration Acceptance and Design Verification Tests Complete b. Flight Critical Component Env Verifications Complete
4. Second Air Vehicle Ready for Flight Tests							X										a. Payload Systems Integrated in UAV-2 b. UAV-2 Acceptance and Design Verification Tests Complete c. UAV-2 Delivered to Edwards AFB
5. Preparation for Phase III Production Complete									X								a. UFP Analysis Updated b. Air Vehicle Design Stabilized c. Risk Reduction Plans Updated

II 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11000 Air Vehicle Analysis/Integration/Test. Support the development of a configuration that possesses satisfactory mission performance, demonstrates proper air vehicle command and control, demonstrates adequate payload performance, and demonstrates operational capability through analysis and test. Conduct physical integration and testing to prepare the air vehicles for the system level ground and flight test program. Develop detailed test requirements for tests identified in the Master Test Plan that will verify the design and performance requirements. Analyze ground and flight test results. Update models and recommend corrections to deficiencies identified during the testing to be incorporated into the final air vehicle configuration. Update Air Vehicle Segment Specification; place under control requiring bilateral agreement with government for changes. Input changes to System Specification.

11100 Air Vehicle Analysis. Work with the Airframe, Payload and Avionics IPTs to ensure successful air vehicle design occurs. Support risk assessment and risk mitigation analysis being conducted by the Systems Engineering IPT. Conduct aerodynamic analyses in support of airframe design and air vehicle performance predictions. Conduct propulsion analyses in support of engine installation and vehicle performance predictions. Design the ECS in order to provide adequate thermal environments for avionics, payload and airframe subsystems. Provide air vehicle guidance and control software to the Avionics IPT. Develop and maintain all 6DOF simulations. Support the Airframe IPT with structural load analysis and structural dynamics analysis. Design the air vehicle electrical system in order to provide adequate power to all avionics, payload and airframe subsystem hardware. Finalize the air vehicle EMI/EMC control plan and monitor compliance. Finalize mass properties control plan and monitor compliance.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
11000 AIR VEHICLE ANALYSIS/INTEGRATION/TEST																	
1. Air Vehicle Design Requirements Baselined	X																a. Air Vehicle TPMs Updated b. Environmental Allocation DRB Completed c. Aerodynamic Tolerances DRB Completed d. Guidance and Control DRB Completed e. Fuselage Electrical Installation DRB Completed f. Structural Design Criteria Completed g. Electrical Bonding Specification Completed h. Mass Properties Control Plan Panel Updated i. Air Vehicle Test Requirements Updated
2. Air Vehicle Preliminary Design and Analysis Completed		X															a. Air Vehicle External Lines Finalized b. High Altitude Engine Development Completed c. ECS Design Completed d. Preliminary Guidance and Control System Developed and Analyzed e. Preliminary Engineering 6DOF Simulation Developed f. External Loads Defined g. Air Vehicle Modal and Flutter Analyses Completed h. Electrical Master Drawings Completed i. PDCU Design Completed j. Air Vehicle Wiring Design Completed k. Air Vehicle Antenna Locations Defined l. Lightning Protection System Design Completed m. Air Vehicle Mass Properties Refined n. Segment Level SIL Test Requirements Defined

II 11000 AIR VEHICLE ANALYSIS/INTEGRATION/TEST

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11000 AIR VEHICLE ANALYSIS/INTEGRATION/TEST (Continued)																	
3. Air Vehicle Design Matured			X														a. Air Vehicle Performance Model Completed b. Guidance and Control System Updated c. Engineering 6DOF Simulation Updated d. External Loads Verified e. Electrical Loads Analyses Updated f. EMI/EMC Design Requirements Updated g. Segment Level SIL Test Plans Completed h. Segment Level Engineering Test Requirements Defined i. Air Vehicle Segment Specification under Bilateral Control
4. UAV-1 Ready for System Level Testing				X													a. Airborne Guidance and Control Software Completed b. UAV-1 Configuration SIL Tests Completed c. UAV-1 Final Assembly Completed d. UAV-1 Final Acceptance Completed e. UAV-1 Engineering Tests Completed f. Stability and Control Analysis Updated
5. UAV-2 Ready for System Level Testing							X										a. UAV-2 Configuration SIL Tests Completed b. UAV-2 Final Assembly Comleted c. UAV-2 Final Acceptance Completed d. UAV-2 Engineering Tests Completed
6. Phase II Change Evaluation Completed									X								a. Change Requests Compiled b. Performance Impacts Evaluated c. Producibility Analyses Updated d. Cost and Schedule Evaluation Updated
7. Production Air Vehicle Performance Characterized										X							a. Final Installed Engine Performance Model Completed b. Final Mass Properties Model Completed c. Final Air Vehicle Performance Model Completed

IPT 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11110 Aerodynamic Performance/Stability and Control. Provide the Airframe IPT with air vehicle external lines based on Phase I air vehicle and inlet wind tunnel test results, CFD computer modeling, payload installation requirements and aerodynamic manufacturing tolerances. Provide the Airframe IPT with CG control requirements and control surface geometry requirements. Conduct Phase II air vehicle wind tunnel test. Develop performance estimates based on updated aerodynamic data, updated installed engine performance and a high fidelity mass properties model. Generate a general flight performance parameter matrix, air vehicle operational speed/altitude envelopes, and optimized mission profiles. Provide air vehicle performance predictions to the Ground Segment IPT to support development of the mission planning system. Develop a complete nonlinear aerodynamic model of the Phase II configuration for use in the 6DOF simulation. Update takeoff and landing performance and cross wind operational limits. Define the final flight performance and aerodynamic characteristics following analysis of Phase II flight test results.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11110 AERODYNAMIC PERFORMANCE/STABILITY AND CONTROL																	
1. Aerodynamic Design Requirements Updated	X																a. Phase I Wind Tunnel Test Analysis Completed b. Initial Configuration CFD Analysis Completed c. CG Limits Defined d. EO/IR Installation Requirements Analyzed e. Aerodynamic Manufacturing Tolerances DRB Completed f. Preliminary Stability and Control Analysis Completed
2. Air Vehicle External Lines Finalized		X															a. Configuration CFD Models Updated and Analyzed b. Phase II Wind Tunnel Test Completed c. Preliminary Aerodynamic Capability Characterized
3. Preliminary Air Vehicle Performance Model Completed			X														a. Phase II Wind Tunnel Test Results Analyzed b. Preliminary Aerodynamic Database Updated c. Preliminary Takeoff Performance Characterized d. Preliminary Landing Performance Characterized e. Preliminary Mission Capability Characterized f. Stability and Control Analysis Updated
4. Final Air Vehicle Performance Model Completed										X							a. Flight Test Results Analyzed b. Final Aerodynamic Database Updated c. Final Takeoff Performance Characterized d. Final Landing Performance Characterized e. Final Aerodynamic Capability Characterized f. Final Mission Capability Characterized

11120 Propulsion. Redesign the Phase I engine inlet and nozzle. Conduct Phase II engine inlet wind tunnel test. Complete the pretest AE3007H engine design. Build a test engine for the high altitude engine chamber test. Conduct high altitude engine chamber test. Finalize AE3007H engine design. Review engine production data. Analyze engine power extraction requirements. Update installed engine performance database. Provide engine installation requirements to the Airframe IPT. Provide engine software interface requirements to the Avionics IPT for Build 3 of the airborne software development. Define the final installed engine performance database following analysis of Phase II flight test results.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11120 PROPULSION																	
1. Propulsion System Design Requirements Updated	X																a. Thrust Requirements Updated b. TFSC Requirements Updated c. Surge Margin Requirements Updated d. Power Extraction Requirements Updated e. Speed Transient Capability Requirements Updated
2. Engine Inlet Designed	X																a. Inlet Geometry Defined b. Inlet CFD Analyses Completed c. Inlet Wind Tunnel Test Completed
3. Engine Nozzle Designed		X															a. Nozzle Geometry Defined b. Nozzle Analyses Completed
4. High Altitude Engine Development Completed		X															a. AE3007H Engine Pre-Test Design Completed b. High Altitude Engine Chamber Test Article Built c. High Altitude Engine Chamber Test Article Tested d. High Altitude Engine Chamber Test Results Analyzed e. AE3007H Engine Design Finalized f. Engine Power Extraction Characterized g. FADEC/IMMC Interface Finalized
5. Installed Engine Performance Model Completed			X														a. Engine Component Characterization Updated b. Inlet Performance Characterized c. Nozzle Performance Characterized
6. Installed Engine Vibration Test Requirements Defined			X														a. Installed Engine Vibration/Thermal Survey Test Requirements Defined
7. Installed Engine Vibration Test Results Analyzed				X													a. Installed Engine Vibration/Thermal Survey Test Results Analyzed
8. Final Installed Engine Performance Model Completed										X							a. Ground Test Results Analyzed b. Flight Test Results Analyzed

11130 Thermodynamics. Refine and analyze thermal models of the air vehicle structure and compartments to ensure adequacy of the environmental control system (ECS). Analyze the air vehicle system transient and steady state thermal behavior in hot and cold conditions. Predict temperature history of structure and unpressurized components. Specify ECS components. Verify ECS component qualification, and coordinate ECS component procurement. Provide ECS installation requirements to the Airframe IPT. Provide ECS software interface requirements to the Avionics IPT for build 3 of the airborne software development. Analyze ECS ground test results.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11130 THERMODYNAMICS																	
1. Thermal Environment Defined	X																a. Pressurized Compartment Temperature Environment Defined b. Unpressurized Compartment Temperature Environment Defined c. UAV Handling and Storage Temperature Environment Defined d. UAV Relative Humidity Environment Defined
2. ECS Design Completed		X															a. ECS Power Dissipation Database Updated b. ECS Cooling Requirements Database Updated c. ECS Physical Characteristics Database Updated d. Fuel System/Pressurized Compartment SINDA Analysis Updated e. ECS Thermal Transients Analyzed f. ECS Components Specified g. ECS Components Selected h. ECS Installation Coordinated i. ECS/IMMC Interface Finalized
3. UAV Structural Temperature Analysis Completed			X														a. UAV Structural SINDA Analysis Developed b. Structural Thermal Transients Analyzed
4. Thermal Survey Test Requirements Defined			X														a. UAV-1 Installed Engine Vibration/Thermal Survey Test Requirements Defined b. UAV-2 ECS/Thermal Survey Test Requirements Defined
5. UAV-1 Thermal Survey Test Results Analyzed				X													a. UAV-1 Installed Engine Vibration/Thermal Survey Test Results Analyzed
6. UAV-2 Thermal Survey Test Results Analyzed							X										a. UAV-2 ECS/Thermal Survey Test Results Analyzed

11140 Guidance and Control. Develop and analyze linear and nonlinear guidance and control laws and mode control logic for all air vehicle specified flight modes and ground modes including reconfiguration, emergency modes and ground taxi using MATRIX_X® analysis tools and the 6DOF simulation. Analyze the need for structural bending mode filters. Generate the guidance and control portions of the airborne software for validation and testing in the 6DOF simulation. Provide the guidance and control portions of the airborne software to the Avionics IPT for Build 5 of the airborne software development.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
11140 GUIDANCE AND CONTROL																	
1. Guidance and Control DRB Completed	X																a. Flight Control Modes Identified b. Guidance Functions Defined c. Mode Control Logic Methodology Defined d. Guidance and Control Performance Requirements Defined
2. Guidance and Control Subsystem Requirements Updated	X																a. Control Surface Actuator Requirements Updated b. Nose Wheel Steering Requirements Updated c. Guidance and Control Sensor Requirements Updated
3. Preliminary Guidance and Control System Developed and Analyzed		X															a. Guidance and Control Architecture Finalized b. Air Vehicle MATRIX_X® Models Built c. Preliminary Air Vehicle Flexibility Analyzed d. Preliminary Flight Control Performance Analyzed
4. Guidance and Control System Updated			X														a. Air Vehicle MATRIX_X® Models Updated b. Air Vehicle Flexibility Analysis Updated c. Flight Control Performance Updated d. Guidance Laws Developed and Analyzed e. Mode Control Logic Developed and Analyzed
5. Airborne Guidance and Control Software Completed				X													a. Guidance, Flight Control and Mode Control Logic Integrated b. Airborne Guidance and Control Software Delivered
6. Airborne Guidance and Control Software Testing Completed					X												a. Guidance and Control Software Test Plans Completed b. Software 6DOF Simulation Testing Completed c. Hardware-in-the-Loop 6DOF Simulation Testing Completed

II 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11150 Simulation. Develop, maintain, and validate the 6DOF simulations. Configure the 6DOF simulation for operation as an engineering analysis simulation and for hardware-in the loop (HWIL) operation in the SIL. Incorporate updated aerodynamic, propulsion and mass properties databases. Develop air vehicle subsystem models such as landing gear, actuators and sensors. Incorporate a Monte Carlo capability into the engineering 6DOF simulation. Develop HWIL simulation interfaces for IMMC I/O, payload I/O, subsystem I/O and user I/O. Develop HWIL interface hardware. Provide for simulation real time operation.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11150 SIMULATION																	
1. Preliminary Engineering 6DOF Simulation Developed		X															a. Preliminary 6DOF/Aerodynamic Database Integration Completed b. Preliminary 6DOF/Installed Engine Database Integration Completed c. Preliminary 6DOF/Mass Properties Database Integration Completed d. Preliminary 6DOF/Aeroelastic Model Integration Completed e. Preliminary Air Vehicle Subsystem Simulation Models Developed
2. Engineering 6DOF Simulation Updated			X														a. 6DOF/Aerodynamic Database Updated b. 6DOF/Installed Engine Database Updated c. 6DOF/Mass Properties Database Updated d. 6DOF/Aeroelastic Model Updated e. Air Vehicle Subsystem Simulation Models Updated
3. Hardware-in-the-Loop 6DOF Simulation Developed			X														a. HWIL I/O Interfaces Defined b. HWIL Interface Hardware Integration Completed c. HWIL 6DOF Real Time Operation Completed
4. Monte Carlo 6DOF Simulation Developed					X												a. Monte Carlo Simulation Variables Defined b. Monte Carlo Simulation Statistical Data Compiled c. Monte Carlo 6DOF Driver Program Completed

11160 Structural Loads. Perform detailed analyses of the air vehicle structural loads in support of the Airframe IPT design effort and in support of air vehicle aeroelastic analyses. Conduct aerodynamic, ground and miscellaneous loads analyses and update the structural design requirements generated during Phase I. Validate the wing, fuselage, empennage and landing gear design with data collected from static structural loads tests.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11160 STRUCTURAL LOADS																	
1. Preliminary External Loads Defined	X																a. Preliminary Wing/Spoiler/Aileron Loads Defined b. Preliminary Fuselage Loads Defined c. Preliminary Empennage Loads Defined d. Preliminary Landing Gear Loads Defined
2. Final External Loads Defined		X															a. Final Wing/Spoiler/Aileron Loads Defined b. Final Fuselage Loads Defined c. Final Empennage Loads Defined d. Final Landing Gear Loads Defined e. Static Aeroelastic Analyses Completed f. Final Miscellaneous Loads Defined
3. Final External Loads Verified			X														a. Final Wing/Spoiler/Aileron Loads Verified b. Final Fuselage Loads Verified c. Final Empennage Loads Verified d. Final Landing Gear Loads Verified e. Static Aeroelastic Analyses Verified f. Final Miscellaneous Loads Verified
4. Airframe Static Test Requirements Defined		X															a. Wing/Main Landing Gear Test Requirements Defined b. Fuselage/Nose Landing Gear/Empennage Test Requirements Defined
5. Airframe Static Test Results Analyzed					X												a. Wing/Main Landing Gear Test Results Analyzed b. Fuselage/Nose Landing Gear/Empennage Test Results Analyzed

IPT 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11170 Structural Dynamics. Refine natural and induced environments for the air vehicle and installed equipment. Perform detailed analyses of the air vehicle structural dynamics characteristics in support of the Airframe IPT design effort and in support of air vehicle control system analyses. Conduct air vehicle modal and flutter analyses. Validate the air vehicle modal analyses with the results from a Ground Vibration Modal Test (GVMT) on a complete UAV as required.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11170 STRUCTURAL DYNAMICS																	
1. Mechanical Environment Defined	X																a. Shock Environment Defined b. Vibration Environment Defined
2. Structural Design Criteria Completed	X																a. A/V Strength Requirements Defined b. Design Gross Weights Defined c. Gust Criteria Defined
3. Modal Analyses Completed		X															a. FEM Built b. NASTRAN Free-Free Modal Analyses Completed c. Mode Shapes and Frequencies Determined
4. Flutter Analyses Completed		X															a. NASTRAN Free-Free Flutter Analyses Completed b. Flutter and Divergence Margins Determined
5. Modal Analyses Validated				X													a. GVMT Requirements Defined b. GVMT Results Analysis Completed

II 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11180 Electrical Systems. Refine the Phase I air vehicle electrical loads analyses. Design the air vehicle power distribution and conditioning unit (PDCU). Specify PDCU components. Verify PDCU component qualification, and coordinate PDCU component procurement. Collect avionics, payload and airframe subsystem electrical interface data. Define air vehicle connectors and wiring. Design electrical harnesses to support early electrical subsystems testing in the SIL.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11180 ELECTRICAL SYSTEM																	
1. Fuselage Electrical Installation DRB Completed	X																a. Frame and Bulkhead Wire Harness Penetrations Located b. Fuselage Wire Harness Raceways Located
2. Electrical Loads Analyses Completed	X																a. Engine Start Bus Battery Electrical Loads Analyzed b. Engine Failure Bus Battery Electrical Loads Analyzed c. Flight Critical Bus Electrical Loads Analyzed d. DC Payload Bus Electrical Loads Analyzed e. AC Payload Bus Electrical Loads Analyzed
3. ALM Preparation Completed	X																a. Advanced List of Materials Generated
4. Electrical Master Drawings Completed		X															a. Master Cordage Diagram Completed b. Master Schematic Diagram Completed c. Master Wiring Diagram Completed
5. PDCU Design Completed		X															a. PDCU Parts Selection Completed b. PDCU Schematic Diagram Completed c. PDCU Wiring Diagram Completed d. PDCU Electrical/Mechanical Design Completed
6. UAV Wiring Design Completed		X															a. Engine Wire Harness Design Completed b. Avionics Compartment Wire Harness Design Completed c. SAR and EO/IR Wire Harness Design Completed d. Wing Wire Harness Design Completed e. Communications Group Wire Harness Design Completed f. Navigation Lighting Wire Harness Design Completed
7. Preliminary SIL Wiring Design Completed		X															a. Preliminary SIL Electrical Master Drawings Completed b. Preliminary SIL Harness Drawings Completed
8. Electrical Loads Analysis Updated			X														a. Engine Load Testing Analyzed b. Electrical Loads Analysis Updated
9. Electrical Loads Test Requirements Defined			X														a. UAV-1 Electrical Loads Test Requirements Defined b. UAV-2 Electrical Loads Test Requirements Defined
10. UAV-1 Electrical Loads Test Results Analyzed				X													a. UAV-1 Electrical Loads Test Results Analyzed
11. UAV-2 Electrical Loads Test Results Analyzed							X										a. UAV-2 Electrical Loads Test Results Analyzed

11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

11190 Electromagnetic Interference (EMI)/Electromagnetic Compatibility (EMC). Provide air vehicle antenna location criteria to the Airframe IPT. Provide lightning protection design criteria to the Airframe IPT. Define air vehicle electrical wiring requirements. Develop air vehicle electrical bonding specification. Analyze air vehicle external EME. Analyze air vehicle internal EMI/EMC. Provide avionics, payload and airframe subsystem internal location criteria to the Airframe IPT. Finalize the EMI/EMC Control Plan. Work with all affected IPTs to develop corrective design improvements if tests uncover compatibility issues.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11190 EMI/EMC																	
1. Preliminary EMI/EMC Requirements Defined	X																a. Preliminary LRU Locations Defined b. Preliminary Antenna Locations Defined c. Preliminary Electrical Bonding Specification Completed d. Preliminary Wing Lightning Protection Requirements Defined
2. Air Vehicle Antenna Location Defined		X															a. Antenna to Antenna Coupling CAD Model Completed b. Antenna to Antenna Isolation Analysis Completed c. Antenna Isolation Report Completed
3. Lightning Protection System Design Completed		X															a. Wing Lightning Protection Requirements Defined b. Fuselage Lightning Protection Requirements Defined
4. Air Vehicle Wiring Requirements Defined		X															a. Power Grounds/Returns Criteria Completed b. Shielding Criteria for Faraday Cage Cables Completed c. Shielding Criteria for External Faraday Cage Cables Completed
5. Electrical Bonding Specification Completed		X															a. Air Vehicle Electrical Bonding Specification Updated
6. Air Vehicle External EME Analysis Completed			X														a. LRU EME Effects Analysis Completed
7. Air Vehicle Internal EMI/EMC Analysis Completed			X														a. Internal EMI/EMC Analysis Completed
8. Air Vehicle Hardware Installation Requirements Finalized			X														a. LRU Locations Finalized b. Antenna Locations Finalized
9. EMI/EMC Control Plan Updated			X														a. Frequency Management Analysis Updated b. Adjustment of Required Levels for EMC Completed
10. EMC Test Requirements Defined			X														a. UAV-1 EMC Test Requirements Defined b. UAV-2 EMC Test Requirements Defined
11. UAV-1 EMC Test Results Analyzed				X													a. UAV-1 EMC Test Results Analyzed
12. UAV-2 EMC Test Results Analyzed							X										a. UAV-2 EMC Test Results Analyzed

II 11000 AIR VEHICLE ANALYSIS/ INTEGRATION/TEST

PHASE II EVENTS

111A0 Mass Properties. Finalize Mass Properties Control Plan. Integrate airframe, payload and avionics mass properties into the total air vehicle mass properties database. Provide IPTs with current air vehicle mass properties. Document UAV mass properties by vehicle and configuration.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
111A0 MASS PROPERTIES																	
1. Mass Properties Control Plan Completed	X																a. Target Weights Established b. Weight and CG Guidelines Defined c. Element and Subsystem Weight and CG TPMs Defined d. Adverse Weight and CG Recovery Procedure Developed
2. Initial Mass Properties Established	X																a. Initial Weight, CG and Moments of Inertia Analyzed and Documented
3. Air Vehicle Mass Properties Refined		X															a. Mass Properties Maturity Index Updated to Calculated and Documented
4. Weight and Balance Test Requirements Defined			X														a. UAV-1 Weight and Balance Test Requirements Defined b. UAV-2 Weight and Balance Test Requirements Defined
5. Air Vehicle Mass Properties Verified				X													a. UAV-1 Weight and Balance Test Results Analyzed b. Mass Properties Maturity Index Updated to Actual and Documented
6. Actual UAV-1 Mass Properties Documented					X												a. UAV-1 Actual Weight and Balance Documentation Completed b. 1st A/W Flight Config. Mass Properties Documentation Completed
7. Actual UAV-2 Mass Properties Documented							X										a. UAV-2 Weight and Balance Test Results Analyzed b. UAV-2 Actual Weight and Balance Documentation Completed c. 1st Payload Flight Config. Mass Properties Documentation Completed
8. Final Mass Properties Model Completed										X							a. Flight Test Results Analyzed b. Final Mass Properties Documentation Completed

11200 Air Vehicle Integration and Test. Work with the Airframe, Payload and Avionics IPTs to ensure successful air vehicle integration, assembly and acceptance testing occurs. Conduct segment level tests following the Airframe, Payload and Avionics IPT element or stand alone tests. Begin air vehicle segment level integration in the SIL with hot bench testing and HWIL testing of avionics, payload, airframe subsystems and software in order to validate system and subsystem interfaces. Follow segment level SIL testing with avionics, payload and software installation into the airframe for air vehicle segment level engineering tests and final acceptance tests.

IF 11000 AIR VEHICLE AN. YSIS/ INTEGRATION/TEST

PHASE II EVENTS

11210 Segment Level SIL Tests. Plan and conduct air vehicle segment level SIL tests on avionics, payload, airframe subsystems and software to ensure functional compatibility. Conduct air vehicle command and control tests to verify hardware electrical compatibility, communications protocols, air vehicle guidance, navigation and control, payload control and fault detection and redundancy management.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11210 SEGMENT LEVEL SIL TESTS																	
1. SIL Design Requirements Defined	X																a. SIL Design Requirements Defined
2. Preliminary SIL Test Requirements Defined		X															a. Preliminary SIL Test Requirements Defined
3. SIL Test Plans Completed			X														a. SIL Test Plans Completed
4. UAV-1 Configuration Segment Level SIL Tests Completed				X													a. Hardware Electrical Compatibility Verified b. Communication Protocols Verified c. Guidance, Navigation and Control Verified (HWIL Simulation) d. Fault Detection and Redundancy Management Verified
5. UAV-2 Configuration Segment Level SIL Tests Completed					X												a. Hardware Electrical Compatibility Verified b. Communication Protocols Verified c. Guidance, Navigation and Control Verified (HWIL Simulation) d Payload Control Verified e. Fault Detection and Redundancy Management Verified

11220 Segment Level Engineering Tests. Plan and conduct air vehicle segment engineering tests on UAV-1 and UAV-2 to ensure avionics, payload, airframe and software compatibility. Ensure hardware compatibility with assembly, handling, form, fit and accessibility tests. Validate electrical loads analyses and electrical quality with electrical loads tests. Verify conducted and radiated susceptibility margins with EMC tests. Verify Red/Black isolation during EMC tests (UAV-2). Substantiate thermal analyses with an ECS thermal survey test. Ensure safe engine installation with an installed engine vibration and thermal survey test. Substantiate air vehicle mass properties analysis and prepare for flight with weight and balance measurements. Validate modal and flutter analyses with a ground vibration modal test as required by analysis. Verify fuel system design with a fuel system and CG management test.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
11220 SEGMENT LEVEL ENGINEERING TESTS																	
1. Segment Level Engineering Test Plans Completed				X													a. Segment Level Engineering Test Plans Completed
2. UAV-1 Segment Level Engineering Tests Completed				X													a. Assembly Handling, Form, Fit and Accessibility Tests Completed b. Electrical Loads Test Completed c. EMC Test Completed d. Installed Engine Vibration and Thermal Survey Test Completed e. Weight and Balance Test Completed; Ballast Installed and Trimmed f. Ground Vibration Modal Test Completed g. Fuel System and CG Management Test Completed
3. UAV-2 Segment Level Engineering Tests Completed							X										a. Electrical Loads Test Completed b. EMC Test Completed, Red/Black Isolation Verified c. ECS Thermal Survey Test Completed d. Weight and Balance Test Completed; Ballast Installed and Trimmed

11230 Final Assembly. Install avionics hardware, essential communications payload hardware and airworthiness essential software into UAV-1. Install avionics hardware, full payload hardware and full air vehicle software into UAV-2. Retrofit UAV-1 with full payload hardware and full air vehicle software.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11230 Final Assembly																	
1. UAV-1 Final Assembly Completed				X													a. UAV-1 Avionics Installed b. UAV-1 Essential Communications Payload Installed c. UAV-1 Airworthiness Software Installed
2. UAV-2 Final Assembly Completed							X										a. UAV-2 Avionics Installed b. UAV-2 Full Payload Installed c. UAV-2 Full Software Installed
3. UAV-1 Retrofitted with Payload										X							a. UAV-1 Full Payload Installed b. UAV-1 Full Software Installed

11240 Final Acceptance Test. Develop test procedures, coordinate and conduct tests and document results for final acceptance tests on UAV 1 and UAV 2 with concurrence from the Airframe, Payload and Avionics IPTs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
11240 FINAL ACCEPTANCE TESTS																	
1. ATP Outline Established			X														a. ATP Outline Established
2. ATP Completed				X													a. ATP Completed
3. UAV-1 Acceptance Tests Completed				X													a. Test Procedures Developed and Validated b. UAV-1 Inspections and Functional Checkout Completed
4. UAV-2 Acceptance Tests Completed							X										a. Test Procedures Refined and Validated b. UAV-2 Inspections and Functional Checkout Completed

12000 Airframe Element. Refine and complete the design (including manufacturing, QA and tooling plans), perform analyses, and fabricate and assemble (2) airframe elements, which include the structure, mechanical and electrical subsystems installations, completely integrated propulsion subsystem, as well as provisions for the installation of payload and avionics components. Perform the design and manufacturing testing required to validate structural, mechanical and electrical subsystems integrity

12100 Airframe Analysis/Integration/Test. Develop and document a complete airframe element that includes the following subsystems: structures, electrical, fuel, ECS, hydraulics, landing gear and propulsion. Coordinate and maintain a complete airframe element common electronic design database to control sub element interfaces. Coordinate flight test instrumentation requirements and design provisions for the required instrumentation sensors and equipment. Support risk assessment and risk mitigation analysis being conducted by the Systems Engineering IPT. Develop and refine detailed design and manufacturing schedules. Perform producibility analyses. Develop a quality program plan using ISO 9000.1 as a guide. Perform assembly operations and conduct testing to validate the design and prepare for air vehicle segments tests.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12100 AIRFRAME ANALYSIS / INTEGRATION / TEST																	
1. Phase II Change Evaluation Completed									X								a. Change Requests Compiled b. Performance Impacts Evaluated c. Producibility Analyses Completed d. Cost and Schedule Evaluation Completed e. Customer Reviews Complete

ARPA • DARO TIER II PLUS

1rT 12000 AIRFRAME ELEMENT

PHASE II EVENTS

12110 Airframe Engineering. Refine and maintain the air vehicle's external lines/surfaces, general arrangement (3-view) and inboard profile drawings. Refine and finalize the structural pre-design performed in Phase I. Monitor and coordinate the structural and mechanical subsystem interfaces between the fuselage, wing, empennage, landing gear, and propulsion system. Refine the fuel, environmental control, hydraulic, pneumatic and electrical wiring harness systems installation drawings created in Phase I. Implement provisions for compliance with the EMI/EMC and aerodynamic smoothness tolerance control plans. Refine the airframe finite element model to perform structural load path and stress analyses. Monitor and maintain the airframe element mass properties database. Prepare final assembly drawings, develop subsystems installations, coordinate fabrication and assembly. Coordinate with the support segment to satisfy handling, maintainability and supportability requirements, generate procurement documentation including performance and test requirements for vendor supplied subsystem components. Identify long lead time elements which would potentially impact the first vehicle delivery schedule. Implement control measures to mitigate schedule impacts. Develop and model the manufacturing processes for fabrication, inspection, assembly and the test techniques, to guarantee product quality and repeatability and minimize the risk of transition into Phase III pre-production and subsequent production. Ensure appropriate interchangeability and replaceability tolerance control and payload sensor installation alignment. Complete the detail design and manufacturing plans for the airframe. Prepare final assembly station product data packages (PDPs) to include wing to fuselage mate, installation of main and nose landing gear assemblies, installation of doors, covers, and fairings, installation of the propulsion system, installation of the nacelle components, installation of final electrical, hydraulic, fuel, pneumatic ECS components and flight control actuators. Maintain configuration control and tracking of the PDPs. Document and evaluate in process change requests, disposition and expedite approvals through release/control.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12110 AIRFRAME ENGINEERING																	
1. Design Requirements Established	X																a. Subsystems Design Requirement Bulletins Completed b. Mechanical Installation Design Requirement Bulletins Completed b. Preliminary Payload and Avionics Installation Requirements Defined
2. Configuration Predesign Completed	X																a. Wing Loft Finalized b. Initial Fuselage, Inlet, Nacelle, and Empennage Loft Complete c. Preliminary General Arrangement and Inboard Profile Drawing Complete d. Preliminary Structural Arrangement Drawings Completed e. Sub-element ICDs Released f. Manufacturing Flow Baselined g. PDP Schedules Released
3. Subsystems Predesign Completed	X																a. Subsystems Schematics Completed b. Major Components Identified (Long Lead Items) c. Advanced List of Materials Generated d. Modified Component Specifications Generated and Released to Vendors
4. Configuration Design Completed		X															a. External Surface Lofting Finalized b. General Arrangement and Inboard Profile Drawing Released c. Structural Arrangement Drawings Completed
5. Critical Subsystems Detail Design Complete		X															a. Long Lead Detail PDPs Complete b. Fuel/ECS/Pneumatics/Hydraulics Analyses Complete
6. Airframe PDPs Completed			X														a. Structures PDPs Released b. Subsystems Details and Installation PDPs Released c. Final Assembly PDPs Released

12120 Airframe Assembly and Integration. Assemble and deliver for final air vehicle integration two (2) airframe elements including wings, nacelles, empennage, engine/propulsion system, access doors/panels and fairings. Perform final airframe subsystems integration including hydraulic and landing gear systems, fuel system, environmental control, and electrical system, along with all the necessary provisions to support the installation and integration of the avionics, radomes and payload components.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12120 AIRFRAME ASSEMBLY AND INTEGRATION																	
1. Preparations for Final Assembly Completed				X													a. Fabrication and Assembly Facilities Ready b. Final Assembly Tooling Fabricated and Accepted c. Final Assembly Stations PDPs Released d. Critical Subsystem Components Delivered
2. UAV-1 Final Assembly Operations Completed				X													a. Sub-element Installations Complete b. Final System Components Installed c. Airframe Subsystems Check-out Completed d. Deliver UAV-1 for Avionics and Instrumentation Installations
3. UAV-2 Final Assembly Operations Completed					X												a. Sub-element Installations Complete b. Final System Components Installed c. Airframe Subsystems Check-out Completed d. Deliver UAV-2 for Avionics Payload and Instrumentation Installations

12130 Airframe Element Tests. Support the requirements definition for the systems test plan and air vehicle systems acceptance test plan. Refine the element, subsystem, and component instrumentation requirements. Complete the instrumentation detailed design. Perform qualification of all airframe systems components to predicted ground and flight environments. Perform static structural allowable tests on coupons or representative structural specimens, to qualify materials and processes. Perform static structural testing of the wing with main landing gear, and the fuselage with empennage and nose landing gear. Install flight test instrumentation sensors and perform calibration procedures. Conduct engine operation testing and control surface alignment and response checks.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLO	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12130 AIRFRAME ELEMENT TEST																	
1. Wing and Landing Gear Testing Complete				X													a. Wing and Landing Gear Static Loads and Functional Testing Complete b. Test Report Complete
2. Fuselage and Empennage Testing Complete				X													a. Fuselage, Empennage, and Nose Landing Gear Static Loads and Functional Testing Complete b. Test Report Complete
3. LRUs Qualification Testing Complete				X													a. Electrical and Electromechanical LRU Qualification Tests Complete b. Test Reports Completed

1r T 12000 AIRFRAME ELEMENT

PHASE II EVENTS

12200 Fuselage. Complete detail design of the fuselage structure including doors, covers, and access panels. Create CAD solid models of the fuselage parts and assemblies, including embedded fuel, environmental control, hydraulics and electrical systems components. Coordinate mechanical interfaces with the wing, landing gear, nacelle, empennage and propulsion systems sub-elements. Coordinate payloads and avionics installation interface requirements. Provide installation provisions for sensor and equipment boxes, antennas, and radomes, installation as well as provisions for structural and flight test instrumentation. Create and refine FEA models and perform structural stress analyses. Perform mass properties analyses and update the mass properties data base. Perform producibility analyses. Develop, design and build the required fabrication and assembly tooling. Provision for, procure and issue the materials required to support fabrication, assembly and integration tasks. Fabricate and assemble fuselage sub-elements. Install and integrate with hydraulic, fuel, environmental control, and electrical systems. Install and calibrate flight test and structural test instrumentation. Perform fuel tank leak and pressure tests. Perform electrical continuity tests and adhesives/sealant cure testing.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12200 FUSELAGE																	
1. Primary Structure Design Complete		X															a. Fuselage Critical Structure PDPs Released (Manufacturing Station 1-5) b. Long Lead Items Ordered
2. Detail Design Complete			X														a. Detail Part and Assembly PDPs Released
3. Fabrication and Assembly Requirements Released			X														a. Fabrication and Assembly Tooling Complete b. Long Lead Items on Dock c. Parts and Material Procurement Complete
4. UAV-1 Fabrication and Assembly Operations Complete				X													a. Detail Parts Fabrication Complete b. Forward, Center, and Aft Fuselage Sections Assembled c. Elect. Continuity, Fuel Tank Sealing, and Adhesives/Sealants Testing Complete d. Mating Operations Complete e. Doors, Covers, and Subsystem Components Installed and Tested
5. UAV-2 Fabrication and Assembly Operations Complete					X												a. Detail Parts Fabrication Complete b. Forward, Center, and Aft Fuselage Sections Assembled c. Elect. Continuity, Fuel Tank Sealing, and Adhesives/Sealants Testing Complete d. Mating Operations Complete e. Doors, Covers, and Subsystem Components Installed and Tested

IPT 12000 AIRFRAME ELEMENT

PHASE II EVENTS

12300 Wing. Complete the detail design of the wing structure, subsystems installations, doors, covers, and access panels. Create CAD models of parts and assemblies to include in the common electronic design database. Perform interface design coordination tasks with the fuselage and landing gear sub-elements. Generate finite element models and perform structural stress analyses. Perform engineering development test to generate materials bearing and joint allowables and perform layup optimization analyses. Provide updated inputs to the mass properties database. Develop manufacturing coordination CAD drawings to facilitate precision assembly process. Establish allowable defect criteria. Perform fuel tank sealing process simulations. Develop CAD part and tooling data set. Design, build, and inspect the required fabrication and assembly tooling. Provision for, procure and issue the materials required to support fabrication, assembly and integration. Fabricate and assemble wing sub-elements complete with installed and integrated hydraulic, fuel, electrical, and flight control systems. Perform fuel tank sealing tests. Perform electrical continuity tests and adhesives/sealant cure testing. Install embedded flight test instrumentation and instrumentation required for structural testing.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12300 WING																	
1. Wing Preliminary Design and Process Characterization Complete	X																a. Loft Released b. Structural Arrangement Finalized c. Finite Element Models Updated d. Material Allowables and Mechanical Joints Testing Complete e. Fuel Tank Sealing Simulations Complete f. Long Lead Material on Order g. Manufacturing Assembly Plan Defined
2. Design and Analysis Complete		X															a. Detail Part and Assembly PDPs Complete
3. Fabrication and Assembly Requirements Released		X															a. Fabrication and Assembly Tooling Completed b. Parts and Material Procurement Complete c. Detail Parts Fabrication Complete
4. UAV-1 Wing Delivered			X														a. Center, and Outer Wing Sections Assembled b. Fuel Tank Sealing and Adhesives/Sealants Testing Complete c. Electrical Continuity Testing Complete d. Inspections and Tests Complete e. Wing Delivered and On Dock f. Wing Integration Tooling Complete
5. UAV-1 Wing Assembly Operations Complete				X													a. Wing Splice Assembly Completed b. Actuators and Shipped Loose Components Installed
6. UAV-2 Wing Delivered					X												a. Center, and Outer Wing Sections Assembled b. Fuel Tank Sealing and Adhesives/Sealants Testing Complete c. Electrical Continuity Testing Complete d. Inspections and Tests Complete e. Wing Delivered and On Dock
7. UAV-2 Wing Assembly Operations Complete						X											a. Wing Splice Assembly Completed b. Actuators and Shipped Loose Components Installed

T 12000 AIRFRAME ELEMENT

PHASE II EVENTS

12400 Empennage. Complete the detail design of the empennage structure, and subsystems installations, including control actuators, electrical wiring, and instrumentation installations. Generate CAD solid models of parts and assemblies to be included in the electronic mockup database. Create and refine FEA models and perform structural stress analyses. Perform mass properties analyses and update the mass properties database. Coordinate empennage to fuselage mechanical interfaces. Perform producibility analyses. Create, release, and maintain the empennage PDPs. Design, build, and inspect the required fabrication and assembly tooling. Provision for, procure and issue the materials required to support fabrication, assembly and integration. Fabricate and assemble empennage sub-elements. Install and integrate the electrical and flight control systems. Install any embedded instrumentation required for static structural and flight tests. Perform electrical continuity tests and adhesives/sealant cure testing. Perform flight control systems travel calibrations.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12400 EMPENNAGE																	
1. Primary Structure Design Complete		X															a. Empennage Primary Structure PDPs Released b. Long Lead Items Ordered
2. Design Complete			X														a. Detail Part and Assembly PDPs Released
3. Fabrication and Assembly Requirements Released				X													a. Fabrication and Assembly Tooling Built and Accepted b. Parts and Material Procurement Complete
4. UAV-1 Fabrication and Assembly Operations Complete				X													a. Detail Parts Fabrication Complete b. Stabilizer and Control Surfaces Assembled c. Adhesives/Sealants Testing Completed
5. UAV-2 Fabrication and Assembly Operations Complete					X												a. Detail Parts Fabrication Complete b. Stabilizer and Control Surfaces Assembled c. Adhesives/Sealants Testing Completed

IPT 12000 AIRFRAME ELEMENT

PHASE II EVENTS

12500 Nacelle. Incorporate engine inlet changes per Phase II wind tunnel inlet tests results. Complete the detail design of the nacelle and components. Generate CAD solid models of detail parts for inclusion in the common electronic design database. Coordinate fuselage structural and engine inlet and exhaust interface requirements. Perform lay-up optimization analyses. Create and refine FEA models to perform structural stress analyses. Perform mass properties analyses and update the mass properties database. Perform producibility analyses. Create, release, and maintain the nacelle PDPs. Design, build, and inspect the required fabrication and assembly tooling. Provision for, procure and issue the materials required to support fabrication and assembly. Fabricate and assemble nacelle sub-elements. Perform in-process adhesive verification.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12500 NACELLE																	
1. Primary Structure Design Complete		X															a. Nacelle Primary Structure PDPs Released b. Long Lead Items Ordered
2. Design Complete			X														a. Detail Part and Assembly PDPs Released
3. Fabrication and Assembly Requirements Released			X														a. Fabrication and Assembly Tooling Built and Accepted b. Parts and Materiel Procurement Complete
4. UAV-1 Fabrication and Assembly Operations Complete				X													a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Adhesives/Sealants Testing Completed
5. UAV-2 Fabrication and Assembly Operations Complete					X												a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Adhesives/Sealants Testing Completed

12600 Landing Gear. Refine the pre-design layouts for the modified Learjet-45 main gear assembly and the F-5F nose gear assembly. Complete the detail design of the main landing gear, struts, retraction actuators, the nose gear retraction linkages, steering assembly, fuselage and wing mounted door components and mechanisms. Create CAD solid models of parts and assemblies and incorporate into the common electronic design database. Coordinate space and mechanical interfaces with the wing and fuselage structure, hydraulic, and electrical subsystem. Perform finite element stress analyses of the strut and retraction mechanism assemblies. Perform dynamic drop test simulations. Provide structural test and instrumentation requirements for incorporation into the airframe structural test plan. Design, build, and inspect the required fabrication and assembly tooling. Procure and issue the materials and components required to support fabrication and assembly of main landing gear subsystems. Perform in-process and final acceptance testing.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12600 LANDING GEAR																	
1. Landing Gear Configuration Finalized	X																a. Predesign Complete b. Long Lead Items Ordered
2. Landing Gear Detail Design Complete		X															a. Detail Part and Assembly PDPs Released b. Drop Test Computer Simulations Complete
3. Landing Gear Doors and Mechanism Detail Design Complete		X															a. Landing Gear Doors and Mechanisms Fabrication and Assembly PDPs Released
4. Fabrication and Assembly Requirements for Doors and Mechanisms Released			X														a. Fabrication and Assembly Tooling Built and Accepted c. Parts and Materiel Procurement Complete
5. UAV-1 Main Landing Gear Delivered			X														a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Acceptance Testing Complete
6. UAV-1 Nose Landing Gear Delivered				X													a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Acceptance Testing Complete
7. UAV-1 L.G. Doors and Mechanisms Fabrication and Assembly Operations Complete				X													a. Detail Parts Fabrication Complete b. Assembly of Main and Nose Landing Gears Complete c. Landing Gear Permanent Door Assemblies Complete
8. UAV-2 Main Landing Gear Delivered					X												a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Acceptance Testing Complete
9. UAV-2 Nose Landing Gear Delivered					X												a. Detail Parts Fabrication Complete b. Assembly Operations Complete c. Acceptance Testing Complete
10. UAV-2 L.G. Doors and Mechanisms Fabrication and Assembly Operations Complete						X											a. Detail Parts Fabrication Complete b. Assembly of Main and Nose Landing Gears Complete c. Landing Gear Permanent Door Assemblies Complete

12700 Fairings and Final Assembly Components. Complete the detail design of the airframe fairings and components required for final assembly. Design, build and inspect fabrication and assembly tooling. Procure and issue the material required to support the fabrication and assembly. Fabricate and assemble all fairings. Perform the necessary fit checks and inspections, and kit as required.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12700 FAIRINGS AND FINAL ASSEMBLY COMPONENTS																	
1. Primary Structure Design Complete		X															a. Long Lead PDPs Released b. Long Lead Items Ordered
2. Design Complete			X														a. Detail Part and Assembly PDPs Released
3. Fabrication and Assembly Requirements Released				X													a. Fabrication and Assembly Tooling Built and Accepted b. Parts and Materiel Procurement Complete
4. UAV-1 Fabrication and Assembly Operations Complete				X													a. Detail Parts Fabrication Complete b. Assemblies Complete c. Adhesives/Sealants Testing Completed
5. UAV-2 Fabrication and Assembly Operations Complete					X												a. Detail Parts Fabrication Complete b. Assemblies Complete c. Adhesives/Sealants Testing Completed

12800 Propulsion System. Design, analyze, fabricate, test, assemble, and prepare for final integration the three (3) major sections of the propulsion system.

12810 Propulsion System Integration. Refine and finalize the engine installation pre-design layouts generated in Phase I. Complete the detail design of the propulsion system (engine, engine mounted accessories, engine mounts and miscellaneous components), installation hardware, electrical, pneumatic, and hydraulic subsystems interfaces. Create CAD models of parts and assemblies and incorporate into the common electronic design database. Coordinate space and mechanical interfaces with the fuselage and nacelle structure, as well as with the hydraulic, pneumatic, and electrical system sub-elements. Perform stress analyses of the mounting hardware and subsystems connections. Assess reliability and maintainability characteristics of the engine installation. Develop instrumentation requirements for static loads and engine performance tests. Design, build, and inspect the required fabrication and assembly tooling. Install and integrate FADECs. Install and integrate the pneumatic starter, electrical generator, and hydraulic pump on the engine.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12810 PROPULSION SYSTEM INTEGRATION																	
1. Engine Installation Components Detail Design Complete		X															a. PDPs Released
2. Engine Installation QEC Design Complete			X														a. PDPs Released
3. UAV-1 Engine Buildup Complete				X													a. Generator Installed b. Pneumatic Starter Installed c. Hydraulic Pump Installed d. Other Components, Ducting, and Fluids Lines Installed
4. UAV-2 Engine Buildup Complete					X												a. Generator Installed b. Pneumatic Starter Installed c. Hydraulic Pump Installed d. Other Components, Ducting, and Fluids Lines Installed

12820 Engine. Procure engine and prepare for buildup and installation.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12820 ENGINE																	
1. UAV-1 Engine Delivered				X													a. Materials Purchased and Received b. Engine and Components Received and Prepared for Buildup
2. UAV-2 Engine Delivered					X												a. Materials Purchased and Received b. Engine and Components Received and Prepared for Buildup

12830 Engine Mounts and Miscellaneous Components. Procure and issue the materials required to support fabrication and assembly. Fabricate and assemble engine mounts and miscellaneous components.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
12830 ENGINE MOUNTS AND MISCELLANEOUS COMPONENTS																	
1. Detail Parts Fabrication and Assembly Operation Completed				X													a. Fabrication Materials or "Buy" Details Procured b. Detail Parts Fabricated c. Detail Finish Requirements Incorporated d. Parts and Assemblies Ready for Installation

IPT 15000 AVIONICS ELEMENT

PHASE II EVENTS

15000 Avionics Element. Complete the avionics subsystem design initiated during Phase I. Finalize the preliminary requirements and design work accomplished during Phase I to "build to" status. Prepare final specifications and procure OTS avionics hardware and developmental items. Update ICDs and develop detailed engineering drawings to support fabrication of the avionics element. Expand the hot bench activities started during Phase I as part of the overall UAV systems integration lab (SIL). Develop software concurrent with the expansion of the SIL and hardware availability. Conduct system and software testing using the hot bench, full SIL, and a manned aircraft flying test bed. Utilize the flying test bed for developmental testing of landing and takeoff algorithms using differential GPS. Provide support equipment hardware and software requirements to the Support Segment IPT.

15100 Avionics Analysis/Integration/Tests. Finalize the system detail requirements and design, including avionics hardware and software. Detail avionics installation and integration requirements and provide to other IPTs as required. Procure avionics hardware using updated specifications and provide vendor liaison. Define requirements for hot bench build-up as part of the system integration lab to support hardware/software integration testing and software developmental testing. Establish avionics SIL testing requirements and provide to the System Test IPT. Prepare a detailed component interface control document. Perform avionics hardware integration testing to verify functionality and to verify interfaces. Develop and install an avionics subset into a manned aircraft flying test bed for navigation system and automatic landing and takeoff guidance verification testing. Provide the hot bench/SIL hardware implementation to support integration testing of software using incremental builds. Develop a comprehensive avionics software test plan and procedure. Test and document results. Coordinate antenna installation design with other affected IPTs to minimize EMI/EMC concerns.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	OR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15100 AVIONICS ANALYSIS/INTEGRATION/TEST																	
1. Detail Requirements Baselined	X																a. Avionics ICDs Published b. Actuator Specifications Baselined c. Avionics SIL Hardware Procured
2. Detail Design Completed			X														a. Avionics Analysis Completed b. Antenna Locations Finalized c. Installation and Integration Requirements Finalized d. SIL Facilities Completed
3. Avionics Hardware Integration Testing Completed				X													a. Avionics Integration Test Procedure Written b. IMMC SIL Integration Testing Completed c. Avionics Subsystems Integration Testing Completed d. Miscellaneous Air Vehicle Avionics Hardware Procured
4. Take-Off/Landing Tests Completed					X												a. Testbed Design and Fabrication Completed b. Tests Completed c. Test Results Analyzed and Published
5. Payload Hardware SIL Integration Testing Complete							X										a. Sensor Suite Emulator SIL Integration Testing Completed b. Communication Suite SIL Integration Testing Completed c. Survivability Suite SIL Integration Testing Completed
6. Hardware/Software Integration Tests Completed							X										a. Hardware Integration Support of Software Build 5 Completed b. Hardware Integration Support of Software Build 6 Completed

15200 Integrated Mission Management System. Complete the detailed design, implementation and testing. Coordinate subcontract management of IMMC development. Perform integration of the Integrated Mission Management System in the SIL beginning with prototype IMMCs progressing to flight configured IMMCs.

15210 Integrated Mission Management Computers. Finalize the procurement specification and submit to the IMMC supplier. Develop and integrate a prototype IMMC for early SIL testing. Produce an interface control drawing describing the interface between the embedded GPS receiver and the external antenna. Specify and procure COTS GPS antennas. Establish the integration and installation requirements and provide to other IPTs as required. Coordinate antenna installation design to preclude EMI/EMC concerns. Install two antennas in the SIL and integrate with the IMMCs. Write an interface requirements specification to establish and control the interface between the IMMC COTS software (the operating systems and navigation software) and the avionics applications software. Analyze simulation and test data from navigation Kalman filter to evaluate stability of the navigation solution. Perform static and mobile tests to establish navigation system accuracy.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
15210 INTEGRATED MISSION MANAGEMENT COMPUTERS																	
1. IMMC Development Complete	X																a. Procurement Specification Complete b. GPS Receiver and Antenna ICD Complete c. Special Integration Requirements Established d. IMMC and IMU ICD Complete
2. Navigation Software Evaluated		X															a. Vendor Supplied Simulation and Performance Data Analyzed b. Navigation Tests Completed

COMPETITION SENSITIVE – NOT RELEASABLE

15220 Integrated Mission Management Subsystem Integration. Install prototype IMMCs into the Systems Integration Lab.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15220 INTEGRATED MISSION MANAGEMENT SYSTEM INTEGRATION																	
1. IMMC Integrated into SIL		X															a. Prototype IMMC #1 SIL Installation Complete b. Prototype IMMC #2 SIL Installation Complete

15230 Inertial Measurement Units. Specify and procure COTS IMUs. Establish the integration and installation requirements of the IMUs and provide data to other IPTs. Install two IMUs in the SIL facility and integrate with the IMMCs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15230 INERTIAL MEASUREMENT UNITS																	
1. IMU Requirements Description Complete	X																a. IMU Ordered
2. IMU Integration Complete		X															a. SIL Installation Complete b. Integration and Installation Requirements Established

15240 Differential GPS (DGPS) Data Link. Specify and procure the COTS differential GPS data link receiver and antenna. Document the integration and installation requirements and provide to other IPTs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15240 DIFFERENTIAL GPS (DGPS) DATA LINK																	
1. DGPS Data Links Requirements Description Complete		X															a. DGPS Data Link Ordered b. Integration and Installation Requirements Established
2. DGPS Data Links Integration Complete			X														a. SIL Installation and Test Complete

15250 Radar Altimeter. Specify and procure the OTS radar altimeter. Integrate the radar altimeter in the SIL. Provide installation and integration data to other IPTs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15250 RADAR ALTIMETER																	
1. Radar Altimeter Requirements Description Complete		X															a. Radar Altimeter Ordered b. Integration and Installation Requirements Established
2. Radar Altimeter Integration Complete				X													a. SIL Installation Complete

15260 Air Data Sensor. Specify and procure the OTS air data sensor system and the OTS total temperature sensor. Integrate these systems in the SIL with the avionics and the computer controlled air data simulator to support hardware-in-the-loop simulation testing. Provide integration and installation requirements for the complete air data system to other IPTs.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DIR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
15260 AIR DATA SENSOR																	
1. Air Data Sensors Requirements Description Complete	X																a. Air Data Sensors Ordered
2. Air Data Sensors Integration Complete				X													a. SIL Installation Complete b. Integration and Installation Requirements Established

1. T 15000 AVIONICS ELEMENT

PHASE II EVENTS

15300 Identification Friend or Foe (IFF). Specify and procure the OTS IFF system. Integrate the IFF with the IMMC in the SIL. Develop an ICD detailing the integration and installation requirements of the IFF system.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15300 IDENTIFICATION FRIEND OR FOE																	
1. IFF Integration Requirements Description Complete	X																a. IFF Ordered
2. IFF Integration Complete				X													a. SIL Installation and Test Complete b. Integration and Installation Requirements Established

15400 Air Traffic Control (ATC) and Flight Termination Subsystems. Specify and procure the OTS ATC communications and flight termination systems. Complete the detail design of the flight termination system. Provide installation and integration requirements for ATC and FTS equipment to affected IPTs. Integrate the ATC and FTS elements in the SIL. Develop and document the interfaces to the range safety flight termination receivers (FTR-551) to ensure activation of flight termination on command. Conduct performance tests to verify proper response to commands.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15400 AIR TRAFFIC CONTROL AND FLIGHT TERMINATION SYSTEM																	
1. Flight Termination System Design Complete		X															a. FTS Requirements and Design Comleted b. FTS Ordered
2. Flight Termination System Integration Complete				X													a. FTS Fabrication Completed b. Integration and Installation Requirements Established b. SIL Installation Complete
3. ATC Radio Integration Complete				X													a. ATC Radio Ordered b. Integration and Installation Requirements Established c. SIL Installation Complete

15500 Flight Control Actuators. Procure all flight control actuators and monitor supplier development activities. Witness supplier developmental and acceptance testing for compliance with specified requirements. Integrate both prototype and production actuators with the SIL and perform systems integration testing. Develop ICDs for integration and installation of the actuators and provide to affected IPTs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
15500 ACTUATORS:																	
1. Flight Control Actuator Require-ments Description Complete		X															a. Actuators Ordered b. Integration and Installation Requirements Established
2. Flight Control Actuator Integration Complete			X														a. SIL Installation Complete

15600 Avionics Software. Establish the infrastructure to support the development of the avionics software. Develop a host based support system for performing unit tests. Provide inputs to the Systems Engineering Software Manager to finalize the top level software requirements. Support the System Engineering Software Manager in developing inter-segment Interfaces. Develop a detailed design document consistent with defined incremental builds. Create an interface requirements specification (IRS) for the interface between the avionics software and other air vehicle systems. Produce an IRS for the messages passed between the CSCs and CSUs. Produce design notes for CSCs and CSUs to provide detailed requirements and design. Develop the software for each of 6 defined incremental software builds. Perform unit testing on the CSCs and CSUs. Develop the test plan for each of the 6 builds. Perform and document integration testing on each build in accordance with the test plan. Monitor and track defined software metrics (TPMs). Provide monthly TPM status reports to the Systems Engineering Software Manager.

UT 15000 AVIONICS ELEMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS: IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	PH III EVENTS: DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
15600 AVIONICS SOFTWARE																	
1. Startup Tasks Complete	X																a. Software Development Process Defined b. Configuration Management System (CMS) Defined c. Development Environment Implemented d. Software Quality Assurance (SQA) Plan Completed
2. Requirements Developed		X															a. Segment and CSCI Defined b. Interfaces Defined c. Preliminary Integrated Test Plan Developed
3. Operational Software Designed			X														a. High-level Completed b. Interface Specifications Completed c. Unit/Component-level Completed d. Test Description Completed
4. Test Software Designed			X														a. Design Completed
5. Implementation Completed				X													a. Off-the-Shelf (OTS) Products Procured b. OTS Modifications Completed c. TRA Coding Completed d. Test Procedures Completed
6. Build System Created				X													a. Builds Defined b. Automated Setups Created
7. Subsystems (Software Standalone) Tested				X													a. Unit Level Completed b. Component Level Completed c. Subsystem Level Completed
8. Final Test Plan Completed				X													a. Final Test Plan Completed
9. Build 1 (Establish the Framework) Integrated Testing Completed		X															a. IMMC Boot Software and OS Initialization Complete b. VTC and IMMC Communications Verified c. Build 1 Test Passed
10. Build 2 (Dual IMMC Support) Integrated Testing Completed			X														a. Cross Channel Data Link Driver Complete b. Dual Processor Coordination Verified c. Build 2 Test Passed
11. Build 3 (Serial Devices and Navigation Integration) Integrated Testing Completed			X														a. Build 3 Integration Complete b. Build 3 Test Passed
12. Build 4 (Major Avionics Hardware Support) Integrated Testing Completed				X													a. Build 4 Integration Complete b. Build 4 Test Passed
13. Build 5 (Flight Control and Communication System) Integrated Test Complete				X													a. Build 5 Integration Complete b. Build 5 Test Passed
14. Build 6 Payload Completed						X											a. Build 6 Integration Complete b. Build 6 Test Passed
15. Ground and Flight Test Completed										X							a. Flight Tests Completed b. Avionics Flight Test Report Written
16. Software Updates Completed									X								a. Phase III Avionics Software Upgrades Recommended

20000 GROUND SEGMENT

20000 Ground Segment. Complete the design, development, integration and testing of one developmental HAE UAV Ground Segment (MCE development followed by LRE development, both with embedded communications subsystems). Perform segment, element, subsystem and component hardware and software testing to verify performance meets System and Segment Specifications. Support Tier II Plus system acceptance and flight testing. Support Tier III Minus Ground Segment–UAV interface definition.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
20000 GROUND SEGMENT - PHASE II																	
1. Complete HAE UAV Ground Segment Development and Test										X							a. Ground Segment Analysis Completed b. LRE Analysis, Development, Integration and Test Completed c. MCE Analysis, Development, Integration and Test Completed d. Ground Segment Integration Completed e. Ground Segment Test Completed

IPT 20000 GROUND SEGMENT

PHASE II EVENTS

21000 Ground Segment Analysis/Integration/Test. Support the development of a configuration with well defined inter- and intra-segment/system interfaces. Conduct physical integration and testing to support system level ground and flight tests. Analyze ground and flight test results. Recommend corrections to deficiencies identified during the testing for incorporation into final HAE UAV Ground Segment configuration.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21000 GROUND SEGMENT ANALYSIS/INTEGRATION/TEST - PHASE II																	
1. Complete Ground Segment Analysis, integration, and test									X								a. Ground Segment Analysis completed b. Ground Segment Integration completed c. Ground Segment Test completed d. Ground Segment Documentation completed

IPT 20000 GROUND SEGMENT

PHASE II EVENTS

21100 Ground Segment Analysis. Finalize Ground Segment Specification. Finalize LRE–MCE Interface definition including data types, formats and protocol. Finalize Ground Segment to external system connectivity definition including voice/data and product dissemination interfaces. Finalize Ground Segment to GPS space component interface definition in support of UAV precision takeoff and landing. Perform Ground Segment EMI/EMC/RFI preliminary analysis. Support Ground to Air Segment interface finalization including command and control, telemetry, and sensor data formats and protocol. Update and verify Ground Segment SIL Tier II Plus Air Vehicle Segment Interface simulator. Support Ground to Support Segment interface finalization including UAV maintenance tether and Vehicle Test Controller (VTC) connectivity. Perform Ground Segment SIL functional analysis in the areas of continued early prototyping and connectivity analysis. Finalize and initiate characterization of Ground Segment design metrics and technical performance measures. Perform Tier III Minus UAV C^2 and sensor data processing interface analysis. Perform Tier III Minus software loading analysis. Validate Air Vehicle Segment and Ground Segment Simulators. Perform analysis of prototype software. Conduct benchmarking of OS, HW, new code, existing code, and projected code to feed Segment and interface documentation. Perform other design trade analyses in support of benchmarking. Document all design requirements affected by Ground Segment SIL Prototyping and Measurements to feed IDD Development.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21100 GROUND SEGMENT ANALYSIS																	
1. Ground Segment Specifications and Interfaces approved (Baselined at IDR, complete at FDR)			X														a. Ground Segment update to Preliminary System Specification accepted b. Ground Segment Specification Update accepted c. Updates to Air Vehicle, Support, and Payload Specifications supported d. LRE - MCE IDD completed e. LRE/MCE - External Voice/Data IDD completed f. MCE - Dissemination IDD completed g. LRE/MCE - GPS Space Segment IDD completed h. Ground Segment - Tier II Plus A/V Segment IDD completed i. Ground Segment - Tier III Minus A/V Segment IDD completed j. Ground Segment - Support Segment IDD completed
2. Develop/Enhance AVS Simulators			X														a. Phase I Ground Segment SIL Tier II Plus A/V Segment Interface Simulator enhancement completed and validated b. Validation of AVS/GS Interface Simulators (TRA/ESYS)
3. Complete Segment Performance Analysis Utilizing East Coast SIL (at E-Systems)			X														a. Perform measurement of OTS HW and SW b. GFI Software (AFMSS, JDISS) installed and characterized c. Preliminary EMI/EMC/RFI planning completed d. Additional design trades and early functional prototyping completed e. Design Metrics and TPM list finalized and early prototype Metrics captured f. Documentation of design requirements from Ground Segment SIL prototyping and measurements g. Analysis of prototype SW completed h. Benchmark of HW and SW completed

21200 Ground Segment Integration. Perform LRE–MCE interface integration including landline and commercial communication connections. Perform Ground Segment to Tier II Plus Air Vehicle Segment Interface Simulator integration. Perform Ground Segment to external system connectivity integration including SIL connections simulating tasking and dissemination system interfaces. Perform Ground Segment to GPS Space Component integration, specifically establish the Differential GPS RF interface. Configure all Ground Segment electrical and physical connections. Conduct physical hardware and software integration, including required SIL and media connections, to support Version 1 testing (coast-to-coast C2 interface capability between the LRE/MCE and the UAV SIL); Version 2 testing (sufficient LRE C2, Nav planning, and required UHF LOS/SATCOM communications capabilities to fully support UAV airworthiness ground/flight tests); and Version 3 testing (sufficient Ground Segment C2, Mission Planning, Image Processing and Dissemination, required interface communications (external and inter-/intra-segment), and LRE/MCE hand-off capabilities to fully support UAV payload flight tests).

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21200 GROUND SEGMENT INTEGRATION (AT E-SYSTEMS)																	
21210 Ground Segment Integration Requirements																	
1. Complete Ground Segment Integration Requirements Definition	X																a. Ground Segment Integration Requirements identified and defined
2. Complete Ground Segment Integration Requirements		X															a. Ground Segment Integration Requirements updated by Ground Segment IPT and accepted by IPT 5000
21220 Ground Segment Integration																	
1. Complete Element Integration				X													a. LRE-MCE Electrical/Physical Integration completed b. LRE-MCE Landline Interface Integration completed c. LRE-MCE Commercial/Theater Comms Interface Integration completed
2. Complete Ground Segment to A/V Segment (A/V Segment Simulator) Integration				X													a. Version 1 Ground Segment – Tier II Plus A/V Segment Interface Simulator (Ground Segment SIL) Integration completed b. Version 1 Integration completed c. Version 2 Integration completed
3. Complete Ground Segment to A/V Segment (A/V Segment Simulator) Integration							X										a. Version 3 Ground Segment - Tier II Plus A/V Segment Interface Simulator (Ground Segment SIL) Integration completed b. Version 3 Integration completed
4. Complete Ground Segment to External System (SIL Simulator) Integration							X										a. Ground Segment - Tasking Authority Interface Simulator (Ground Segment SIL) Integration completed b. Ground Segment - Exploitation System (JSIPS-N, CARS, ETRAC/MIES) Interface Simulator Integration completed c. Version 3 Integration completed
5. Complete Ground Segment to GPS Space Component Integration				X													a. LRE DGPS – GPS Space Component Interface Integration completed

IPT 20000 GROUND SEGMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21200 GROUND SEGMENT INTEGRATION (AT E-SYSTEMS) (continued)																	
21230 Ground Segment System Integration Support																	
1. Provide System Level Integration Requirements		X															a. System Level Integration Requirements (Ground Segment) identified and defined b. System Level Integration Requirements (Ground Segment) updated by Ground Segment IPT and accepted by IPT 50000
2. Provide Input to System Integration Plan			X														a. System Level Integration Requirements (Ground Segment) updated by Ground Segment IPT and accepted by IPT 50000

21300 Ground Segment Test. Provide Tier II Plus Ground Segment test requirements to the System Test IPT for Tier II Plus system test planning. Perform LRE–MCE interface testing. Perform Ground Segment to Tier II Plus Air Vehicle Segment Interface Simulator testing. Perform Ground Segment connectivity testing (via the Ground Segment SIL). Perform Ground Segment/Element to Tier II Plus Air Vehicle Segment testing. Perform Ground Segment to GPS space component connectivity testing including signal receipt from the GPS satellite constellation and pseudorange corrections to the Tier II Plus Air Vehicle Segment Interface Simulator. Perform Ground Segment electromagnetic interference and compatibility testing at the integrated element (shelter) level to verify concurrent operation is possible when the LRE and MCE are collocated. Perform RF interference testing at the integrated element level to verify concurrent operation. Requirements from IPT reviewed and approved Segment/System specificaions will be verified through Functional Thread and Operational Scenario execution during Subsystem, Element and Segment Test. Specifically those functions/threads involved with the Technical Performance Measurements (TPMs) will be tracked and evaluated during the Test Phase of the Program.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21300 GROUND SEGMENT TEST																	
21310 Ground Segment Test Requirements																	
1. Complete Ground Segment Test Requirements Definition	X																a. Ground Segment Test Requirements identified and defined
2. Complete Ground Segment Test Requirements		X															a. Ground Segment Test requirements updated and accepted by System Test IPT
21320 Ground Segment Testing																	
1. Complete LRE-MCE Interface Testing (Versions 2 & 3)							X										a. Mission Plan Transfer Test completed b. OPSCOMM Test completed c. Voice Test completed d. Weather Information Transfer Test completed e. ATO Transfer Test completed f. Maintenance Data Transfer Test completed g. Version 2 Testing completed h. Mission Plan Transfer Test completed i. Dynamic Retasking Test completed j. Dynamic Replanning Test completed k. Collection Tasking Transfer Test completed l. Threat Information Transfer Test completed m. Version 3 Testing completed

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS: IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	PH III EVENTS: DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
21300 GROUND SEGMENT TEST (continued)																	
21320 Ground Segment Testing (continued)																	
2. Complete Ground Segment – Tier II Plus Air Vehicle Segment (A/V Segment Interface Simulator) Testing (Versions 1 & 2)				X													a. Version 1 (Coast-to-Coast C2, voice, telemetry) testing completed b. UHF SATCOM (C^2, Voice, Telemetry, LRE/MCE Handoff) Testing completed c. UHF LOS (C^2, Voice, Telemetry, LRE/MCE Handoff) Testing Completed d. Maintenance Tether (C^2, Telemetry, BIT/BITE, Mission Plan Loading) Testing completed e. Portable Media (Mission Plan Loading) Testing completed f. DGPS VHF Beacon (Pseudorange Corrections) Testing completed g. VHF/UHF Voice Relay Test completed h. Version 2 (LRE capabilities to fully support Tier II Plus A/V airworthiness Ground/Flight tests) testing completed
3. Complete Ground Segment - Tier II Plus Air Vehicle Segment (A/V Segment Interface Simulator) Testing (Version 3)							X										a. CDL (C^2, Voice Telemetry, Sensor Data) Testing Completed b. Ku SATCOM (C^2, Voice, Telemetry, Sensor Data) Testing Completed c. Version 3 (Ground Segment capabilities to fully support Tier II Plus A/V payload Ground/Flight tests) testing completed
4. Complete Ground Segment – External System (SIL) Connectivity Testing (Version 3)							X										a. Input Tasking (JCS/JFACC/JTF/Squadron LAN ATO and 1684/IINS) Testing completed b. Threat/Weather Input Testing completed c. Exploitation Dissemination (CARS) Interface Testing completed d. Exploitation Dissemination (JSIPS-N) Interface Testing completed e. Exploitation Dissemination (ETRAC/MIES) Interface Testing completed f. ATC/ABCCC/AWACS VHF/UHF Voice Testing completed g. Version 3 Testing completed
5. Complete Ground Segment GPS Space Component Testing				X													a. Multiple Satellite Constellation Signal Processing Testing completed
6. Complete Ground Segment EMI/EMC/RFI Characterization				X													a. Collocated LRE-MCE EMI/EMC/RFI Verification completed

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21300 GROUND SEGMENT TEST (continued)																	
21330 System Test Support																	
1. Provide System Level Test Reqirements		X															a. System Level Test Requirements (Ground Segment) identified and defined b. System Level Test Requirements (Ground Segment) updated by Ground Segment IPT and accepted by System Test IPT
2. Provide Input to System Test Plan			X														a. System Level Test Plan (Ground Segment) updated by Ground Segment IPT and accepted by System Test IPT
3. Provide Input to System Test Procedures				X													a. System Level Test Plan (Version 1 Ground Segment) updated by Ground Segment IPT and accepted by System Test IPT
4. Provide Input to System Test Procedures					X												a. System Level Test Plan (Version 2 Ground Segment) updated by Ground Segment IPT and accepted by System Test IPT
5. Provide Input to System Test Procedures							X										a. System Level Test Plan (Version 3 Ground Segment) updated by Ground Segment IPT and accepted by System Test IPT

21900 Ground Segment Documentation. Provide Ground Segment product data packages to include final drawings.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
21900 GROUND SEGMENT DOCUMENTATION																	
1. Ground Segment Product Data Package Placed Under Configuration Control									X								a. LRE and MCE Interconnect Drawings Finalized b. LRE and MCE Assembly Drawings Finalized c. LRE and MCE Interface Control Drawings Finalized d. LRE and MCE Equipment Installation Parameters Finalized e. LRE and MCE Power Requirements Finalized f. LRE and MCE Cable Assembly Drawings Finalized

22000 Launch and Recovery Element (LRE). Complete the design, development, integration, and testing of one developmental HAE UAV LRE with embedded communications subsystems.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22000 LAUNCH AND RECOVERY ELEMENT - PHASE II																	
1. Complete HAE UAV LRE Development and Test							X										a. LRE Analysis completed b. LRE Workstations completed c. LRE Communications completed d. LRE Differential GPS completed e. LRE Infrastructure/Facilities completed f. LRE Software completed g. LRE Integration completed h. LRE Test completed

22100 LRE Analysis/Integration/Test. Ensure flowdown of derived LRE requirements. Finalize requirements allocation to hardware and software components. Finalize LRE design metrics and technical performance measures. Finalize LRE design trades as required. Finalize LRE internal interfaces. Complete LRE processing/memory/throughput analyses. Finalize all hardware and software to be included in, or associated with, the LRE. Provide engineering support to manufacturing/procurement. Provide hardware quality inspection on fabricated/procured items. Prepare ECNs and incorporate change as required. Define the required software builds to support LRE integration and test activities. Perform Version 1 LRE Integration and Test activities. Perform LRE hardware-software functional build integration and testing sequentially. Perform component/LRU/rack/shelter installation, cabling and integration. Perform Version 2 LRE Integration and Test activities. Provide quality inspection and sign-off of LRE. Perform Version 3 LRE Integration and Test activities. Update LRE Product Data Package.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22100 LRE ANALYSIS/INTEGRATION/TEST																	
1. Complete LRE Requirements Allocation Baselined	X																a. LRE Functional, Performance, and Interface requirements allocated to hardware and software components in RD-100 b. LRE portion of Ground Segment specification baselined
2. LRE Design/Analysis Completed		X															a. LRE Design Trades completed b. LRE Processing/Memory/Throughput Analysis completed c. List of all Hardware and Software to be Included in, or associated with, the LRE finalized
3. LRE Design Documentation Completed			X														a. LRE portion of Ground Segment specification finalized b. LRE Product Data Package baselined
4. Complete LRE Version 1 Integration and Test				X													a. Build 0 and Build 1 software completed b. LRE Version 1 hardware procured c. LRE Version 1 Integration and Test completed
5. Complete LRE Version 2 Integration and Test				X													a. Build 2 software completed b. LRE Manufacturing/Procurement completed c. Quality Inspection of Manufactured/Procured components completed d. LRE C2, Mission Planning, DGPS, and LAN Integration and Test completed e. LRE Input Interface Integration and Test completed f. LRE Output Interface Integration and Test completed g. LRE Component/LRU/Rack/Shelter Installation, Cabling and Integration completed h. LRE Version 2 Integration and Testing completed i. LRE Quality Inspection and Signoff completed
6. Complete LRE Version 3 Integration and Test							X										a. Build 3 software completed b. LRE Version 3 Software Integration and Regression testing completed c. LRE Product Data Package updated

22200 LRE Workstations. Purchase the command and control and mission planning workstations. Perform incoming physical inspection. Perform mechanical verification for rack insertion. Verify operating system version and load OS onto workstation. Verify OS and run-time applications/utilities. Verify manufacturer's built-in test software results. Insert and verify third party hardware (ATM, memory, etc.) and configure system.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DHR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22200 LRE WORKSTATIONS																	
1. Complete LRE Workstation Procurement				X													a. Workstation/Hardware Procurement Documentation completed b. Incoming Physical Inspection performed
2. Complete LRE C^3 and Mission Planner Workstation Hardware Integration				X													a. Rack Insertion and Mechanical verification performed b. Operating System Verified and Loaded c. OS and Run-Time Applications/Utilities verified d. Manufacturer's BIT Software and results verified e. Installation/Configuration of WS OTS and third party CCAs

22300 LRE Communications. Procure and fabricate the platform (LRE-UAV), external (LRE-MCE and external systems) and internal (intra-LRE) communications components or subsystems including embedded/external crypto device(s). Perform incoming inspection and functional test on components/subsystems. Install the components/subsystems in rack/chassis shelves. Interconnect cables. Verify functional performance. Perform hardwire link tests for each RF subsystem. Verify SATCOM channels and verify time delays and bit error rates are within tolerances. Integrate radio and modem equipment. Move equipment to secure area following appropriate security procedures as required. Integrate external crypto equipment (if required). Verify red/black installation procedures (if required). Verify BIT/BITE of the Subsystem. Perform RFI characterization.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22300 LRE COMMUNICATIONS																	
22310 LRE Platform Communications Hardware Integration																	
22311 UHF LOS/SATCOM Hardware Integration																	
1. Complete Requirements Analysis	X																a. Procurement Specification/SOW completed b. IDD baselined
2. Complete Design		X															a. IDD completed
3. Fabrication Complete				X													a. Material Orders Placed/Internal Fabrication initiated b. Subsystem Test completed
4. Complete UHF LOS/SATCOM Subsystem Comms Hardware Integration				X													a. Subsystem Incoming Inspection completed b. Components/Subsystem Installed in Rack/Chassis shelves c. Functional Performance verified d. Subsystem I & T with AVS components completed.
22320 LRE External Communications Hardware Integration																	
22321 LRE - MCE Communications Hardware Integration																	
1. Complete Requirements Documentation		X															a. Procurement specifications completed
2. Complete Design			X														a. Material orders placed
3. Complete LRE-MCE Comms Hardware Integration				X													a. Incoming Inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified
22322 LRE - EXTERNAL SYSTEM COMMUNICATIONS HARDWARE INTEGRATION																	
1. Complete Requirements Documentation		X															a. Procurement specification completed
2. Complete Design			X														a. Material orders placed
3. Complete LRE - External Comms Hardware Integration				X													a. Incoming inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	ORR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22300 LRE COMMUNICATIONS																	
22330 LRE Internal Communications Hardware Integration																	
1. Complete Requirements Documentation		X															a. Procurement specifications completed
2. Complete Design			X														a. Material orders placed
3. Complete Internal Comms Hard-ware Integration				X													a. Incoming inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified

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T 20000 GROUND SEGMENT

PHASE II EVENTS

22500 LRE Differential GPS. Finalize DGPS specification. Verify command and control interface compatibility. Subcontract the DGPS ground component. Perform incoming inspection and functional test on DGPS ground component. Install the DGPS ground component in LRE rack. Interconnect cables. Verify functional performance. Verify BIT/BITE of the Subsystem. Perform RFI characterization.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22500 LRE DIFFERENTIAL GPS																	
1. Complete DGPS Requirements Analysis.		X															a. DGPS Procurement Specification baselined
2. Complete DGPS Ground Procurement				X													a. DGPS Procurement Specification finalized b. Hardware Procurement completed c. Incoming physical inspection performed
3. Complete DGPS Integration and Test				X													a. Subsystem Installed in rack b. Cable Interconnection completed c. Functional Performance verified d. RFI Characterization completed e. C^2 data interface verification completed

22700 LRE Infrastructure/Facilities. Finalize requirements for the LRE shelter, environmental control unit, power distribution unit, generator, racks, cables and ancillary equipment with the selected vendor(s). Finalize SOWs, specifications and/or drawings. Procure and/or fabricate the necessary equipment. Visit vendors to review progress and inspect before delivery. Inspect upon delivery prior to acceptance. Prepare LRE infrastructure and facility PDP.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22700 LRE INFRASTRUCTURE/FACILITIES HARDWARE INTEGRATION																	
1. Baseline LRE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Requirements		X															a. Hardware Requirements baselined Drawings baselined c. Long lead items identified and ordered d. Input to Segment Specification completed
2. Complete LRE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Design and procurement		X															a. Design finalized b. Vendor(s) Selected and Requirements finalized c. SOW, Procurement Specifications, and/or Drawings finalized d. Infrastructure items ordered or fabricated
3. Complete LRE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Integration				X													a. Progress Review and Pre-Delivery Inspections completed b. Delivery Acceptance inspections completed

22800 LRE Software. Obtain software licenses for the LRE, develop LRE unique software, and support LRE testing.

22810 LRE CSCI Integration. Perform CSCI level testing in accordance with the software development plan.

22820 LRE Software Licenses. This task will include the procurement of all required software licenses for the LRE deliverable hardware.

22830 LRE Software Development. Develop software needed to start and stop DGPS and obtain DGPS status. This task will include all phases of software development from requirements through code and unit test.

22890 LRE Software CR Support. This task will provide software personnel support for LRE Element Test and Ground Segment I & T. This will include the diagnosis, debug, and correction of any software problems identified during this testing and the production of new CSCI baselines containing the corrections.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
22800 LRE SOFTWARE																	
22810 LRE CSCI Integration and Test																	
1. DGPS Build 2 CSCI Integration and Test complete				X													a. DGPS CSCI test procedures successfully executed
22820 LRE Software Licenses																	
1. Complete Analysis of Software Licenses Required.	X																a. Identify all COTS/OTS software required
2. Complete procurement of all software licenses for LRE.		X															a. Licenses procured
22830 LRE Software Development																	
1. DGPS CSCI Build 2 Development Complete				X													a. DGPS CSCI Build 2 Complete (requirements, code design, code, and unit test) in accordance with the SDP.
22890 LRE Software CR Support																	
1. Software support for LRE Element Test Complete.					X												a. All software CRs resolved.
2. Software support for Segment I&T Complete.							X										a. LRE I&T Completed b. Ground Segment I & T Completed

23000 Mission Control Element (MCE). Complete the design, development, integration and testing of one developmental HAE UAV MCE with embedded communications subsystems.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EKC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23000 MISSION CONTROL ELEMENT - PHASE II																	
1. Complete HAE UAV MCE Development and Test										X							a. MCE Analysis completed b. MCE Integration completed c. MCE Test completed d. MCE Workstations completed e. MCE Communications completed f. MCE Servers completed g. MCE Infrastructure/Facilities completed h. MCE Software completed

23100 MCE Analysis/Integration/Test. Ensure flow down of derived MCE requirements. Finalize requirements allocation to hardware and software components. Finalize MCE design metrics and technical performance measures. Finalize MCE design trades as required. Finalize MCE internal interfaces. Complete MCE processing/memory/throughput analyses. Finalize all hardware and software to be included in, or associated with, the MCE. Provide engineering support to manufacturing/procurement. Provide hardware quality inspection on fabricated/procured items. Prepare ECNs and incorporate changes as required. Define the required software builds to support MCE integration and test activities. Perform Version 1 MCE Integration and Test activities. Perform MCE Hardware-Software Functional Build integration and testing sequentially. Perform component/LRU/rack/shelter installation, cabling and integration. Perform Version 2 MCE Integration and Test activities. Provide quality inspection and sign-off of MCE. Perform Version 3 Integration and Test activities. Update MCE Product Data Package.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23100 MCE ANALYSIS/INTEGRATION/TEST																	
1. Complete MCE Requirements Allocation Baselined	X																a. MCE Functional, Performance, and Interface Requirements Allocated to Hardware and Software Components in RDD-100 b. MCE portion of Ground Segment Specification baselined
2. MCE Design/Analysis Completed		X															a. MCE Design Trades completed b. MCE Processing/Memory/Throughput Analysis completed c. List of all Hardware and Software to be Included in, or Associated with, the MCE finalized
3. MCE Design Documentation Completed			X														a. MCE portion of Ground Segment Specification finalized b. MCE Product Data Package baselined
4. Complete MCE Version 1 Integration and Test				X													a. Build 0 and Build 1 software completed b. Version 1 hardware procured c. MCE Version 1 Integration and Test completed
5. Complete MCE Version 2 Integration and Test				X													a. Build 2 software completed b. MCE Manufacturing/Procurement completed c. Quality Inspection of Manufactured/Procured components completed d. MCE C2, Mission Planning, and LAN Integration and Test completed e. MCE Input Interface Integration and Test completed f. MCE Output Interface Integration and Test completed g. MCE Communications and Image Specialist, Formation, and Server Integration and Test completed h. MCE Component/LRU/Rack/Shelter Installation, Cabling and Integration completed i. MCE Version 2 Integration and Test completed j. MCE Quality Inspection and Sign-off completed
6. Complete MCE Version 3 Integration and Test							X										a. Build 3 software completed b. MCE Version 3 hardware procured c. MCE Version 3 Integration and Test completed d. MCE Product Data Package updated

23200 MCE Workstations Purchase the command and control, mission planning, image QC and communications workstations. Perform incoming physical inspection. Perform mechanical verification for rack insertion. Verify operating system version and load OS onto workstation. Verify OS and run-time applications/utilities. Verify manufacturer's built-in test software results. Insert and verify third party hardware (ATM, memory, etc.) and configure system.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23200 MCE WORKSTATIONS HARDWARE INTEGRATION																	
1. Complete MCE Workstation Procurement				X													a. Workstation/Hardware Procurement Documentation Completed b. Incoming Physical Inspection Performed
2. Complete MCE C², Mission Planning, Image QC, and Communications Workstation/ Hardware Integration				X													a. Rack Insertion Mechanical Verification Performed b. Operating System Verified and Loaded c. OS and Run-Time Applications/Utilities Verified d. Manufacturer's BIT Software and Results Verified e. Installation/Configuration of WS OTS and third party CCAs

23300 MCE Communications. Procure and fabricate the platform (MCE-UAV), external (LRE-MCE and external systems) and internal (intra-MCE) communications components or subsystem including embedded/external crypto device(s). Perform incoming inspection and functional test on components/subsystem. Install the components/subsystem in rack/chassis shelves. Interconnect cables. Verify functional performance. Perform hardwire link tests for each RF subsystem. Verify SATCOM channels and verify time delays and bit error rates are within tolerances. Integrate radio and modem equipment. Move equipment to secure area following appropriate security procedures as required. Integrate external crypto equipment (if required). Verify red/black installation procedures (if required). Verify BIT/BITE of the subsystem. Perform RFI characterization.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23300 MCE COMMUNICATIONS HARDWARE INTEGRATION																	
23310 MCE Platform Communications Hardware Integration																	
23311 UHF SATCOM Hardware Integration																	
1. Complete Requirements Analysis	X																a. Procurement Specification/SOW completed b. IDD baselined
2. Complete Design		X															a. IDD completed
3. Fabrication Complete				X													a. Material Orders Placed/Internal Fabrication initiated b. Subsystem Test completed
4. Complete UHF SATCOM Communications Hardware Integration							X										a. Subsystem Incoming Inspection completed b. Components/Subsystem Installed in Rack/Chassis shelves c. Functional Performance verified d. Subsystem Integration and Test with AVS Components completed e. SATCOM Terminal Certification completed
23312 MIST LOS Hardware Integration																	
1. Complete Requirements Analysis	X																a. Procurement Specification/SOW completed b. IDD baselined
2. Complete Design		X															a. IDD completed b. MINI-ACA /Design completed c. MUX/DEMUX Interface Card completed
3. Fabrication complete				X													a. Material Orders Placed/Internal Fabrication initiated b. MUX/DEMUX Interface Card delivered c. Subsystem Test completed
4. Complete MIST LOS Communications Hardware Integration					X												a. Subsystem Incoming Inspection completed b. Components/Subsystem Installed in Rack/Chassis shelves c. Functional Performance verified d. Subsystem Integration and Test with AVS Components completed

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	ORR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23313 TFT SATCOM Hardware Integration																	
1. Complete Requirements Analysis	X																a. Procurement Specification/SOW completed b. IDD baselined
2. Complete Design		X															a. IDD completed
3. Fabrication Complete				X													a. Material Orders Placed/Internal Fabrication initiated b. Subsystem Test completed
4. Complete TFT SATCOM Communications Hardware Integration					X												a. Subsystem Incoming Inspection completed b. Components/Subsystem Installed in Rack/Chassis sShelves c. Functional Performance verified d. Subsystem Integration and Test with AVS Components completed e. SATCOM Terminal Certification completed
23320 MCE External Communications Hardware Integration																	
23321 LRE - MCE Communications Hardware Integration																	
1. Complete Requirements Documentation		X															a. Procurement specifications completed
2. Complete Design			X														a. Material orders placed
3. Complete LRE-MCE Communications Hardware Integration				X													a. Incoming inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified
23322 MCE - External System Communications Hardware Integration																	
1. Complete Requirements Documentation		X															a. Procurement specifications completed
2. Complete Design			X														a. Material orders placed
3. Complete MCE External Communications Hardware Integration				X													a. Incoming inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified
23330 MCE Internal Communications Hardware Integration																	
1. Complete Requirements Documentation		X															a. Procurement specifications completed
2. Complete Design			X														a. Material orders placed
3. Complete MCE Internal Communications Hardware Integration				X													a. Incoming inspection performed b. Components installed in rack/chassis shelves c. Functional performance verified

23400 MCE Servers. Purchase the MCE server, the Image Formation Processing Suite and chassis, and the 24-hour storage. Perform incoming physical inspections. Perform mechanical verification for rack insertion. Verify operating system version and load OS onto processors. Verify OS and run-time applications/utilities. Verify manufacturer's built-in test software results. Insert and verify 3rd party hardware (ATM, memory, etc.) and configure system.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23400 MCE SERVERS																	
1. Complete MCE Server Requirements Analysis	X																a. Baseline Server, Image Formation Processor Suite, and Storage Processing/Storage requirements completed
2. Complete MCE Server Procurement		X															a. Hardware Procurement Completed b. Incoming Physical Inspection Performed
3 Complete MCE Server Integration/ Configuration			X														a. Rack Insertion Mechanical Verification Performed b. Operating System Verified and Loaded c. OS and Run-Time Applications/Utilities Verified d. Manufacturer's BIT Software and Results Verified e. Installation/Configuration of OTS and third Party CCAs

23700 MCE Infrastructure/Facilities. Finalize requirements for the MCE shelter, environmental control unit, power distribution unit, generator, racks, cables and ancillary equipment with the selected vendors. Finalize SOWs, specifications and/or drawings. Procure and/or fabricate the necessary equipment. Visit vendors to review progress and inspect before delivery. Inspect upon delivery prior to acceptance.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23700 MCE INFRASTRUCTURE/FACILITIES HARDWARE INTEGRATION																	
1. Baseline Complete MCE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Requirements		X															a. Hardware Requirements baselined b. SOW, Procurement Specifications, and/or Drawings baselined c. Long Lead items identified and ordered d. Input to Segment Specification baselined
2. Complete MCE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Design and Procurement		X															a. Design finalized b. Vendor(s) Selected and Requirements finalized c. SOW, Procurement Specifications, and/or Drawings finalized d. Infrastructure items ordered or fabricated
3. Complete MCE Shelter, Environmental Control and Power Distribution Units, Generator, Racks and Cables Hardware Integration				X													a. Progress Review and Pre-Delivery Inspections completed b. Delivery Acceptance Inspections completed

23800 MCE Software. Provide all software required for the MCE. This will include obtaining and modifying existing reused software, as well as developing new software. The development effort will include development of detailed requirements, design, code, unit test, and CSCI level testing. This task will also include software personnel support for MCE Element level and Segment I & T. Software CSCIs developed for the MCE will also be used in the LRE as required.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23800 MCE SOFTWARE																	

23810 Software CSCI Integration and Test. Perform CSCI level testing in accordance with the Software Development Plan. This will include for each CSCI, planning, development of test procedures and data files, the conduct of testing, and documenting the test results. CSCI integration and test will be performed in support of multiple builds. This task will also include all required management, coordination, test tools, and documentation. The completion of this activity will produce tested CSCI baselines which will support MCE and LRE Subsystem Test.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
23810 MCE Software Integration																	
1. Build 0 Software CSCI integration and test complete		X															a. Common Software CSCI test procedures successfully executed b. JDISS CSCI test procedures successfully executed
2. Build 1 Software CSCI integration and test complete				X													a. Selected Image Dissemination CSCI test procedures successfully executed b. Primary Image Dissemination CSCI test procedures successfully executed c. Serial Interface CSCI test procedures successfully executed d. Remote SSI CSCI test procedures successfully executed e. C2 Workstation CSCI test procedures successfully executed f. UAVComms CSCI test procedures successfully executed g. Comms Exec CSCI test procedures successfully executed
3. Build 2 Software CSCI Integration and test complete				X													a. C2 Workstation CSCI test procedures successfully executed b. UAV Comms CSCI test procedures successfully executed c. Comms Exec CSCI test procedures successfully executed
4. Build 3 software CSCI Integration and Test complete							X										a. Remote SSI CSCI test procedures successfully executed b. UAV Comms CSCI test procedures successfully executed c. Comms Exec CSCI test procedures successfully executed d. C2 Workstation CSCI test procedures successfully executed

23820 MCE Software Licenses. This task will include the procurement of all required software licenses for the MCE deliverable hardware.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23820 MCE COTS/OTS/GOTS Software (Material)																	
1. Complete analysis of software licenses required	X																a. Identify all COTS/OTS software licenses required
2. Complete procurement of all software licenses for MCE		X															a. Procure licenses

23830 MCE Software Development Build 0/1. In accordance with the Software Development Plan, develop detailed requirements, perform design, develop code, and perform unit test for the Build 0 and Build 1 CSCIs identified below. This will include identifying, obtaining, and implementing existing/reused software, as well as developing new code. HCIs will also be identified, prototyped, and finalized as a part of the requirements, design, and code activities. Interfaces between CSCIs will be definitized to a level sufficient to support code development. Software baselines will be established under configuration control in the Software Development Library. Test procedures and data files for use in unit testing of new and modified software will be prepared. All software development activities will be documented online in the Software Development Library.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23830 MCE Software Development																	
1. Common Software CSCI Build 0 development complete		X															a. Common Software CSCI Build 0 complete (requirements, code design, code and unit test) in accordance with the SDP
2. JDISS CSCI Build 0 development complete		X															a. JDISS CSCI Build 0 complete (requirements, code design, code and unit test) in accordance with the SDP
3. Select Image Dissemination CSCI Build 1 development complete				X													a. Select Image Dissemination CSCI Build 1 complete (requirements, code design, code and unit test) in accordance with the SDP
4. Primary Image Dissemination CSCI Build 1 development complete				X													a. Primary Image Dissemination CSCI Build 1 complete (requirements, code design, code and unit test) in accordance with the SDP
5. Serial Interface CSCI Build 1 development complete				X													a. Serial Interface CSCI Build 1 complete (requirements, code design, code, and unit test) in accordance with the SDP
6. Remote SSI CSCI Build 1 Development Complete				X													a. Remote SSI CSCI Build 1 complete (requirements, code design, code, and unit test) in accordance with the SDP
7. C2 Workstation CSCI Build 1 development complete				X													a. C2 Workstation CSCI Build 1 complete (requirements, code design, code, and unit test) in accordance with the SDP
8. UAV Comms CSCI Build 1 Development Complete				X													a. UAV Comms CSCI Build 1 complete (requirements, code design, code, and unit test) in accordance with the SDP
9. Comms Exec CSCI Build 1 Development Complete				X													a. Comms Exec CSCI Build 1 complete (requirements, code design, code, and unit test) in accordance with the SDP

23840 MCE Software Development Build 2. In accordance with the Software Development Plan, develop detailed requirements, perform design, develop code, and perform unit test for the Build 2 CSCIs identified below. This will include identifying, obtaining, and implementing existing/reused software, as well as developing new code. HCIs will also be identified, prototyped, and finalized as a part of the requirements, design, and code activities. Interfaces between CSCIs will be definitized to a level sufficient to support code development. Software baselines will be established under configuration control in the Software Development Library. Test procedures and data files for use in unit testing of new and modified software will be prepared. All software development activities will be documented online in the Software Development Library. Development activities will support multiple builds of software CSCI baselines.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23840 MCE Software Development																	
1. C2 Workstation CSCI Build 2 Development Complete				X													a. C2 Workstation CSCI Build 2 complete (requirements, code design, code, and unit test) in accordance with the SDP
2. UAV Comms CSCI Build 2 Development Complete				X													a. UAV Comms CSCI Build 2 complete (requirements, code design, code, and unit test) in accordance with the SDP
3. Comms Exec CSCI Build 2 development complete				X													a. Comms Exec CSCI Build 2 complete (requirements, code design, code, and unit test) in accordance with the SDP

23850 MCE Software Development Build 3. In accordance with the Software Development Plan, develop detailed requirements, perform design, develop code, and perform unit test for the Build 3 CSCIs identifed below. This will include identifying, obtaining, and implementing existing/reused software, as well as developing new code. HCIs will also be identified, prototyped, and finalized as a part of the requirements, design, and code activities. Interfaces between CSCIs will be definitized to a level sufficient to support code development. Software baselines will be established under configuration control in the Software Development Library. Test procedures and data files for use in unit testing of new and modified software will be prepared. All software development activities will be documented online in the Software Development Library. Development activities will support multiple builds of software CSCI baselines.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23850 MCE Software Development																	
1. Remote SSI CSCI Build 3 Develcoment complete							X										a. Remote SSI CSCI Build 3 (requirements, code design, code, and unit test) in accordance with the SDP
2. C2 Workstation CSCI Build 3 Develcoment Complete							X										a. C2 Workstation CSCI Build 3 complete (requirements, code design, code, and unit test) in accordance with the SDP
3. UAV Comms CSCI Build 3 Develcoment Complete							X										a. UAV Comms CSCI Build 3 complete (requirements, code design, code, and unit test) in accordance with the SDP
4. Comms Exec CSCI Build 3 development complete							X										a. Comms Exec CSCI Build 3 complete (requirements, code design, code, and unit test) in accordance with the SDP

IPT 20000 GROUND SEGMENT

PHASE II EVENTS

23870 Mission Planning Software Development Builds 1, 2, and 3. In accordance with the Software Development Plan, develop detailed requirements, perform design, develop code, and perform unit test for Builds 1, 2, and 3 CSCIs identifed below. This will include identifying, obtaining, and implementing existing/reused software, as well as developing new code. HCIs will also be identified, prototyped, and finalized as a part of the requirements, design, and code activities. Interfaces between CSCIs will be definitized to a level sufficient to support code development. Software baselines will be established under configuration control in the Software Development Library. Test procedures and data files for use in unit testing of new and modified software will be prepared. All software development activities will be documented online in the Software Development Library. Development activities will support multiple builds of software CSCI baselines.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23870 Mission Planning Software																	
1. Mission Planning CSCI Build 1 development complete				X													a. Mission Planning CSCI Build 1 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 1 CSCI Integration and Test completed
2. Mission Planning CSCI Build 2 development complete				X													a. Mission Planning CSCI Build 2 complete (requirements, code design, code and unit test) in accordance with the SDP b. Build 2 CSCI Integration and Test completed
3. Mission Planning CSCI Build 3 development complete							X										a. Mission Planning CSCI Build 3 complete (requirements, code design, code and unit test) in accordance with the SDP b. Build 3 CSCI Integration and Test completed

23880 Image Processing Software Development Builds 2 and 3. In accordance with the Software Development Plan, develop detailed requirements, perform design, develop code, and perform unit test for Builds 2 and 3 CSCIs identifed below. This will include identifying, obtaining, and implementing existing/reused software, as well as developing new code. HCIs will also be identified, prototyped, and finalized as a part of the requirements, design, and code activities. Interfaces between CSCIs will be definitized to a level sufficient to support code development. Software baselines will be established under configuration control in the Software Development Library. Test procedures and data files for use in unit testing of new and modified software will be prepared. All software development activities will be documented online in the Software Development Library. Development activities will support multiple builds of software CSCI baselines.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23880 Image Processing Software																	
1. Image Server CSCI Build 2 development complete				X													a. Image Server CSCI Build 2 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 2 CSCI Integration and Test completed
2. Image Server CSCI Build 3 development complete							X										a. Image Server CSCI Build 3 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 3 CSCI Integration and Test completed
3. Image Formation Processor CSCI Build 2 development complete				X													a. Image Formation Processor CSCI Build 2 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 2 CSCI Integration and Test completed
4. Image Formation Processor CSCI Build 3 development complete							X										a. Image Formation Processor CSCI Build 3 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 3 CSCI Integration and Test completed
5. QC Workstation CSCI Build 2 development complete				X													a. QC Workstation CSCI Build 2 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 2 CSCI Integration and Test completed
6. QC Workstation CSCI Build 3 development complete							X										a. QC Workstation CSCI Build 3 completed (requirements, code design, code and unit test) in accordance with the SDP b. Build 3 CSCI Integration and Test completed

23890 MCE Software CR Support. This task will provide software personnel support for MCE Element Test and Segment I & T. This will include the diagnosis, debug, and correction of any software problems identified during this testing and the production of new CSCI baselines containing the corrections.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
23890 MCE Software CR Support																	
1. Software Support for MCE Element Test Complete					X												a. All Software Crs resolved
2. MCE Software Support to Segment I & T Complete							X										a. MCE I & T complete b. Ground Segment I & T complete

30000 SUPPORT SEGMENT

30000 Support Segment. In Phase II, the Support IPT will complete and document the analysis of deployment to operating locations, preparation for operations, refurbishment after operations and maintenance of operational condition. The Support IPT will participate in the Air Vehicle, Avionics, Payload and Ground Segment IPTs to incorporate the evolving supportability requirements into the system design. The Support IPT will document the support requirements in the support segment specification and provide the resources needed to support the development and performance test, and to transition to the demonstration phase. Specific tasks to be accomplished within each support element are identified in the following paragraphs.

31000 Support Planning and Analyses. The preliminary trades and economic analyses started in Phase I to evaluate alternate support concepts will be extended to include additional system components for the definition of the final Tier II Plus support posture. This element includes the analyses that establishes a basis for identification of support resources and the definition of requirements for manpower, facilities, PHS&T, and design interfaces.

31100 Maintenance Planning, Analysis and Test. Define operational scenarios to provide a firm basis for analysis of maintenance tasks. Complete deployment preparation and site setup, operations preparation, refurbishment and maintenance task analyses. Identify support resources required to deploy, and maintain the system elements. Develop servicing, handling, maintenance, and operations procedures. Integrate UAV, MCE and LRE support resources. Update maintenance economic analysis. Update support segment specification; place under Class I control. Provide Support Segment updates to System Specification.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
31100 MAINTENANCE PLANNING, ANALYSIS AND TEST																	
1. Baseline Support Scenarios Established	X																a. Solicitation Logistic Scenarios Reviewed b. MOB and Deployed Locations Support Scenarios Defined c. MOB and Deployed Location Operating Rates Projected
2. Preliminary Task Analyses Completed				X													a. UAV, LRE and MCE Operations and Support Tasks Identified b. Operations Tasks Support Resource Requirements Analyzed c. Maintenance Tasks Support Resources Analyzed
3. Maintenance Concept Established										X							a. Economic Level Of Repair Analysis for Updated Sub-systems Completed b. Organic versus Contractor Maintenance Analysis Completed c. Support Influences on Life Cycle Cost Decisions Assessed
4. Preliminary Support Resource Requirements Identified		X															a. Support Resources Required to Operate, Service, Maintain and Repair the UAV, MCE, LRE and SE Identified b. Trade Studies Conducted
5. Draft Maintenance Procedures and Checklists Developed					X												a. Maintenance Procedures and Checklists Validated in SIL and During Ground Testing
6. UAV, MCE, and LRE Support Commonalities Identified				X													a. Support Resource Requirements Common to all System Elements Identified b. Opportunities to Eliminate Duplicate Support Resource Requirements Identified
7. Air Vehicle Turnaround Time Assessed										X							a. Maintenance History from SIL and Flight Test Programs Compiled b. Maintenance History Data Analyzed c. Support System Effectiveness Determined and Improvement Opportunities Identified

T 30000 SUPPORT SEGMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
31100 MAINTENANCE PLANNING , ANALYSIS AND TEST - (continued)																	
8. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided
9. Task Analyses Finalized										X							a. UAV, LRE and MCE Operations and Support Tasks Updated b. Operations Tasks Support Resource Requirements Updated c. Maintenance Tasks Support Resources Updated
10. Support Resource Requirements Finalized										X							a. Flight Test Data Analyzed b. Support Resource Requirements Updated
11. Maintenance Procedures and Checklists Finalized									X								a. Maintenance Procedures Verified During Flight Testing b. Procedures and Checklists Source Data Available For Technical Manuals

31200 Manpower and Personnel. Review maintenance and operations tasks. Group tasks by similarity and occupational type. Estimate task manpower requirements. Identify maintenance and operations skills and skill levels. Estimate operational scenario manpower levels.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
31200 MANPOWER AND PERSONNEL																	
1. Preliminary Maintenance and Operations Skills and Manpower Levels Identified					X												a. Required Skills to Maintain the Air, Ground, and Support Segments Identified b. Requirements to Operate Ground Segment Work Stations Identified c. Requirements to Perform Command and Control Functions Identified d. M&P Requirements to Support MOB and FOB Operations Consolidated
2. Personnel Skills and Manpower Levels Finalized										X							a. Flight Test Data Reviewed b. Personnel Skills and Manpower Levels Updated
3. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed under Bilateral Control b. Updates to System Specification Provided

31300 Facilities. Identify facility requirements for real estate, installations, buildings, and utilities.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
31300 FACILITIES																	
1. Facility Requirements Established				X													a. Review UAV, MCE, and LRE Operational and Maintenance Functions from Task Analysis b. Real Estate, Buildings, Installations and Utilities Needed to Accomplish Operational and Maintenance Functions Defined c. Facilities Report Created
2. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

31400 Packaging, Handling, Storage and Transportation. Determine packaging size, handling procedures and constraints for shipment of MCE, LRE, MSK, and support equipment. Define C-141B loadout configurations. Update PHS&T program to include development and test program results.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
31400 PACKAGING, HANDLING, STORAGE AND TRANSPORTATION																	
1. Deployment Transport Preparation Tasks Established										X							a. Ground and Support Segments Teardown and Packaging Requirements Identified
2. Deployed Site Setup Tasks Established										X							a. Ground and Support Elements Site Setup Requirements Identified
3. PHS&T Analyses of Packaging Size, Procedures, Constraints Complete										X							a. Dimensions and Weights of Components Determined b. Transport Containers, Procedures, Packaging, Handling, Environmental Limitations, Hazardous Effects and Preservation Methods Determined c. PHS&T Analyses Documented d. Test Program PHS&T Data Reviewed
4. Transport Configurations that are Compatible with C-141 Loadout Accommodations Completed										X							a. C-141 Compatible Transport Configurations Defined b. C-141 Loadout Simulated
5. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

31500 Design Interface. Identify and assess logistics-related design parameters. Influence design through supportability analysis to improve operational availability. Improve fault tolerance through redundancy management and reconfigurability.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
31500 : DESIGN INTERFACE																	
1. Logistics-Related Design Parameters Identified	X																a. Design Requirements Reviewed b. Logistics Impact for Design Parameters Assessed c. Logistics-Related Design Parameters Documented
2. Design Influenced by Supportability Analysis		X															a. Accessibility, Clearances, Testability, and Other Design Factors Reviewed b. Design Changes to Improve Supportability Recommended
3. Fault Tolerance Assessed		X															a. Failure Modes Identified b. Criticality of Failure Modes Assessed c. Alternative Approaches to Preclude or Reduce Failure Effects Developed
4. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

32000 Training and Training Support. Identify training required to accomplish operations and maintenance tasks. Create and develop training program plan.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
32000 TRAINING AND TRAINING SUPPORT																	
1. Training Requirements Established									X								a. Operations and Maintenance Task Analyses Reviewed b. Training Requirements for Support and Operations Personnel Identified
2. Training Program Plan Developed									X								a. Courses, Subjects, Course Length Identified b. Trainee Type, Facilities Requirements Identified
3. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

ARPA - DARO

T2T 30000 SUPPORT SEGMENT

PHASE II EVENTS

33000 Support Equipment. Identify and update CSE and PSE physical and functional requirements. Design, develop, fabricate and test PSE. Integrate SE in SIL and with UAV, MCE and LRE.

33100 Air Vehicle Test Equipment Set. Re-evaluate and finalize SE design concepts. Specify and procure hardware items. Accomplish mechanical and electrical design. Provide engineering test requirements and fabrication support. Accomplish hardware/software integration and acceptance tests.

33200 MCE/LRE Test Equipment Set. Re-evaluate and finalize SE requirements. Substantiate COTS/MOTS SE needs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
33000 SUPPORT EQUIPMENT																	
1. Initial Common and Peculiar Support Equipment (CSE & PSE) Requirements Established	X																a. Task Analysis Reviewed to Identify UAV/LRE/MCE Checkout, Test, Servicing and Maintenance SE Requirements b. SE Physical and Functional Design Requirements Determined
2. SE Predesign Completed		X															a. Detailed System Test Requirements Determined b. CSE List Reviewed and Scheduled
3. PSE Designed, Fabricated and Tested				X													a. PSE Integrated with CSE b. PSE Items and CSE Adapters Designed c. ATPs Created d. PSE and CSE Adapters Fabricated e. Off-The-Shelf SE Purchased f. SE Component Engineering Tests Performed g. SE Integrated in SIL h. Test Program Changes Incorporated In SE Configuration
4. PSE and CSE Integrated with UAV and LRE #1					X												a. GFSE Delivery Coordinated b. SE Hardware and Software Functionally Integrated with UAV c. SE Functionally Integrated with UAV and LRE
5. PSE and CSE Integrated with UAV-2 and MCE							X										a. SE Functionally Integrated with UAV and MCE
6. SE Requirements Finalized										X							a. PSE and CSE Requirements Finalized to Reflect Flight Test Experience and Final Maintenance Concept
7. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

34000 Technical Data. Identify technical data requirements. Obtain supplier and government data.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
34000 TECHNICAL DATA																	
1. Preliminary Technical Data Requirements Identified	X																a. Technical Data Required to Operate and Maintain the System Identified
2. Technical Data Source Material Identified			X														a. Vendor and TRA Technical Data Collected b. External Agency (FAA, ICAO) Technical Data Requirements Available
3. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided
4. Technical Data Requirements Finalized									X								a. LORA, Operations and Maintenance task Analyses, and Flight Test Results Reviewed b. Technical Data Requirements Documented

35000 Computer Resources Support. Identify embedded computers, SW, documentation. Determine and provide computer support resources. Update computer support to reflect flight test results.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
35000 COMPUTER RESOURCES SUPPORT																	
1. Mission Critical Computers, Software, Documentation, and Support Facilities/Equipment Identified										X							a. Identify Requirements to Operate and Support Mission Critical Computers, Software, and/or Documentation b. Identify Military-Specific Hardware, Software, and/or Documentation Required to Interface with Military-Specific Equipment and Agencies c. Identify and Assure Availability of Unique Skills Required to Support, Operate, Install, and/or Diagnose Mission Critical Computers, Software, and/or Documentation
2. Computer Resource Support Structure In Place										X							a. Hardware, Object Code on Media, Documentation, Facilities, and Diagnostic Equipment to Support Mission Critical Computers On Hand
3. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

IPT 30000 SUPPORT SEGMENT

PHASE II EVENTS

36000 Supply Support. Provide spares and repair parts to support Flight Test Program. Identify Phase III demonstration program spares. Define spares management program.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
36000 SUPPLY SUPPORT																	
1. Spares and Repair Parts Requirements Updated					X												a. Spares to Support the Flight Test Program Identified b. Flight Test Spares Provided
2. Operational Demonstration Spares Management Program Defined										X							a. Asset Acquisition and Management Determined b. Repair Processing Implemented c. Spares Modification Processing Procedures Determined d. Repair Processing Procedures Assessed
3. Phase III Spares and Repair Parts Lists Developed									X								a. Preliminary Supplier Parts Lists Available b. Supplier and Associate Contractor Technical Data Integrated c. Long Lead Spares and Repair Parts Identified
4. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

37000 Support Software. Establish the infrastructure to support the development of the Support Segment software. Provide inputs to the Systems Engineering Software Manager to finalize the top level software requirements. Support the System Engineering Software Manager in developing inter-segment IDDs. Develop a detailed design document. Create an interface design document (IDD) for the interface between the support software and air vehicle and ground systems. Produce an IDD for the messages passed between the CSCs and CSUs. Produce design notes for all CSCs and CSUs to provide detailed requirements and design. Perform unit testing on the CSCs and CSUs. Develop the test plan. Perform and document integration testing in accordance with the test plan. Monitor and track defined software metrics (TPMs). Provide monthly TPM status reports to the Systems Engineering Software Manager.

37100 Air Vehicle Test Equipment Software . Define interface design document and test requirements for UAV/test equipment interface. Build checkout and test control software for air vehicle test controller. Verify software program sets for preflight and postflight test and prelaunch checkout of UAV.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
37100 AIR VEHICLE SUPPORT SOFTWARE																	
1. UAV/Test Equipment Interface Design Document Created			X														a. Identify Avionics, Sensor and Data Link Test Functions b. Define UAV Test Parameters c. Identify and Characterize Test Interface Locations
2. Test Interface Management SW Build Complete				X													a. Write Pre/Postflight Test and Prelaunch Checkout Software Code b. Create Test Procedures and Maintenance Checklists Display Code c. Verify Software on UAV Test Equipment d. Integrate Software with UAV Test Equipment in SIL
3. Functional Checkout SW Verified					X												a. Integrate Software with UAV Test Equipment on UAV b. Perform Acceptance Test Procedure on UAV
4. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

37200 MCE/LRE Support Software. Define test requirements for MCE and LRE. Build test interface management software. Accomplish integrated functional checkout and fault isolation test of MCE and LRE.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
37200 LRE/MCE SUPPORT SOFTWARE																	
1. Test Requirements Defined			X														a. Identify Test Functions b. Define MCE and LRE Test Procedure c. Identify and Characterize Test Parameters
2. Functional Checkout SW Verified					X												a. Integrate Software with MCE and LRE b. Perform MCE and LRE Factory Acceptance Test
3. Support Segment Specification Updated			X														a. Support Segment Specification Updated and Placed Under Bilateral Control b. Updates to System Specification Provided

40000 SYSTEMS ENGINEERING/PROGRAM MANAGEMENT

41000 Systems Engineering. Accomplish technical processes leading to a complete and fully integrated Tier II Plus System. Perform system level analyses and specialty engineering tasks. Integrate system level trades into requirements and architecture flowdown into the system and the segment specification. Define and monitor system interfaces.

41100 Systems Analysis and Integration. Ensure that the Tier II Plus Segments form a coherent, integrated, composite entity capable of accomplishing the Tier II Plus system performance requirements while meeting the $10M UFP. Track system level TPMs. Define and manage interfaces between system segments and their respective external elements and environments. Implement an integration control program, and establish Interface Control Working Groups (ICWGs). Provide guidance to the IPTs responsible for segment development, integration and testing.

41120 Systems Integration Perform technical integration of the total Tier II Plus system during design, fabrication, assembly and test. Conduct regular IPT engineering and procurement review boards to monitor system and segment development and progress. Track system risk and invoke any necessary risk mitigation measures to ensure cost, technical performance, and schedule objectives are achieved.

41130 System Software Management. Implement a software management program that flows down requirements and tracks and controls the development of Air Vehicle Segment, Ground Segment, Support Segment, Payload Segment, and System Integration software. Develop and maintain the segment level software requirements specifications and System Level Software Integration and Test Requirements. Develop and maintain inter-segment interface requirements specifications. Produce and maintain the software development plan and schedule. Develop and implement software risk reduction measures. Develop and implement a COTS software control plan. Collect and monitor software technical and management metrics (TPMs) for each segment software development activity. Track development progress and report to program management.

41140 Operations Research. Perform survivability analyses and simulations that provide guidance to the IPTs for design and operation of the Tier II Plus system in warfighting and peacetime scenarios. Update and refine scenarios with the aid of ARPA, DARO and the User agencies consistent with the evolving and overall system CONOPS. Refine metrics to evaluate system effectiveness. Develop system P3I plans that address cost, schedule, risk, and system benefits that include a plan of action in consultation with ARPA, DARO and User agencies. Evaluate the full range baseline and alternative operational concepts and deployment options. Integrate cost and effectiveness methodologies for modular sensor and defense suite alternatives and combinations. Evaluate the key military utility (MU) components for their contribution in maximizing MU. Refine and exercise the MU model to develop sensitivity of system effectiveness leading to a cost effective system design.

41150 Reliability and Fault Tolerance. Perform analyses to estimate the air vehicle's Mean Flights to Loss (MFTL) and Mean Time Between Failure (MTBF) influencing mission abort probability. Harmonize trade-off studies used to determine LRU failure rates and the level of fault tolerance needed to remain within MFTL and Operational Availability requirements with the $10M UFP. Collect and analyze test and failure data to assess reliability problems. Recommend corrective action when needed.

41160 System Safety. Prepare a Preliminary Hazard Analysis (PHA) to identify Safety Critical hardware and software items and safety-essential operations and maintenance activities. Initiate design changes, establish instructions, cautions and warnings, and identify any special safety testing and training requirements based on PHA results. Assess results of safety tests and conduct of ground and flight tests for hazards. Direct efforts to reduce severity and/or frequency of hazard occurrences.

41170 Human Factors. Review all man-machine interfaces required during operation, maintenance and support to ensure personnel safety and compatibility with human capabilities. Recommend potential design changes and personnel training to improve man-machine interfaces.

41180 Maintainability. Evaluate and perform trade studies of the maintainability features of the system design. Quantify turn-around time, mean time to repair, maximum corrective maintenance time and maintenance man hours per mission for potential improvements. Coordinate maintainability issues with the design and development of all segments. Review test operations and maintenance tasks for maintainability problems requiring corrective action.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FOR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
41000 SYSTEMS ENGINEERING																	
1. Preliminary Requirements and Interfaces Baselined	X																a. Software Management Program Implemented b. Segment Level Software Requirements Baselined c. Software Development Plans and Schedules Delivered d. MFTL and MTBF Preliminary Analysis Performed e. ICDs Released f. DRBs Released g. Procurement Specifications Updated h. Risk Analysis Updated i. TPMs Updated j. UFP Analysis Updated k. Process IMP Updated l. Reliability Plan Baselined m. Draft System Integration Plan Released
2. System Preliminary Design and Analysis Completed		X															a. Software Risk Reduction Measures Delivered b. COTS Software Control Plan Delivered c. Segment Software TPMs Defined and Evaluated d. CONOPS Scenarios Updated with ARPA/User Inputs e. Preliminary Hazard Analysis (PHA) Complete f. TPMs Updated g. Risk Analysis Updated h. Preliminary System Performance Analyzed i. UFP Analysis Updated j. System Integration Plan Released k. System Software Development Plan Updated
3. System Design Baselined			X														a. Risk Analysis Updated b. Reliability, Fault Tolerance, Safety, Human Factors, Maintainability, and Survivability Analysis Updated c. Baseline System Performance Estimated d. TPMs Updated e. UFP Analysis Updated
4. Ready for First Flight					X												a. Failure Analysis Status - Reliability Data Review b. System Safety Analysis Update/Review c. System Software Verified
5. Ready for Payload Flight							X										a. System Performance Status b. System Software Verified c. System Checkout Complete
6. System Flight Test Results Implemented									X								a. Tests Evaluated, Anomalies Identified, Recommended Changes Addressed as Required b. System Software Baselines Established and Documented for Phase III c. ARPA/User Feedback Evaluated d. Test and Failure Data Acquired and Analyzed; Corrective Actions Recommended e. System Verification Status Updated

II 40000 SYSTEMS ENGINEERING/ PROGRAM MANAGEMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	ORR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
41000 SYSTEMS ENGINEERING (Continued)																	
7. Ready to Initiate Phase III Production									X								a. Bilateral-approved Changes to the Specifications Incorporated b. Changes to System Hardware and Software Configurations Identified, Documented and Incorporated into Procurement Orders and Specs c. Preplanned Upgrades Identified in Phase II Implemented d. Manufacturing, Integration, and Test Plans Reviewed e. UFP Analysis Updated f. System Performance Analysis Updated g. System Checkout Requirements Baselined

COMPETITION SENSITIVE – NOT RELEASABLE

41200 Systems Engineering Controls. Continue with the following System Engineering control tasks that refine the system and segment specifications as the products mature, and track and report development progress.

41220 Specifications. Update the system specification to incorporate results of design trades and refinements which are performed at the segment and system levels. Flow down system level requirements affecting segment level specifications. Update system specifications affected by approved configuration changes and flow down changes to procurement specifications.

41230 Trade Study Tracking. Assess, evaluate and document trade studies on a recurring basis at the system level. Perform cost trades.

41240 Configuration Management (CM), Data Management (DM). Finalize selection and identify Tier II Plus system hardware and software requiring separate configuration management (CIS and CSCIs). Process proposed changes from the field with the Configuration Control Board. Coordinate changes to any technical data affected by approved changes. Coordinate hardware and software validation tests and deliveries, if applicable. Track and document configuration changes for current status accounting. Maintain a data accession list (DAL). Maintain files and distribute technical data exchanged between the IPTs and the customer member.

41250 Key Program Reviews. Organize and manage key program design reviews. Coordinate action items resulting from these reviews with the team responsible for the action. Manage to closure responses from all reviews. Report status of review action items on the MIS.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
41200 SYSTEM ENGINEERING CONTROLS See Process IMPs																	

II 40000 SYSTEMS ENGINEERING/ PROGRAM MANAGEMENT
PHASE II EVENTS

42000 Program Management. Continue to implement and refine the integrated product development processes developed during Phase I. Maintain the program WOS, TDD, IMP and IMS and fully implement the Management Information System (MIS) and Earned Value Management System (EVMS) defined during Phase I. Maintain configuration control of the system and segment specifications. Implement and manage a risk management program. Interface with all functional departments and subcontractors to ensure adequate resources are available to support the IPTs, and that processes, procedures and program plans are in place and working.

42100 Configuration Control Board. Establish and convene a weekly Configuration Control Board (CCB) to review proposed system hardware and software changes. Acquire bilateral TRA/government approval on changes affecting the system and segment specifications.

42200A Management Information System. Provide, operate and maintain a program-wide Management Information System (Tier II Plus UAVNet) that will make program documents accessible to the Tier II Plus program sites/personnel (Contractor and Government) via a secure Internet Website. Government sites will include the ARPA HAE UAV JPO and its two satellite sites at WPAFB and NAWC. The website and its contents will be maintained by TRA on a Widows NT server located at Teledyne Ryan.

The following minimum functions will be made available on the Tier II Plus UAVNet:

- View lists of Tier II Plus program documents organized by Work Outline number
- Download program documents to IPT members' desktop computers
- Deposit IPT working files in IPT member file drops
- Upload documents to the server for subsequent cataloging and posting to the document list by the TRA Data Manager
- Search document abstracts for keywords

At a minimum, site security will be provided through the use of Lan Guardian encryption/decryption devices and Windows NT password controls. Data will be protected during transmission over the internet by the encryption/decryption function of the Lan Guardian equipment. The Tier II Plus UAVNet will not be used for classified information.

42300 Integrated Master Schedule. Maintain an Integrated Master Scheduling system which corresponds with the program IMP and provides visibility into the program accomplishments. Update the IMS on a monthly basis and make available to the customer/contractor team via the MIS.

42400 Financial Management System. Expand and refine the financial management system implemented during Phase I. Update the FMS data and make available via the MIS within 5-10 days from the close of TRA's monthly accounting period.

42500A Earned Value Management System. Augment the earned value management system developed and validated in Phase I with IPD Toolkit software to include the integration and use of wInsight, Risk+, C/S Glue, X12 and Recalc. Provide sufficient copies of this software for both Contractor and Government personnel (approximately 15 Government copies and 15 Contractor copies) in Macintosh or PC format as required by the user. Provide training for a cadre of Government and Contractor personnel in its use. Update the EVMS and IPD Toolkit data and make it available via the MIS within 5 to 10 days from the close of TRA's monthly accounting.

42600 Risk Management. Track, evaluate and manage risk issues and mitigation efforts. Present proposed risk management and mitigation measures at bi-monthly Risk Review Boards for implementation. Track and report progress on risk mitigation via the MIS.

42700 Technical Performance Measures (TPMs). Track and refine TPMs and report monthly via the MIS with corrective actions and recovery plans as necessary. TPM progress will be correlated to the system maturity plan and reported at key events.

IF 40000 SYSTEMS ENGINEERING/ PROGRAM MANAGEMENT
PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
42000 PROGRAM MANAGEMENT																	
See Process IMPs																	

IPT 50000 SYSTEM TEST

PHASE II EVENTS

50000 System Test. Plan, conduct, support and document system level ground and flight tests as required by the System Specification verification matrix and the Master Test Plan. Monitor and witness all segment level acceptance tests, including review of acceptance test procedures. Testing at the component, subsystem, element and segment levels are included in the respective segment sections of this TDD.

51000 Ground Tests. Complete system level ground tests prior to commencement of flight tests. System level ground tests consist of engineering design verification tests conducted at either the manufacturing facility or the flight test site.

51100 Engineering Tests. Conduct engineering tests to verify system design. Prepare detailed test procedures for each test. Prepare a report documenting the results of each test, identifying anomalies, and recommending corrective action. Prepare follow up reports documenting results of any corrective action taken.

Accomplish system level command control and status connectivity tests between the Air Vehicle and Ground Segment Systems Integration Labs (SILs) using land lines to verify communication capability and valid data transfer.

Accomplish system level MCE/ICS data link tests with SIL to verify system connectivity and valid data transfer.

Conduct segment functional integration tests of each air vehicle with the LRE and MCE to verify satisfactory functionality and connectivity prior to flight test. Verify the following functions and connectivity:

a. End-to-end C^2, telemetry and mission tasking data transfer via UHF and Ku band satellite links, and the CDL link.
b. Direct and satellite relay voice communications on both VHF and UHF bands between the LRE, MCE, and local airspace management facility.
c. UAV C^2 and telemetry data transfer on the UHF local control data link (LCDL) with the LRE.
d. End-to-end imagery data transfer via Ku band satellite and CDL links.

Perform connectivity and product dissemination tests prior to payload flight test to verify satisfactory end-to-end image acquisition and delivery via Ku band satellite links and CDL link via the MCE to government exploitation system(s). Include image data delivery to government-provided JSIPS-N, CARS, and ETRAC.

Perform ground handling, steering and braking tests, under control of the LRE, to assess taxi characteristics, steering accuracy using differential GPS, shimmy damping, and stopping distances.

Conduct LRE/MCE/Tier III Minus air vehicle interoperability ground tests to verify functional compatibility and interface connectivity prior to flight tests.

ARPA • DARO TIER II PLUS

IPT 50000 SYSTEM TEST

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
51100 ENGINEERING TESTS																	
1. System Integration Lab Test Requirements Completed			X														a. Connectivity Test Requirements Defined
2. Systems Integration Lab (SIL) Connectivity Tests Complete				X													a. Connectivity Test Procedure Approved b. UAV SIL and G/S SILs Prepared for Test c. Landline Lease Coordinated d. Landline Coast-to-Coast Tests Completed e. Test Report Completed
3. UAV-1 Functional Integration Test Requirements Complete				X													a. System Test Requirements Defined b. Test Procedure Approved c. Satellite Support Coordinated
4. UAV-1 Segment Functional Integration Test Complete					X												a. LCDL, UHF SATCOM and Voice Comm Link Tests Completed b. Test Reports Completed
5. Ground Handling, Steering and Braking Test Preparation Complete					X												a. Test Procedure Prepared and Approved b. Edwards AFB/NASA DFRC Coordination Complete
6. Ready for First Airworthiness Test						X											a. Taxi, Steering and Braking Tests Complete b. Operational Control and Safety Demonstrated c. Satisfactory Shimmy Damping Demonstrated
7. UAV-2 Segment Functional Integration Tests Complete							X										a. MCE/ICS Interface Tests Completed in SIL b. Test Procedure Updated with Payload and Imagery Test Requirements c. LCDL, UHF SATCOM, Voice Comm Link Tests Completed d. Ku-Band and CDL Imagery Link Tests Completed
8. Connectivity and Product Dissemination Static Tests Complete							X										a. Test Requirements Defined b. Test Procedure Prepared, Coordinated and Approved c. Exploitation System Specific Interfaces (SSIs) Installed and Tested d. MCE-to Exploitation System Comm Link Tested e. End-to-End (UAV-to-Exploitation System) Connectivity Demonstrated
9. LRE/MCE/Tier III Minus Interoperability Test Completed										X							a. Test Requirements Defined b. Test Plan Prepared and Coordinated with Tier III Minus Team c. End-to-End (Tier III Minus UAV-to-Exploitation System) Connectivity Demonstrated
10. UAV-1 ISS/ICS Retrofit Tests Complete										X							a. Remainder of ICS installed in UAV-1 b. ISS Installed in UAV-1 c. Functional Integration Tests Completed in Order to Support the Dual Test Flight

51200 Test Support. Provide management, engineering, manufacturing and logistics support to system level engineering ground tests.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
51200 TEST SUPPORT																	
1. System Level Ground Test Support Requirements Updated				X													a. Segment IPT Support to System Engineering Ground Tests Reviewed
2. Management, Coordination, and Support of Engineering Ground Tests Completed										X							a. All System Level Ground Tests Coordinated, Conducted, and Supported by the System Test IPT and Segment IPTs b. All System Level Ground Tests Documented in Reports c. System Level Test Reports Released

52000 Flight Tests and Field Demonstrations Conduct airworthiness and payload flight tests at Edwards AFB/NASA DFRC, California, in accordance with the Phase II IMP, the Master Test Plan, the General Flight Test Plan, and individual Detailed Flight Test Plans. Prepare and submit the necessary documentation for test range clearance and support, and participate in all test range reviews or boards prerequisite to actual flight testing. Acquire flight test data by UAV instrumentation and range resources to assess air vehicle system performance. Acquire imagery data by the MCE and disseminate to government exploitation systems, to assess payload subsystem performance.

52100 Range Integration Tests. Conduct range integration and compatibility tests at Edwards AFB/NASA DFRC to ensure compatibility and readiness of the UAV and the Edwards AFB/NASA DFRC test resources to preclude loss or degradation of data acquired in actual flight.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52100 RANGE INTEGRATION TESTS																	
1. Range Integration Test Requirements Updated				X													a. Range Integration Test Requirements Defined b. Potential Test Site Interference Sources Identified
2. First Flight Test Preparations Complete					X												a. Test Plan and Procedures Approved b. Site Interference Sources Addressed and Risks Mitigated c. Telemetry Data Plan Coordinated with Edwards AFB/NASA DFRC d. Range Integration Test Completed and Compatibility Demonstrated

52200 System Acceptance Tests. Conduct a combined systems acceptance test employing the air vehicle, LRE, MCE, and support equipment prior to each planned free flight to ensure total Tier II Plus system mission readiness. Perform installed engine runs, mission plan data transfer, C^2/telemetry and comm link checkout and UAV preflight checkout. Perform connectivity tests to exploitation systems for planned payload flights.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52200 SYSTEM ACCEPTANCE TESTS																	
1. Preflight Acceptance Test Requirements Complete					X												a. Test Requirements Defined b. System Acceptance Test Procedure Prepared and Reviewed
2. Preflight Acceptance Test Completed for A/W Flights (Repeat for each Flight)						X											a. End-to-End (UAV-1) System Acceptance Test Accomplished b. Test Requirements/Procedures Refined, as required
3. Preflight Acceptance Test Completed for Payload Flights (Repeat for each Flight)								X									a. End-to-End (UAV-2) System Acceptance Test Accomplished b. End-to-End (UAV-1) System Acceptance Test Accomplished (Following UAV-1 Retrofit) c. Test Requirements/Procedures Refined, as required

52300 Flight Tests. Develop detailed procedures for each flight, specifying success criteria, mission profile, step-by-step activity, test players and roles, normal and emergency procedures, GO/NO GO criteria, time lines, support, and instrumentation/comm/data analysis plans. Prepare a "quick look" report for each test flight. Conduct up to six (6) airworthiness test flights using UAV-1 without payload sensors for evaluation of air vehicle performance and subsystem functionality. Acquire data to update or substantiate simulations and math models, and to reveal any system anomalies. Demonstrate operational safety and control, leading to a successful payload flight test readiness review (FTRR-2).

Conduct up to ten (10) payload flight tests for demonstration of end-to-end Tier II Plus system performance including capability to collect, process and disseminate encrypted imagery data to government exploitation systems. Evaluate UAV flight performance, C^2, status, imagery, and voice comm links. Disseminate imagery data from the MCE to JSIPS-N, CARS, and ETRAC exploitation systems in NITFS 2.0 format. Prepare test procedures and quick look reports for each mission. Install SAR and EO/IR components in UAV-1 following airworthiness flights to support subsequent payload flight tests.

Conduct LRE/MCE/Tier III Minus interoperability flight test(s) in conjunction with an associate contractor.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
52300 FLIGHT TESTS																	
1. Airworthiness Flight Tests Completed										X							a. Detailed Flight Test Procedures for each Flight Prepared and Coordinated b. Up to Six (6) Airworthiness Test Flights Conducted c. Flight Test Data Acquired and Analyzed d. Operational Control and Safety Demonstrated e. Acquire Data to Support PRR-3 System Maturity Assessment and DRR f. Assess the Extent of Compliance with Flight Test Objectives and System Specification Requirements g. Quick Look Reports Prepared and Submitted
2. Payload Flight Tests Completed										X							a. Detailed Flight Test Procedures for Each Flight Prepared and Coordinated b. Up to Ten (10) Payload Test Flights Conducted c. UAV-1 Retrofitted with Payload Sensor and Imagery Comm Components d. Off-Range Reconnaissance Missions and Survivability Suite Tests Conducted e. Flight Test Data Acquired and Analyzed f. Acquire Data to Support PRR-3 System Maturity Assessment and DRR g. Assess the Extent of Compliance with Flight Test Objectives and System Specification Requirements h. Quick Look Reports Prepared and Submitted
3. LRE/MCE/Tier III Minus Interoperability Flight Test Completed										X							a. Detailed Flight Test Procedures for Each Flight Prepared and Coordinated b. Up to TBD Test Flights Conducted c. System Functional and Performance Data Acquired and Analyzed d. Quick Look Reports Prepared and Submitted e. Acquire Data to Support DRR Decision with Respect to the LRE/MCE

52400 Field Demonstration Operation and Maintenance Support. There are no specific TDD tasks for this WO in Phase II.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52400 FIELD DEMONSTRATION OPERATION AND MAINTENANCE SUPPORT No Phase II Effort																	

IPT 50000 SYSTEM TEST

PHASE II EVENTS

52500 Flight Clearances. Prepare and submit all necessary range documentation for flight clearance to the Edwards AFB/NASA DFRC and adjoining jurisdiction restricted airspaces and military operating areas (MOAs). Prepare a Program Introduction (PI) document and an Operations Requirements (OR) document based on the Range Commanders Council (RCC) Universal Documentation System (UDS). Prepare a Range Safety Analysis (RSA), a Flight Termination System Report (FTSR), and an environmental assessment report in collaboration with Edwards AFB/NASA DFRC. Prepare for and attend all range coordination meetings including Technical Review Boards (TRB) and Safety Review Boards (SRB). Address results of earlier ground testing in support of obtaining flight clearances. Coordinate with Federal Aviation Administration (FAA) management for transit outside Edwards airspace complex via Letters of Agreement, filing of flight plans, and Notices to Airmen (NOTAMS). Assist the government as necessary and when requested, in coordination with FAA, on use of air vehicles in National Airspace System (NAS).

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	OR	FOR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52500 FLIGHT CLEARANCES																	
1. Range Documentation Submitted		X															a. RCC/UDS Program Introduction Document (PID) Submitted
2. Range Documentation Updated				X													a. RCC/UDS Operations Requirements Document (ORD) Submitted b. Complex Control Board Briefed and Range Complex Use Agreed Upon
3. Safety Documentation Submitted					X												a. Range Safety Analysis (RSA) Submitted b. Flight Termination System Report (FTSR) Submitted c. Environmental Assessment Statement Submitted d. Pre-mishap Plan Prepared and Submitted e. Accident Investigation Procedure Prepared and Submitted
4. Technical and Safety Approval					X												a. Range Technical Review Board (TRB) Supported and Approval Received b. Range Safety Review Board (SRB) Supported and Approval Received c. FTRR-1 Safety Review Board Rehearsal Complete
5. FAA Approval							X										a. FAA Letters of Agreement for Off-Range Flight Coordinated

52600 Flight Test Instrumentation/Beacons. Install flight test instrumentation in both Phase II air vehicles. The instrumentation will be tested, calibrated, operated and maintained by the TRA Instrumentation group in support of the System Test IPT. The instrumentation will acquire in-flight subsystem and system functional, performance, and environmental data during airworthiness and payload test flights. The instrumentation system will be compatible with existing Edwards AFB/NASA DFRC telemetry receiving and processing equipment. Install and integrate an airborne television camera and real time, independent telemetry downlink in both UAVs to provide situational awareness to ground controllers and the Range Safety Officer. Install flight safety and critical systems instrumentation in both flight test UAVs. Install G-Band tracking beacons and antennas in both flight test UAVs

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52600 FLIGHT TEST INSTRUMENTATION																	
1. Instrumentation Baseline Configuration Updated	X																a. Phase I Candidate Instrumentation Requirements Updated b. Instrumentation System Predesign Complete c. Embedded Instrumentation Items Identified d. Initial Material List Prepared
2. Instrumentation Design Complete		X															a. All System Components on Order b. Instrumentation Design Documents Complete c. Preliminary Range Telemetry Data Plan Prepared/Coordinated with Edwards AFB/NASA DFRC
3. UAV-1 Test Preparations Complete				X													a. Flight Test Instrumentation Installed in UAV-1 and Checked Out b. MTDAS Data Acquisition System Programmed c. Instrumentation System Calibrated d. Instrumentation System Integrity Verified in Air Vehicle Checks
4. UAV-2 Test Preparations Complete							X										a. Flight Test Instrumentation Installed in UAV-2 and Checked Out b. MTDAS Data Acquisition System Programmed c. Instrumentation System Calibrated d. Instrumentation System Integrity Verified in Air Vehicle Checks

IPT 50000 SYSTEM TEST

PHASE II EVENTS

52700 Flight Test and Field Demonstration Factory Support. Provide management, engineering, manufacturing, and logistics support to Phase II flight test activities. Coordinate and monitor acceptance tests at segment level.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52700 FLIGHT TEST AND FIELD DEMONSTRATION FACTORY SUPPORT																	
1. UAV-1 Acceptance Tests Completed				X													a. Air Vehicle Team ATP Reviewed and Accepted b. Air Vehicle Acceptance Test Witnessed and Approved c. Air Vehicle Accepted by System Test IPT
2. LRE-1 Acceptance Tests Completed				X													a. Ground Support Segment Team LRE-1 ATP Reviewed and Accepted b. LRE-1 Acceptance Test Witnessed and Approved c. LRE-1 Accepted by System Test IPT
3. UAV-2 Acceptance Tests Completed							X										a. Air Vehicle Team ATP Reviewed b. Air Vehicle Acceptance Test Witnessed and Approved c. Air Vehicle Accepted by System Test IPT
4. MCE-1 Acceptance Tests Completed							X										a. Ground Support Segment Team MCE-1 ATP Reviewed b. MCE-1 Acceptance Test Witnessed and Approved c. MCE-1 Accepted by System Test IPT
5. Factory Support Completed										X							a. Technical Interface between Flight Test Team and Factory Provided b. Technical, Logistic and Administrative Support Provided

52800 Readiness Reviews. Prepare for and conduct two (2) Flight Test Readiness Reviews (FTRRs) at Edwards AFB/NASA DFRC, chaired by the System Test IPT. The first FTRR is in preparation for the airworthiness flights, with the second FTRR in preparation for the payload flights.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	ORR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
52800 READINESS REVIEWS																	
1. FTRR-1 Completed						X											a. Segment IPT Analyses, Math Models and Simulations Updated b. Flight Critical UAV-1 Ground Testing Complete c. 6DOF Flight Simulation Complete with First Flight Mission Plan d. Emergency Procedures (Man-in-Loop) Available e. Degraded Modes Analysis Complete f. Fault Analysis Complete g. Flight Clearance Documentation Completed h. Approvals for Taxi and Flight Granted
2. FTRR-2 Completed								X									a. Mission Critical UAV-2 Ground Testing Complete b. 6DOF Flight Simulation Updated c. Emergency Procedures, Degraded Modes and Fault Documentation Updated d. Flight Clearance Documentation Updated e. Approvals for Taxi and Flight Granted

IPT 50000 SYSTEM TEST

PHASE II EVENTS

53000 Frequency Allocation Data. Prepare and submit spectrum certification data (DD Form 1494) for all radio frequency devices used in the Tier II Plus system to ARPA's designated Frequency Management Agency (FMA) for CONUS and future host nation coordination. DD 1494s will be initially submitted for Stage 3 (developmental), with a subsequent Stage 4 (operational) submittal prior to the completion of Phase II.

	PH II EVENTS										PH III EVENTS						
SIGNIFICANT ACCOMPLISHMENTS	JDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
53000 FREQUENCY ALLOCATION DATA																	
1. All Frequency Data Available			X														a. Emitter/Receiver Frequency and Antenna Characteristics Data Requested from Suppliers by Cognizant IPTs
2. Stage 3 DD 1494s Approved				X													a. Emitter/Receiver Frequency and Antenna Characteristics Provided b. Frequency Management Agency (FMA) Identified by ARPA c. Stage 3 (Developmental) DD 1494s Completed and Submitted
3. Stage 4 DD 1494s Approved									X								a. Emitter/Receiver Frequency and Antenna Characteristics Updated b. Determine Tier III Minus Frequency Data Operational Integration Issues c. Stage 4 (Operational) DD 1494s Completed and Submitted

54000 System Test and Demonstration Plans. Prepare a Phase II general flight test plan, to be followed by individual, detailed flight test plans for all flights. Base the general flight test plan on the Master Test Plan prepared in Phase I. Update the portion of the Master Test Plan applicable to Phase III, with government support, during Phase II.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
54000 SYSTEM TEST AND DEMONSTRATION PLANS																	
1. Phase II Test Program Defined	X																a. Test Requirements Updated by IPTs b. Master Test Plan Updated
2. General Flight Test Plan Available		X															a. Flight Test Requirements Updated by IPTs b. General Flight Test Plan Drafted
3. Detailed Test Planning Complete				X													a. Detailed Flight Test Plans Drafted
4. Ready for Airworthiness Flight Tests					X												a. General Flight Test Plan Updated and Approved b. Detailed Flight Test Plan for First Airworthiness Flight Released by System Test IPT
5. Ready for Payload Flight Tests							X										a. Detailed Flight Test Plan for First Payload Flight Released by System Test IPT b. Master Test Plan Updated to Incorporate Tier III Minus Interoperability Testing
6. Ready for Phase III Go-Ahead									X								a. Master Test Plan Updated for Phase III

55000 System Test and Demonstration Reports. Prepare a final Phase II test report covering system level ground and flight tests. Submit the final test report following completion of test flights.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
55000 SYSTEM TEST AND DEMONSTRATION REPORTS																	
1. Final Test Report Completed										X							a. All Systems Level Ground and Flight Test Data Reduced and Analyzed b. Anomalies Identified and Corrective Actions Recommended c. System Maturity Assessed Based on TPMs d. System Level Final Test Report Prepared and Released

IPT 50000 SYSTEM TEST

PHASE II EVENTS

56000 Systems Integration Lab (SIL). Design, procure, fabricate and maintain the Systems Integration Lab (SIL) at TRA. The SIL is to be used by the 11000, 15000, 20000, 30000, 52600 and 60000 IPTs in performing their various integration activities. Facilitate IPT 30000 acceptance test of UAV electrical/electronic PSE. Perform 6 DOF flight simulations, system troubleshooting, and flight test support activities.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
56000 SYSTEM INTEGRATION LAB (SIL)																	
1. SIL Configurations Defined	X																a. Initial SIL Configuration Defined b. Preliminary Air Vehicle Hot Bench Design Complete c. Purchase Requisitions for Materials Submitted
2. SIL Hot Bench Functionality Demonstrated		X															a. Critical UAV Hot Bench EDUs and Emulators Delivered b. Electrical Interfaces Complete c. Power-up Checks Complete
3. SIL Implementation Finalized			X														a. Hot Bench Fully Operational with EDU and Emulator LRUs b. Updates to SIL Incorporated
4. First Flight Preparation Supported					X												a. SIL Avionics Hardware Interfaced and Operating with 6DOF Simulation Computer b. PSE Electrical Hardware/Software Acceptance Test Facilitated c. Connectivity between UAV SIL and LRE (or G/S SIL) Demonstrated
5. First Payload Flight Preparations Supported							X										a. ISS Interface Tests with SIL Completed b. ICS Interface Tests with SIL Completed c. MCE/ICS Interface Tests Completed
6. UAV-1 Retrofit Payload Checks Completed										X							a. ISS Interface Tests with SIL Completed b. ICS Interface Tests with SIL Completed
7. Flight Test Support Completed										X							a. SILs Maintained and Updated b. Flight Test Troubleshooting and Fault Isolation Supported c. IMMC Flight Software Change and Validation and 6DOF Flight Simulations Supported

60000 Payload Segment. Perform analyses, complete the design, fabricate, assemble, test, and deliver the payload systems which include the SAR and EO/IR sensors (including 2 INSs), Ku-Band SATCOM, CDL LOS, UHF SATCOM/LOS, digital recorder, threat warning receiver, and decoy/jammer. Provide Program Management/System Engineering support for the payload. Develop payload ICDs with the Air Vehicle Segment, Ground Segment, Support Segment, and System Test to arrive at an integrated hardware/software approach. Perform the design/manufacturing testing. Develop software documentation and software for the payload systems. Integrate the payload hardware and software and perform tests. Generate requirements, develop, fabricate, assemble, test, and deliver payload emulators for use in the TRA SIL. Provide engineering support to develop test plans and procedures for the SIL, air vehicle integration and test, and flight tests. Deliver the completed payload system for checkout in the TRA SIL and installation in the air vehicle. Perform trade studies on growth options for the payload.

61000 Payload Analysis/Integration/Test.

61100 Payload Program Management/System Engineering. Provide Program Management/System Engineering support for the payload to include: tracking UFP and Phase II cost, tracking schedule, performing and tracking technical progress, performing intra-payload systems engineering, and tracking TPMs.

61200 Payload Analysis. Review the CONOPS and recommend changes. Analyze the payload design to assess military utility and identify areas of maximum payback. Analyze and characterize the individual payload systems to determine their performance, including reliability, in the expected environments. Interface with the Air Vehicle Segment, Ground Segment, and Support Segment IPTs to analyze power, weight, thermal, interfaces (including data format and an Interface Control Document), test equipment, spares and related aspects of the payload segment. Analyze the interaction of payload systems, including antenna coupling, to determine interoperability and compatibility. Perform periodic assessments in risk reduction and risk mitigation. Develop and refine detailed design and manufacturing schedules. Perform producibility analysis.

61300 Payload Integration Provide engineering support to plan, generate procedures, integrate, and conduct tests on the payload sensors, data link subsystems, and the survivability system in the TRA SIL. Interface with the Air Vehicle Segment, Ground Segment, Support Segment, and System Test IPTs to develop plans, test requirements, and procedures for SIL integration and tests, air vehicle integration and tests, factory tests, and flight tests.

61400 Payload Tests. Provide engineering support to plan, generate procedures, and assist UAV flight testing for the Payload. Provide engineering support for data analysis, fault remediation, and retest as required. Develop and test a fuselage section model to verify the antenna coupling analysis. Support the payload systems checkout tests at TRA. Provide engineering support to plan, generate procedures and conduct tests on the payload systems including the antennas and radomes at the manufacturer.

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I. F 60000 PAYLOAD SEGMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
61000 PAYLOAD ANALYSIS/INTEGRATION/TEST																	
1. Payload Interfaces Defined	X																a. Payload Airborne ICD Complete
2. Payload Analysis Completed		X															a. Payload Segment Inputs to Military Utility Analyses Completed b. CONOPS Review Inputs Completed c. Payload Segment Performance Analyses and Characterization Completed d. Payload, A/V, Ground and Support Segment Data Format and End-to-End Analyses Completed e. Payload Interoperability and Compatibility Analyses Completed
3. Payload Integration Completed				X													a. Communications System Integration at TRA Completed b. Self-Defense System Integration at TRA Completed c. ISS Integration at TRA Completed d. SIL Requirements, Plans, and Procedures for Payload Completed e. Air Vehicle Requirements, Plans, and Procedures for Payload Completed f. Factory Requirements, Plans, and Procedures for Payload Completed g. Flight Test Requirements, Plans, and Procedures for Payload Completed
4. Payload Tests Completed							X										a. Fuselage Section Model Development Complete b. Antenna Coupling Tests Complete c. ICS H/W and S/W Integration Test Support Complete d. ISS H/W and S/W Integration Test Support Complete e. Survivability System H/W and S/W Integration Test Support Complete

62000 Integrated Sensors (SAR & EO/IR) System (ISS). Develop facilities, source control drawings, specifications, interface control documents, engineering documents, and test documents for the ISS hardware and software, and SAR radome. Design, develop, fabricate, assemble, and test an integrated EO/IR and SAR sensor system. Perform development flight tests of the SAR sensor to verify test objectives.

62100 ISS Engineering and Management. Provide program direction for implementation of the following: IMP, IMS, EVMS, Risk, Reliability, CM, DM, TPMs and DTC. Complete the definition of the integrated sensor system architecture.

62200 ISS Integration. Integrate and test the ISS hardware and software. Develop engineering and test documents for the ISS emulator. Develop, integrate, and test the ISS emulator. Review requirements and support tests on the SAR radome.

62300 ISS Sensor Electronics Unit (ISEU). Procure material. Fabricate the chassis and other mechanical parts. Assemble circuit cards, backplane, power supply, and harness subassemblies. Integrate subassemblies in the chassis. Conduct tests.

62400 EO/IR Receiver Unit (ERU). Procure material. Fabricate the turret structure and other mechanical parts. Assemble and align mirrors, optical components, visible and infrared detectors, cryogenic components, and the IMU on the optical bench. Assemble turret components including inductosyns and gimbals. Fabricate harness subassemblies. Integrate subassemblies including the optical bench and the INS onto the turret. Align the INS and the optical bench and conduct tests.

62500 SAR Antenna. Evaluate and upgrade the HISAR antenna gimbal. Procure material, fabricate components, assemble, integrate the gimbal and array subassemblies. Conduct servo testing of the gimbal, measure antenna patterns, and conduct tests.

62600 SAR Transmitter. Procure the HISAR transmitter and conduct tests.

62700 SAR Receiver. Procure material. Fabricate the chassis and other mechanical parts. Assemble RF circuit boards, power supply, and harness subassemblies. Integrate subassemblies into the chassis and conduct tests.

62800 SAR Exciter. Procure material. Fabricate the chassis and other mechanical parts. Assemble RF circuit boards, power supply, and harness subassemblies. Integrate the subassemblies into the chassis and conduct tests.

62900 ISS Control Processor (ICP). Procure material, fabricate the chassis and other mechanical parts. Assemble circuit cards, backplane, power supply, and harness subassemblies. Integrate subassemblies in the chassis and conduct tests.

62A00 ISS Signal Processor (ISP). Procure material. Fabricate the chassis and other mechanical parts. Assemble circuit cards, backplane, power supply, and harness subassemblies. Integrate subassemblies in the chassis and conduct tests.

62B00 Inertial Navigation System. TRA will provide engineering support to procure the OTS INSs. Deliver the INSs to the ISS vendor for integration.

62C00 SAR Radome. Provide engineering support. Procure material. Fabricate and conduct tests including phase and attenuation measurements.

62D00 ISS Software. Generate ISS software requirements documents including internal and external interface documents. Design, code, rehost, modify, update and test the ISEU software, the ICP software, and the ISP software. Conduct readiness reviews for the software. Generate an integration plan and integrate the software and hardware.

IPT 60000 PAYLOAD SEGMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
62000 INTEGRATED SENSOR SYSTEM (ISS)																	
1. Design Requirements Defined	X																a. ISS Architecture Defined b. Sensor PDRs Complete c. Specifications, ICD, DRBs, SDP, Technical Descriptions Complete d. Emulator Specification Complete e. Radome Specification Complete f. Long Lead Parts Procured
2. Detailed ISS Design Completed		X															a. Detailed Software Requirements Complete b. Hardware Design Complete c. Test Plans Complete d. All Parts Ordered e. Test Equipment Defined and Ordered
3. ISS Emulator Delivered				X													a. Preliminary ISS Emulator Delivered b. Emulator Software Complete
4. Ready for ISS Integration				X													a. All LRUs Built b. Software Code Review Complete c. EO Subsystem Integrated, Built and Checked Out d. SAR Subsystem I & T Equipment Built and Checked Out e. ISS I & T Equipment Built and Checked Out f. SAR Radome RF Tests Complete g. SAR Radome Delivered to TRA
5. First ISS Integrated					X												a. Electrical Interfaces Check Complete b. Software Checkout Complete c. SAR Integration Complete d. EO/IR Integration Complete e. ISS Integration Complete f. Environmental Tests Complete
6. First ISS Delivered					X												a. Software Updated b. Acceptance Test Passed
7. SAR Flight Test Complete							X										a. Radar Installed in Test Bed Aircraft b. Mode Software Verified c. Software Update Delivered d. Test Objectives Met
8. Second ISS Delivered									X								a. Second Set LRUs Built b. Second Set LRUs Integrated c. Software Updated d. Acceptance Test Passed

63000 Intentionally Left Blank.

64000 Survivability Systems. Provide program direction for implementation of the following: IMP, WOS, TDD, IMS, EVMS, Risk, Reliability, CM, DM, TPMs and DTC. Complete the definition of the survivability system architecture. Develop facilities, source control drawings, specifications, interface control documents, engineering documents, and test documents for the SS hardware and software, and antennas. Design, develop, fabricate, assemble, and test the survivability system.

64100 Survivability Systems Integration. Develop, integrate, and test the survivability system which is comprised of the threat warning receiver and the threat deception system. Develop, integrate and test the survivability system emulator. Complete the definition of the survivability systems architecture. Develop source control drawings, specifications, interface control documents, engineering documents, and test documents for the threat warning receiver and the threat deception system. Conduct risk reduction tests to verify the design approach of selected components. Integrate the threat warning receiver and threat deception system hardware and software.

64200 Threat Warning Receiver. Procure an OTS threat warning receiver and conduct tests.

64300 Threat Deception System. The threat deception system consists of an on-board jammer and towed decoy. Procure an OTS decoy and conduct tests. Finalize and incorporate the on-board jammer modifications and conduct tests.

64400 Survivability System Antennas. Provide engineering support, procure antennas, and conduct tests.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
64000 SURVIVABILITY SYSTEMS (SS)																	
1. SS Design Requirements Updated	X																a. SS Architecture Definition Complete b. SS Specifications and ICD Complete c. SS Emulator Architecture Definition Complete d. SS Emulator Specification Complete e. SS Antennas Specifications Complete
2. Hardware Design Complete		X															a. SS Engineering Documents Complete b. SS Component Procurement Complete
3. SS Emulator Delivered			X														a. SS Emulator Integration Complete b. SS Emulator Delivered to TRA
4. Flight SS Delivered				X													a. TWR Testing Complete b. Threat Deception System Testing Complete c. Antennas Testing Complete d. SS Integration and Testing Complete

II+ 60000 PAYLOAD SEGMENT

PHASE II EVENTS

65000 Airborne Data Recorder. Provide engineering support to procure and test the airborne data recorder which includes the record electronics module, tape transport module, and reproduce electronics modules. Provide engineering support for ICS/ADR integration.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
65000 AIRBORNE DATA RECORDER																	
1. Flight Data Recorders Received			X														a. Acceptance Tests Complete b. Integration Support Complete

66000 Ku-Band SATCOM. Provide program direction for the implementation of the Ku-Band SATCOM subsystem to include the IMP, IMS, CM, DM, risk management, reliability analysis, technical performance measures, and design to cost.

66100 Ku-Band SATCOM Integration. Complete the subsystem architecture definition. Develop source control drawings, specifications, interface control documents, engineering documents, and test documents for the Ku-band SATCOM subsystem hardware and software, and radome. Develop, integrate, and test the Ku-band SATCOM subsystem. Conduct risk reduction tests on selected elements to verify the design approach of selected components. Integrate the Ku-band SATCOM subsystem hardware and software and conduct tests. Develop engineering and test documents for the Ku-band SATCOM emulator. Develop, integrate, and test the Ku-band SATCOM emulator hardware. Integrate the Ku-band SATCOM emulator hardware and software. Refine requirements, develop tests on the Ku-band SATCOM radome.

66200 48-Inch Antenna and Gimbal Assembly. Procure material. Fabricate the antenna structure. Assemble, integrate, and boresight align subassemblies and conduct tests including antenna pattern measurements.

66300 High Voltage Power Supply. Procure material. Fabricate the chassis. Assemble high voltage components. Integrate subassemblies into the chassis and conduct tests.

66400 Power Amplifier. Procure material. Fabricate the chassis and other mechanical parts. Integrate subassemblies into the chassis and conduct tests.

66500 SATCOM RFA. Procure material. Fabricate the chassis and other mechanical parts. Integrate subassemblies into the chassis and conduct tests.

66600 Ku-Band SATCOM Radome. Procure material. Fabricate and conduct tests including phase and attenuation measurements.

IPT 60000 PAYLOAD SEGMENT

PHASE II EVENTS

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FOP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
66000 Ku-BAND SATCOM																	
1. Design Requirements Updated and Software Plans Complete	X																a. Final Requirements for Ku-Band SATCOM Emulator Complete b. Final Requirements for Ku-Band SATCOM Radome Complete c. ICS System Architecture Definition Complete d. Support Software Management Plan e. Generate Software Development Plan for the Communications Software
2. Ku-Band Design Complete, ICS Emulator Delivered, and Software Requirements Complete		X															a. Order Material; Complete Design; Assemble; Test; and Deliver the Ku-Band SATCOM Emulator b. Ku-Band SATCOM Design Documentation Completed. Material Orders Placed. Development and Risk Mitigation Activities Completed. c. Generate Software Requirements Documents including Interface Documents for the Communications Software
3. Ku-Band SATCOM Radome Delivered				X													a. Order Radomes. Fit Check the Radomes. Perform Acceptance Tests.
4. Configured Software Delivered to the ICS Integration Facility					X												a. Generate Software Design Documents; Code, Rehost, Modify and Test the Ku-Band SATCOM Software. b. Generate Software Design Documents; Code, Rehost, Modify and Test the ICS Control Software. c. Generate a Software Test Plan d. Ku-Band SATCOM Software Integration Complete e. ICS Control Software Integration Complete
5. First Flight Ku-Band SATCOM Delivered					X												a. 48-Inch Antenna and Gimbal Fabrication, Assembly, and Test Complete b. High Voltage Power Supply Fabrication, Assembly, and Test Complete c. Power Amplifier Fabrication, Assembly, and Test Complete d. Radio Frequency Amplifier Fabrication, Assembly, and Test Complete e. Radome Fabrication, Assembly, and Test Complete f. Integrate and Acceptance Test the Ku-Band SATCOM at the Vendor Complete
6. Second Flight Ku-Band SATCOM Delivered								X									a. 48-Inch Antenna and Gimbal Fabrication, Assembly, and Test Complete b. High Voltage Power Supply Fabrication, Assembly, and Test Complete c. Power Amplifier Fabrication, Assembly, and Test Complete d. Radio Frequency Amplifier Fabrication, Assembly, and Test Complete e. Radome Fabrication, Assembly, and Test Complete f. Integrate and Acceptance Test the Ku-Band SATCOM at the Vendor Complete

IPT 60000 PAYLOAD SEGMENT

PHASE II EVENTS

67000 Common Data Link (CDL) Line-of-Sight (LOS). Provide program direction for the implementation of the CDL LOS subsystem to include the IMP, IMS, CM, DM, risk management, reliability analysis, technical performance measures, and design to cost.

67100 CDL LOS Integration. Complete the subsystem architecture definition. Modify source control drawings, specifications, interface control documents, engineering documents, and test documents for the CDL LOS subsystem and radome. Develop, integrate, and test the CDL LOS element. Integrate the CDL LOS subsystem hardware and software, and conduct tests. Develop engineering and test documents for the CDL LOS emulator. Develop, integrate, and test the CDL LOS emulator hardware. Integrate the CDL LOS emulator hardware and software. Refine requirements, develop and conduct tests on the CDL LOS radome.

67200 2 Cell AMA. Provide engineering support. Procure material for all modules. Fabricate the chassis and other mechanical parts. Assemble circuit boards for the encryptor and multiplexer. Assemble the power supply and harness subassemblies. Integrate subassemblies into the chassis and conduct tests. Perform interface tests with the data recorder.

67300 CDL LOS RFA. Procure an OTS radio frequency amplifier. Deliver for integration into the SIL and air vehicle.

67400 9-Inch Antenna/Pedestal. Procure an OTS 9-inch antenna/pedestal. Deliver for integration into the SIL and air vehicle.

67500 CDL LOS Radome. Provide engineering support. Procure material. Fabricate and conduct tests including phase and attenuation measurements.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS: IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	PH III EVENTS: DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	ACCOMPLISHMENT CRITERIA
67000 LINE-OF-SIGHT (LOS) COMMON DATA LINK (CDL)																	
1. Design Requirements Updated	X																a. Final Requirements for the LOS CDL Emulator Complete b. Final Requirements for the LOS CDL Radome Complete c. ICS System Architecture Definition Complete
2. LOS CDL Design Complete and ICS Emulator Delivered		X															a. Order Material; Complete Design; Assemble; Test; and Deliver the LOS CDL Emulator b. LOS CDL Design Documentation Completed. Material Orders Placed. Development and Risk Mitigation Activities Completed
3. LOS CDL Radome Delivered				X													a Order Radomes. Fit Check the Radomes. Perform Acceptance Tests.
4. First LOS CDL Flight Unit Delivered					X												a. Two-Cell AMA Fabrication, Assembly and Test Complete b. CDL RFA Procurement and Test Complete c. 9-Inch Antenna/Pedestal Procurement and Test Complete d. Integration and Test of CDL LOS Assemblies Complete
5. Second LOS CDL Flight Unit Delivered								X									a. Two-Cell AMA Fabrication, Assembly and Test Complete b. CDL RFA Procurement and Test Complete c. 9-Inch Antenna/Pedestal Procurement and Test Complete d. Integration and Test of CDL LOS Assemblies Complete

II+ 60000 PAYLOAD SEGMENT

PHASE II EVENTS

68000 UHF SATCOM/LOS. Provide program direction for the implementation of the UHF SATCOM/LOS subsystem to include the IMP, IMS, CM, DM, risk management, reliability analysis, technical performance measures, and design to cost.

68100 UHF SATCOM/LOS Integration. Complete the subsystem architecture definition. Modify source control drawings, specifications, interface control documents, engineering documents, and test documents for the UHF SATCOM/LOS subsystem. Develop, integrate, and test the UHF SATCOM/LOS subsystem. Conduct risk reduction tests to verify the design approach of selected components. Integrate the UHF SATCOM/LOS subsystem hardware and software and conduct tests. Develop engineering and test documents for the UHF SATCOM/LOS emulator. Modify, assemble, integrate, and test the UHF SATCOM/LOS emulator hardware. Integrate the UHF SATCOM/LOS emulator hardware and software. Refine requirements, develop, integrate, and conduct tests on the UHF SATCOM/LOS radome.

68200 UHF SATCOM Antenna. Procure an OTS UHF SATCOM antenna. Deliver for integration into the SIL and air vehicle.

68300 UHF LOS Antenna. Procure an OTS UHF LOS Antenna. Deliver for integration into the SIL and air vehicle.

68400 UHF Rx/Tx. Procure an OTS ARC-210 receiver/transmitter. Deliver for integration into the SIL and air vehicle.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/W	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
68000 UHF SATCOM/LOS																	
1. Design Requirements Updated	X																a. Final Requirements for the UHF SATCOM Emulator Complete b. Final Requirements for the UHF SATCOM Antennas Complete c. ICS System Architecture Definition Complete
2. UHF Design Complete and ICS Emulator Delivered		X															a. Order Material; Complete Design; Assemble; Test; Deliver. b. UHF SATCOM Design Documentation Completed. Material Orders Placed. Development and Risk Mitigation Activities Completed
3. UHF SATCOM /LOS Antenna Delivered			X														a. Order Antennas. Perform Acceptance Tests.
4. First UHF SATCOM Flight Unit Delivered				X													a. UHF SATCOM/LOS Antenna Tests Complete b. UHF LOS Antenna Tests Complete c. UHF Receiver/Transmitter Tests Complete d. Integration and Test of UHF SATCOM/LOS Assemblies Complete
5. Second UHF SATCOM Flight Unit Delivered					X												a. UHF SATCOM Antenna Tests Complete b. UHF LOS Antenna Tests Complete c. UHF Receiver/Transmitter Tests Complete d. Integration and Test of UHF SATCOM/LOS Assemblies Complete

IPT 60000 PAYLOAD SEGMENT

PHASE II EVENTS

69000 Growth Payloads. Evaluate the military utility of ESM/SIGINT, airborne relay, and upgrades to existing payload capabilities. Analyze the options, generate simulations, perform trade studies, and determine the cost/performance benefits. Interface with the Air Vehicle Segment, Ground Segment, Support Segment, and System Test IPTs to define interfaces and technical impact data. Evaluate the capabilities of several vendors. Generate a plan to incorporate the feasible options in the UAV including a retrofit plan for existing UAVs.

SIGNIFICANT ACCOMPLISHMENTS	PH II EVENTS										PH III EVENTS						ACCOMPLISHMENT CRITERIA
	IDR	DR	FDR	EIC	FTRR-1	1st FLT A/V	FTRR-2	1st FLT PLD	PRR-3	PH2 END	DRR	FDP START	A/V ACPT	GND ACPT	PRR-4	PH3 END	
69000 GROWTH PAYLOADS																	
1. Growth Payload Options Selected	X																a. Select Growth Options and Present at IDR
2. Growth Payload Options Evaluated		X															a. Evaluate Selected Growth Options and Determine Which have the Most Military Utility. Analyze, Simulate and Perform Trade Studies. b. Determine Cost/Performance Benefits c. Generate a Plan for Incorporating the Growth Options into the Payload, including Retrofitting Existing Payloads.

PRELIMINARY SYSTEM SPECIFICATION (PSS)

FOR THE

HIGH ALTITUDE ENDURANCE UAV (TIER II PLUS) SYSTEM

ATTACHMENT 2 — WORK OUTLINE AND PRELIMINARY SYSTEM SPECIFICATION

SECTION 2. PRELIMINARY SYSTEM SPECIFICATION

Report No. 367-0000-59R-003C
31 July 1995

AGREEMENT NO. MDA972-95-3-0013
Deliverable Data Item

Prepared for:

Advanced Research Projects Agency
HAE UAV Joint Program Office
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COMPETITION SENSITIVE – NOT RELEASABLE

ATTACHMENT 2

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1.0 SCOPE

1.1 Identification This Preliminary System Specification (PSS) establishes the functional, performance and verification requirements for the Tier II Plus High Altitude Endurance Unmanned Air Vehicle System, hereafter referred to as the Tier II Plus System. The requirements specified herein state the Teledyne Ryan Aeronautical (TRA) Team's engineering baseline definition for Phase I. These requirements have been subjected to a continuous trade-off study process which maximizes Military Utility of the Tier II Plus System within the $10M UFP (FY '94) design-to-price requirement, and the non-recurring cost and low to moderate development risk constraints. These requirements will be subjected to further refinement during Phase II.

1.2 System Overview. The Tier II Plus System will be comprised of the Air Vehicle Segment, Ground Segment, and Support Segment, as illustrated in the system block diagram of Figure 1. The primary mission of the Tier II Plus System is to provide overt, continuous, long endurance, all weather, day/night, wide area reconnaissance and surveillance capability. The Tier II Plus System will be designed with an open architecture and will contain provisions for growth through Pre-Planned Product Improvements (P^3I).

The Tier II Plus System reconnaissance and surveillance capability will be enabled through the use of a high altitude, long endurance unmanned air vehicle (UAV) with an inertial navigation system (INS), augmented with GPS, and coupled with integrated mission control and launch control elements that will facilitate autonomous and/or aided control of the air vehicle. The air vehicle will be capable of simultaneously carrying both a synthetic aperture radar (SAR) and Electro-Optical/Infrared (EO/IR) imaging sensors. These imaging sensors, when combined with airborne processing and line-of-sight (LOS) and satellite communication datalinks, will provide near-real time imagery to the Ground Segment, and to exploitation systems and small mobile terminals in support of tactical users. The Payload sensor subsystem and Ku-band communications subsystems will incorporate adaptive data rate management via C^2 links to compensate for dynamically varying link conditions such as rain attenuation and variations in satellite antenna spot beam tracking.

The Ground Segment will consist of a Launch and Recovery Element (LRE) and a Mission Control Element (MCE), each with embedded communications subsystems. The Ground Segment elements will provide command and control, mission planning, communications, image data processing, and imagery dissemination for both Tier II Plus and Tier III Minus Air Vehicles.

The Support Segment will provide the resources to prepare the Tier II Plus System for operation, accomplish post-operation refurbishment, maintain the system in an operation-assignment ready condition, pack-up for deployment, and set up at a deployed location.

1.2.1 Concept of Operations The Tier II Plus System will support combat plans and battlefield execution by fulfilling the critical missions of extended theater and tactical reconnaissance, providing continuous, all-weather, day/night, wide-area reconnaissance and surveillance in direct support of Joint Task Force Commanders. Extended reconnaissance is defined as the ability to supply responsive and sustained data day or night, regardless of weather, as the needs of the warfighter dictate. The Tier II Plus System will be able to perform the missions described in the following sections.

1.2.1.1 Reconnaissance/Surveillance Mission Applications. The Tier II Plus System will be capable of providing long on-station endurance reconnaissance and surveillance coverage in an area of interest with high quality synthetic aperture radar (SAR) and electro-optical/infrared (EO/IR) sensors. The Tier II Plus Ground and Support Segments will be capable of being readied for deployment within 24 hours, and set-up and capable of commencement of operations within 24 hours after arrival at the operations site.

1.2.1.2 Mission Profile Description. The Tier II Plus System will be capable of fulfilling the performance and operational requirements specified in section 3.1.1.1 when performing a standard mission profile. This mission profile consists of the following phases: takeoff, initial climb, climb to operational altitude at best cruise mach, cruise to mission performance area, loiter at the mission performance area, cruise back to recovery area at best cruise mach, descend, and land.

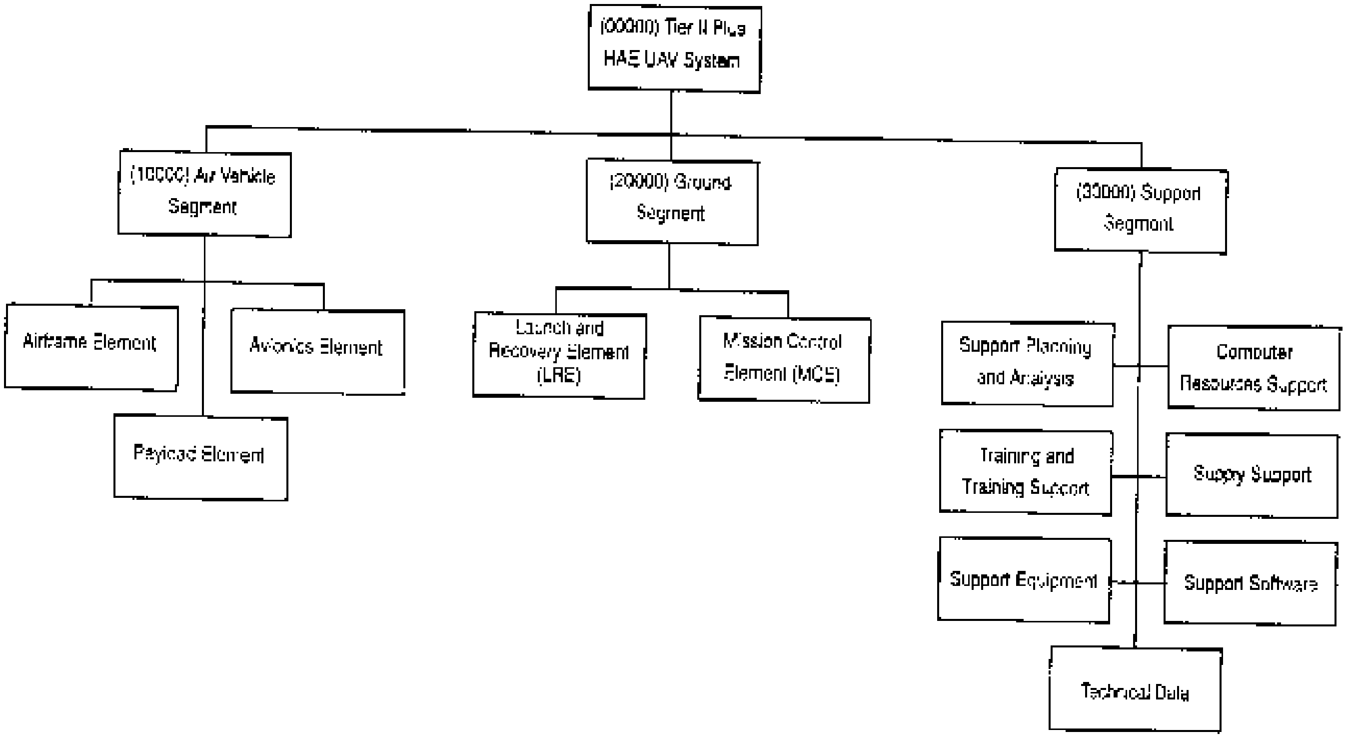

Figure 1. System Block Diagram

Figure 2 provides a system level functional timeline for the Tier II Plus System mission profile.

1.2.2 Interface Definition. The Tier II Plus System interfaces are summarized by the illustration shown in Figure 3, and are based on the Tier II Plus System definition described in the system overview, Section 1.2. The three segment blocks shown in the illustration represent the combination of Tier II Plus System Segments which collectively make up a complete Tier II Plus System capable of executing an assigned mission.

The interfaces are categorized as:

a. Intra-segment (within segments),

b. Inter-segment (between segments),

c. Extra-segment or external interfaces (between segments and agencies outside of the Tier II Plus System), and

d. Outer-external segment (no interface with Tier II Plus System).

This Preliminary System Specification addresses only the external (type "c") interfaces that occur between one or more system segments and external systems or agencies, which are described in section 3.0.2. The inter-segment (type "b") occur between segments and are described in the respective Tier II Plus System segment level specifications. Intra segment (type "a") are within the segment entirely and are covered by the segment or subordinate specifications. Type (d) are outside the scope of the system and segment specifications for Tier II Plus, and therefore are not discussed.

1.3 Document Organization. This PSS has been structured to serve as the formal guidance document for the Tier II Plus System via Phase II Agreement until the Phase II Final Design Review (FDR). As such, the PSS has been organized along the SCD format by following the four major sections that pertain to the Tier II Plus System, Air Vehicle Segment, Ground Segment, and Support Segment. In Section 3 the PSS numbering follows the SCD numbering with the second digit corresponding to the first digit of SCD. Additional derived capabilities and requirements that are pertinent to the Tier II Plus System and Segments are also included in the PSS. The contents of this document have been organized and formatted using MIL STD-490 as a guide.

After FDR the PSS will be realigned to contain only those capabilities and requirements that directly pertain to the Tier II Plus System; the Segment level specifications will then take on those segment level requirements originally contained in the PSS prior to FDR. The segment specifications will be structured and formatted to MIL-STD-490, as applicable.

In this manner, the requirements for each segment fall under the contract agreement from the start of Phase II. Since baseline control is initiated at FDR, restructuring the System and Segment specifications into a more conventional MIL-STD-490 format will benefit the configuration management process.

As a result of this document organization, and to unburden the PSS, only those requirements which will be Tier II Plus System level have verification requirements and methods stated herein. The segment level requirements verification will be documented in the appropriate individual segment specifications.

This System Specification will be subject to Government/contractor bilateral control from the start of Phase II. The Segment Specifications will be subject to Government/contractor bilateral control starting with the Final Design Review for software and hardware.

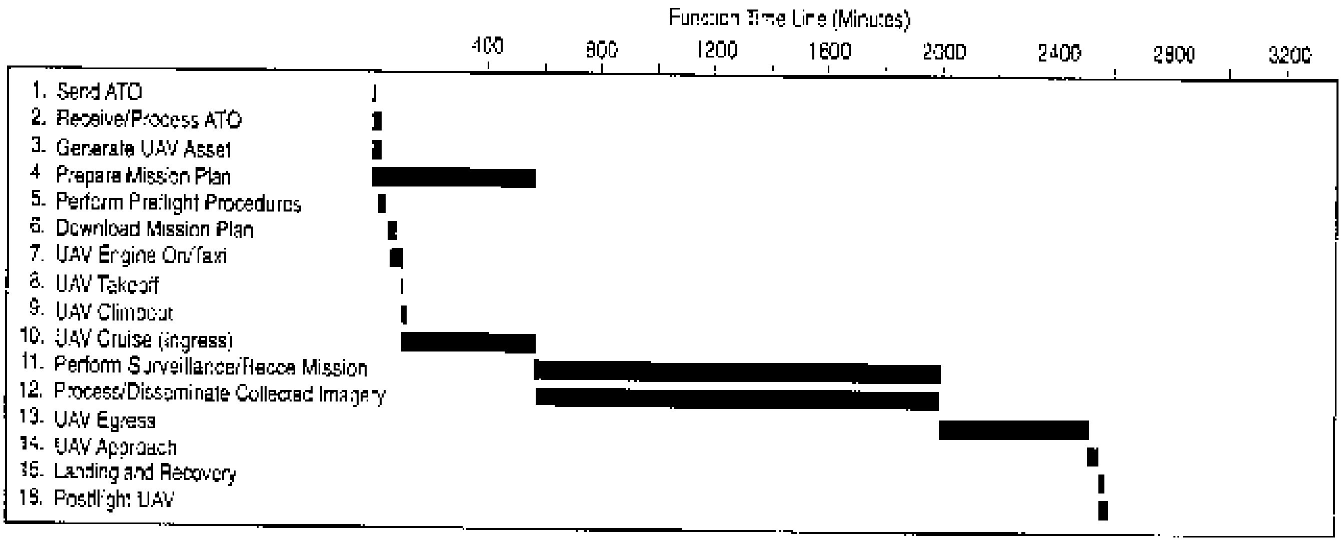

Figure 2. Tier II Plus System Nominal Mission Event Timeline

COMPETITION SENSITIVE - NOT RELEASABLE

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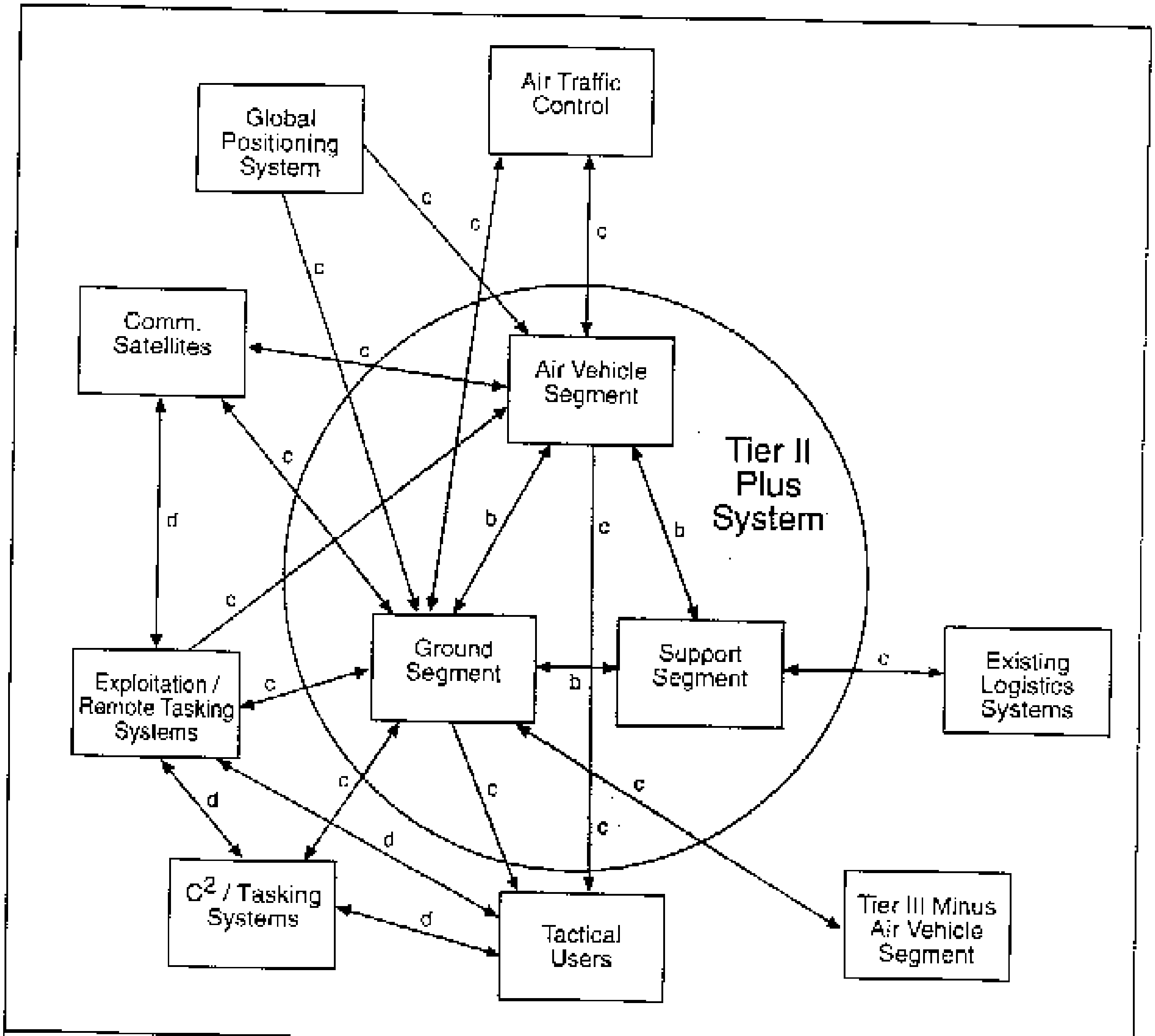

INTERFACE TYPE	DESCRIPTION	REFERENCE DOCUMENT FOR SPECIFICATION
a. Intra	Intra-Segment (Within Segment)	Segment Specification
b. Internal	Inter-Segment (Between Segments)	Segment Specification
c. External	**Extra-Segment (Outside Segment)**	**System Specification**
d. Outer-External	No Interface with Tier II Plus System	Not Applicable

Figure 3. Tier II Plus System Interface Definitions

2.0 APPLICABLE DOCUMENTS

Unless specifically stated in this specification, applicable documents when referenced by a subject paragraph only apply to that cited paragraph.

3.0 (00000) HAE UAV (TIER II PLUS) SYSTEM CHARACTERISTICS

The key Tier II Plus System performance characteristics baselined for the start of Phase II are listed in Table 1. These characteristics are valid for the conditions specified herein, and are applicable for the standard mission described in Section 1 and the scenarios contained in Appendix D of the HAE UAV Concept of Operations, Version 2.1.

Table 1. Key Tier II Plus Minimum System Performance Characteristics

CHARACTERISTICS	PHASE II BASELINE OBJECTIVE
Sensor to Shooter/User Timeline (1)	15 minutes
Air Vehicle Gross Takeoff Weight (GTOW)	24,000 pounds
Time on Station	24 hours (5)
Air Vehicle Maximum Start Loiter Altitude	60,000 feet
SAR Image Formation Processing	1,667 sq nmi/hr
Geolocation CEP (SAR and EO/IR)	20 meters
Spot Image EO/IR NIIRS	6.5 / 5.5
Exploitation Interfaces (Systems) (2)	3
Number of Simultaneous Dissemination Paths (3)	1
Dynamic Retasking	30 seconds
Operational Availability Ao	0.90 (MLDT = 9.5 hours)
Air Vehicle Probability of Loss	.005 (1 in 200 Missions)
Minimum Mission Reliability (4)	.9358

(1) As defined for preplanned EO/IR selected Spot Image; 7 minutes allocated to exploitation site: MCE and exploitation site not collocated.

(2) Three specified exploration system interfaces (i.e., CARS, JSIPS-N, ETRAC/MIES) for Phase II. Phase III and beyond includes CIG/SS, JSIPS, JSIPS-TEG, JICS, NMJIC, and NPIC.

(3) Phase II testing/demonstrations are one at a time. Phase III will support all identified exploitation systems up to five at a time.

(4) Mission Reliability is defined as the probability of retaining mission capable status, and is the product of all mission phases and modes reliabilities, starting at air vehicle takeoff and ending with landing. This reliability is specified for all mission critical elements (Air Vehicle, Ground and Support Segments).

(5) Air Vehicle Time on Station at 3000 Nmi, at or above 60,000 ft.

3.0.1 Design to Price Requirement. There is a firm requirement that the Tier II Plus High Altitude Endurance Air Vehicle be designed to a $10 million (FY94 dollars) recurring unit fly away price (UFP) for each Air Vehicle Segment (Phase IV quantity 10). The $10M UFP will include all flight hardware within the Air Vehicle Segment, including air frame, avionics, sensors, communications, integration and checkout and is the total price paid by the government including profit.

3.0.2 External Interface Requirements. The Tier II Plus System will provide for the external interfaces identified in this section, within the context of the system definition provided in 1.2. and the interface definitions described in 1.2.2. The implementation of the external type c interfaces (reference Figure 3) is shown in Figure 4. The specific data requirements which govern these interfaces are defined in the Tier II Plus System Interface Requirements Specification (IRS), Document No. 397-0000-59R-004 (DRAFT).

3.0.2.1 ATC VHF/UHF Communications. The Tier II Plus System will provide an ATC voice communications capability between the Ground Segment and ATC local authority both LOS and relayed through the Air Vehicle Segment. This capability will provide a continuous, duplex link that operates in the VHF/UHF AM frequency ATC voice bands. ATC Voice will be relayed via SATCOM when the Air Vehicle is beyond line of sight.

3.0.2.2 Commercial Ku-Band SATCOM. The Tier II Plus System will provide Ku-band data link communication capability between the air vehicle and the Ground Segment MCE and/or tactical user, utilizing commercial satellites. This datalink will provide an encrypted, continuous, duplex data link utilizing available commercial satellites. The air vehicle portion of the Ku-band SATCOM data link will include a 48 inch, two-axis, steerable, INTELSAT certifiable antenna, capable of supporting a 14 Ghz uplink and an 11 to 12 Ghz downlink. The Ground Ku-band Satellite link interface tactical field terminal (TFT) will consist of two equipment groups: The 6.25 meter antenna equipment group and the operations equipment group These ground equipment groups shall be connected either by copper (allows the antenna to be located up to 200 feet away) or fiber (allows the antenna to be up to 10 km from the MCE). The Ku-band SATCOM downlink will provide a 1.5 to 50 Mbps capacity to communicate mission sensor data, air vehicle health and status data, ATC voice and threat data. The Ku-band SATCOM uplink will provide a 200 Kbps capacity to communicate ATC Voice, command and control, mission planning and/or mission / remote sensor retasking data.

3.0.2.3 DoD UHF SATCOM. The Tier II Plus System will provide a redundant UHF SATCOM data link capability between the air vehicle and Ground Segment elements (both LRE and MCE). This data link will provide an encrypted, continuous, half-duplex data link utilizing the military FLEETSATCOM System or the equivalent. The air vehicle portion of the UHF SATCOM data link will include a stationary antenna that provides upper hemispherical coverage in the 243-318 MHz frequency band. The ground UHF SATCOM portion will provide encrypted voice and data interfaces for up to a mix of three Tier II Plus / Tier III Minus Air Vehicles simultaneously. The UHF SATCOM data link will provide a DAMA mode downlink capacity to communicate air vehicle maintenance, health and status data, ATC voice, and threat data. The UHF SATCOM uplink will provide a DAMA mode capacity to communicate ATC Voice, command and control, mission planning and mission retasking data.

3.0.2.4 LOS Common Data Link (CDL). The Tier II Plus System will provide a line-of-site (LOS) Common Data Link (CDL) link capability between the air vehicle and Ground Segment MCE or exploitation site or appropriately equipped tactical user provided these are compatible with the MCE. This data link will provide an encrypted, full duplex data link that is configured to provide a Class 1 link capacity of 1.5 to 274 Mbps downlink, in accordance to the System Capability Document for the Common Data Link (Document No. 7681990). The air vehicle portion of the LOS CDL data link will include a two axis, steerable antenna. The Ground CDL portion will contain a remote equipment group and a surface processing group. The remote equipment group will consist of a 6 foot diameter parabolic reflector, dual X and Ku Band feed, and antenna RF assembly mounted on a two-axis pedestal. The surface processing group will consist of the operator equipment group for air vehicle acquisition and tracking plus operation of the link and the link equipment group for digital data processing, COMSEC, modulation/demodulation and signal interfaces. The interface between the two groups shall either be copper (allows the antenna to be located up to 300 feet from the MCE) or fiber (allows the antenna to be up to 7 km from the MCE). The CDL 274 Mbps downlink will communicate imagery data, air vehicle maintenance, health and status data. The CDL uplink will provide a 200 Kbps link capacity to communicate ATC, command and control, mission planning and mission retasking data. The LOS CDL data link will provide jam-resistant capability and accommodate growth to the ABIT airborne relay configuration.

3.0.2.5 UHF LOS. The Tier II Plus System will provide a UHF LOS Data Link capability between the air vehicle and LRE. This data link will provide an encrypted, continuous, duplex data link. The Ground data link portion will provide encrypted voice and data interfaces for up to three Tier II Plus or Tier III Minus Air Vehicles simultaneously. The UHF LOS data link will provide a stationary antenna for omnidirectional coverage throughout the lower hemisphere in the 225 MHz to 400 MHz frequency band. The UHF LOS down link will provide a non-DAMA secure mode capacity to communicate air vehicle maintenance, health and status data, threat data, and non-secure ATC voice. The UHF LOS up link will provide a secure capacity for command and control, as well as mission planning and mission retasking data as well as non-secure ATC voice.

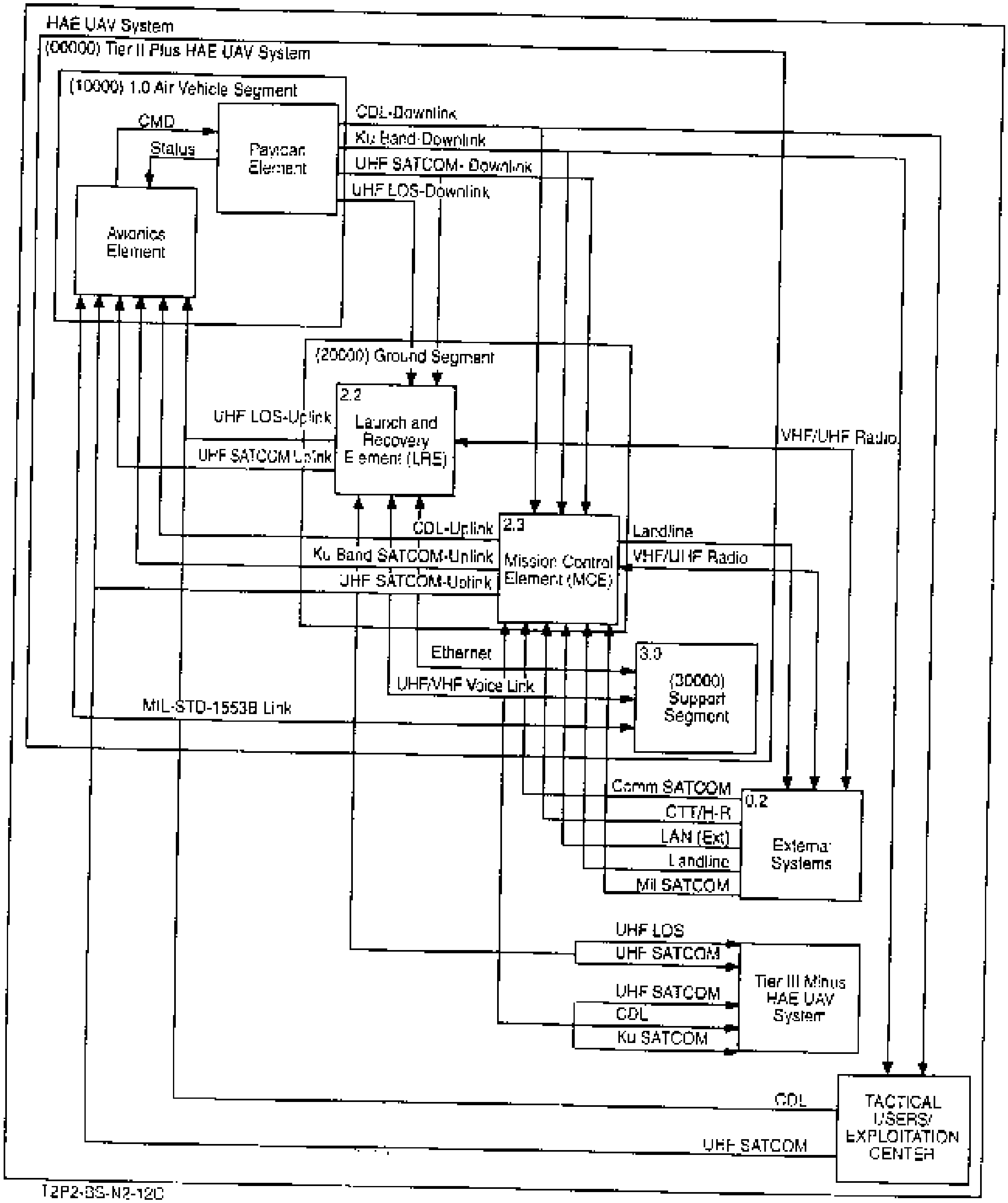

Figure 4. Type "B" and "C" External Interfaces

3.0.3 Design Characteristics

3.0.3.1 Physical Characteristics. The physical characteristics of the Tier II Plus HAE UAV System will be as specified in the respective segment specifications.

3.0.3.1.1 Transport and Storage. The Tier II Plus System transportation and storage configurations will provide protection from natural and induced environments as applicable. These environments, including storage environments, will be within the limits specified in Table 4.

3.0.3.2 System Effectiveness Factors

3.0.3.2.1 Reliability. The Tier II Plus System reliability requirements specified herein will be based on the assumption that the Tier II Plus is in an operable and committable condition at the initiation of takeoff, and will not consider the effects of threats. Failures (including false alarms) while in either a ready or employment state will be considered a mission failure.

3.0.3.2.1.1 Mission Reliability. The Tier II Plus System will be designed to achieve a Mean Time Between Failure causing mission abort [MTBF(ma)] of 654 hours to support a mission reliability of 0.9358 for a 42-hour mission with 24 hours on station. Mission reliability is the probability of successfully performing a standard mission profile as specified in 1.2.1.2 and the attainment of all mission essential performance and functional requirements. Mission essential equipment shall include the payload components required to complete a planned mission.

3.0.3.2.1.2 Flight Safety Reliability. The Tier II Plus System will be designed to meet or exceed a Mean Flights To Loss [MFTL] of the air vehicle due to internal failures of one loss in 200 missions to support a flight safety reliability of 0.995 for a 42-hour mission. Flight safety reliability is the probability of taking off, embarking on a mission, and safely landing at any airfield upon the first failure of a flight critical component.

3.0.3.2.1.3 Storage Reliability. All storage-life sensitive components will be identified and subjected to scheduled maintenance to prevent failures in storage. Upon removal of the Tier II Plus system elements from storage, the system will perform as specified herein without unscheduled maintenance.

3.0.3.2.2 Maintainability

3.0.3.2.2.1 Mission Turnaround Time. The Tier II Plus System will be capable of a mission turnaround time of 4 hours. Mission turnaround will include all servicing and checkout tasks required to refurbish the system after operation and prepare the system for subsequent operation.

3.0.3.2.2.2 Unscheduled Maintenance. Tier II Plus System will provide the resources to accomplish unscheduled maintenance on system hardware. The Tier II Plus System will be capable of achieving a Mean Time to Repair (MTTR) of 2.0 hours at the organizational maintenance level. The Tier II Plus System MTTR is defined to include the time from fault detection through fault isolation, access, removal and replacement of failed Line Replaceable Units (LRU), and closure and verification that the repair has satisfactorily eliminated the original fault condition. The MTTR does not include logistics delays.

3.0.3.2.2.3 Scheduled Maintenance. The Tier II Plus System will provide for scheduled maintenance.

3.0.3.2.2.4 Inspections and Tests. The Tier II Plus System will be designed for ease and adequacy of inspections and tests necessary to ensure system integrity during pre-flight and post-flight servicing and maintenance activities. Testing of Tier II Plus System component elements will be accomplished primarily through automatic means but may include any combination of automatic and/or manual test methods in conjunction with any combination of internal and/or external test equipment.

3.0.3.2.2.5 Built-in-Test (BIT). The Tier II Plus System will provide operational and support personnel with the information necessary for them to determine the readiness of the system to perform a mission. BIT detection rate shall be identical to manufacturer's specification for OTS, GOTS and COTS equipment.

a. Air Vehicle. The air vehicle will provide its health status continuously to the LRE and MCE via the C³ data links. Status will be reported to the subsystem level.

b. Ground Segment. The LRE and MCE will provide their health status continuously to the operator via their control console monitors. Status shall be reported to the subsystem level.

c. System. The Tier II Plus system will implement an end-to-end manually initiated automatic test to determine the readiness of the system to execute or continue a mission. Segment to segment interfaces will be exercised, evaluated and subsystem status will be reported to the operators at the MCE and LRE control consoles. Mission operations may be interrupted as this test is being performed.

3.0.3.2.3 Operational Availability. The Tier II Plus System will have an operational availability of 90 percent, assuming Mean Logistics Delay Time (MLDT) is no greater than 9.5 hours. Operational availability is defined as the probability that the Tier II Plus System is operable and committable to mission critical performance levels when a mission/use is requested at a random point in time. Operational availability will include the down time resulting from preventive maintenance, supply, and administrative delays.

3.0.3.3 Environmental Conditions. The Tier II Plus System will meet all of the requirements stated herein during and after exposure to operating, mission execution, shipping, handling, transportation, and storage environments. These environments are further amplified in the individual segment and subsystem specifications.

3.0.3.3.1 Transportation Environments. The Tier II Plus System will perform as specified herein when subjected to the transportation environments described in Table 4. The environments specified herein are further amplified in the individual segment specifications.

3.0.3.3.1.1 P.H.S.T Shock/Acceleration Environments. The Tier II Plus System segments/subsystems, when packaged in shipping container, will operate without degradation after exposure to the transportation and handling shocks specified herein. The Tier II Plus System elements/subsystems will be shipped without damage in containers via truck, ship, and airborne transportation.

3.0.3.3.2 Ground and Support Segment Surface Environment. The Tier II Plus Air Vehicle, Ground, and Support Segments will be designed for appropriate combinations of temperature, humidity, rain, ice, hail, salt fog, and sand and dust environments as described in Tables 3 and 4.

3.0.3.3.3 Flight Environment. The Tier II Plus Air Vehicle will be designed for appropriate combinations of temperature, humidity, wind, rain, blowing snow, ice, hail, salt fog, and sand and dust environments as described in Table 2.

3.0.3.3.4 Electromagnetic Environment. Subsystems and elements of the Tier II Plus System will meet the electromagnetic compatibility requirements of the TRA [redacted] MIL-STD 461C and RTCA/DO 160C will be used as design guides to control the generation of electromagnetic interference and vulnerability of Tier II Plus system and air vehicle avionics, respectively. 64

3.0.3.3.5 Single Event Upset. The Tier II Plus System will provide the capability to perform without permanent degradation after exposure to a single event upset.

Table 2 Tier II Plus Air Vehicle Standby, Takeoff, Landing and Cruise Environments

ENVIRONMENTAL CONDITION	STANDBY, TAKEOFF AND LANDING	CRUISE
Altitude	0 - 6000 ft	0 - 75,000 ft (1)
High Temperature (2)	45°C (113°F) @ Sea Level 28°C (82°F) @ 6,000 ft	49°C (121°F) @ Sea Level -22°C (80°F) @ 75,000 ft
Low Temperature (2)	-54°C (-65°F) @ Sea Level -34°C (-29°F) @ 6,000 ft	-54°C (-65°F) @ Sea Level 70°C (-94°F) @ 75,000 ft
Relative Humidity	100% @ 36°C (96°F)	Negligible
Rain	2 inches/hour for 1 hour	Negligible
Ice and Hail	1 inch/hour, 2 inch buildup	Negligible
Sand and Dust	45Kt 1.06 gm/m^3, 0.1 to 0.4 mm dia	Negligible
Salt Fog	5% Salt Solution for 24 hours	Negligible
Shock	20g, 11ms, Peak Sawtooth	Negligible
Acceleration	Fuselage - 5g, Wing - 5g	Fuselage - 5g, Wing - 5g
Vibration	f (Hz) PSD (g^2/Hz) 20-1000 0.04 1000-2000 -6 db/octave 2000 0.01 Overall GRMS = 7.69 (1 hr/axis)	TBD
Electromagnetic Radiation	As defined in [redacted]	As defined in [redacted]

(1) Equipment located in controlled compartments will be exposed to altitudes of 0 - 35,000 feet (maximum)

(2) Operating temperatures will be determined by component location in the air vehicle. Temperatures shown are ambient temperatures.

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Table 3. Ground and Support Segment Environments.

ENVIRONMENTAL CONDITION	EXPOSED EQUIPMENT	SHELTERED EQUIPMENT
Altitude	0 - 6,000 feet, operating 50,000 feet, non-operating	0 - 6,000 feet, operating 50,000 feet, non-operating
High Temperature	113°F, operating 160°F, storage	104°F, operating 149°F, storage
Low Temperature	-40°F, operating -40°F, storage	40°F, operating 40°F, storage
Relative Humidity	100% @ 36°C	100% @ 36°C
Rain	2 in/hr for 1 hour	Negligible
Vibration	TBD	TBD
Shock	TBD	TBD
Sand and Dust	45 Kt 1.06 gm/m^3 ; 0.1 to 0.4 mm dia	N/A
Salt Fog	5% Salt Solution for 48 hours	Negligible
Radiation	As defined in [redacted]	As defined in [redacted]

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Table 4. Transportation Environments (in Containers)

ENVIRONMENTAL CONDITION	EXTREMES
Altitude	0 to 50,000 feet
High Temperature	149°F
Low Temperature	-40°F
Relative Humidity	100% @ 36°C
Rain	2 inches/hour for 1 hour
Ice and Hail	1 inch/hour, 2 inch buildup
Sand and Dust	45 Kt 1.06 gm/m^3 ; 0.1 to 0.4 mm dia
Vibration	TBD
Shock	20 g, 11 ms, peak sawtooth
Salt Fog	5% salt solution for 48 hours

3.0.3.4 Transportability. The Tier II Plus System will be transportable by military or commercial truck, aircraft, ship, and rail. The Tier II Plus System equipment requiring special transportation handling or design will be as specified in the individual equipment specifications. The specific segment transportability requirements are specified herein.

a. Transportation will include the processes, materials, equipment and procedures required to transport the system segments and elements.

b. The Tier II Plus Air Vehicle Segment will be ferried to operating locations.

c. The Ground and Support Segments will be transportable by three (3) C-141 aircraft. The Ground and Support Segments will be capable of being packed and made ready for transport in less than 24 hours. The Ground and Support Segments will be capable of being unpacked, set up and made ready for operation in less than 24 hours.

3.0.3.5 Flexibility and Expansion

3.0.3.5.1 Electrical Growth. The Tier II Plus System will provide sufficient electrical power for growth. Specific margins will be addressed in the applicable Segment Specifications.

3.0.3.5.2 Environmental Control Growth. The Tier II Plus System will provide sufficient compartment heat dissipation capability to allow for growth. Specific margins will be addressed in the applicable Segment Specification.

3.0.3.5.3 Processor Growth. The Tier II Plus System will provide computer resource growth via the use of open bus architectures, commercial standards, spare slots, and power supply reserves. This processing growth capability will be consistent with the Computer Resource Reserve Capacity requirements specified in 3.0.3.7.6.

3.0.3.6 Portability. The Tier II Plus System elements that are portable will have suitable provisions for handling and movement, standard power interfaces and appropriate security requirements.

3.0.3.7 Design and Construction. Design and construction requirements for the Tier II Plus System will be as specified in the segment specifications and individual subsystem specifications, and compliant with the requirements specified herein.

3.0.3.7.1 Materials. The use of asbestos, mercury, PVC (except for coaxial cable jackets), and ozone depleting substances is prohibited. Requirements for materials, processes, and parts for the Tier II Plus System will be as specified in segment and individual subsystem specifications. Commercial equipment and parts will be assessed by TRA for their suitability to achieve the performance and reliability requirements of the Tier II Plus System.

3.0.3.7.2 Electromagnetic Radiation. The operation and performance of the Tier II Plus System will not be degraded or compromised when operating in the environments specified in the [redacted] b4

3.0.3.7.3 Safety. The Tier II Plus System will be designed to minimize hazards to personnel and equipment in accordance with requirements specified in individual segment specifications.

3.0.3.7.4 Human Engineering. The design of the Tier II Plus System, and the selection/arrangement of its segments/elements will include consideration of the personnel who must operate and maintain the system and will meet the requirements specified in segment and individual subsystem specifications. Critical tasks will be analyzed to determine if human errors may jeopardize Tier II Plus HAE UAV System mission accomplishment or in any way create a hazard to the personnel or any equipment.

3.0.3.7.5 System Security. The Tier II Plus System will provide for protection of equipment and data to the appropriate level of classification as specified in the Program's Security Classification Guide, and the Industrial Security Manual.

3.0.3.7.6 Computer Resource Reserve Capacity. The Phase II Tier II Plus System flight critical computer resources will be delivered with spare memory, processor bandwidth, and I/O capacity as described below:

Processor Reserve	> 20%
Memory	> 20% unused
Discrete I/O	> 10% unused spares
Analog I/O	> 10% unused spares
Connectors Pins	> 5 % unused spares

The mission critical computer resources (excluding flight critical computer resources as described above) will be delivered with spare memory, processor bandwidth, and I/O capacity consistent with sound engineering design practices.

3.0.4 Logistics

3.0.4.1 Maintenance. The Tier II Plus System will be capable of being maintained at the organizational level with on-equipment maintenance. The Tier II Plus System will be capable of being supported with off-equipment maintenance of removed items at the intermediate and/or depot levels. The Tier II Plus System design will support a scheduled depot level maintenance interval of 6,000 hours.

3.0.4.2 Manpower and Personnel. The Tier II Plus System will be capable of being operated and supported in both peacetime and wartime by organic military skills. Skill compression and cross training will be used to minimize manpower and personnel requirements wherever possible..

3.0.4.3 Supply Support. The Tier II Plus System will be capable of using spare and repair parts that meet all original equipment specifications and approved modifications. The Tier II Plus System will include Mission Support Kits (MSK). The MSK will be sized to support 30 days of operations using 4 Air Vehicles, 1 LRE, 1 MCE, and support equipment to sustain one airborne air vehicle continuously on-station. The MSK will be compatible with the Tier II Plus System transportation requirements as specified herein. The Tier II Plus System will provide a spares inventory lay-in at each operation station.

3.0.4.4 Support Equipment. The Tier II Plus System will be capable of being serviced and maintained by using and/or adapting common test and support equipment where feasible. The Tier II Plus System will be designed to minimize the use of peculiar test and support equipment.

3.0.4.5 Technical Data. The Tier II Plus System will provide technical data handbooks in a common format for all DoD services. Technical data will include data required to operate, maintain, support, and train, for the operation, maintenance, and support of the Tier II Plus System. The Tier II Plus System will maximize the use of computerized technical data.

3.0.4.6 Training and Training Support. The Tier II Plus System will have the capability to train Air, Ground, Support Segment personnel to perform the necessary tasks required to support the Tier II Plus System mission objectives and operations, including maintenance and support tasks.

3.0.4.7 Computer Resources Support. The Tier II Plus System will have the capability to operate and support all computers, software, facilities, and documentation

3.0.4.8 Facilities. The Tier II Plus System will be capable of being maintained and operated in worldwide temperate locations, for the environmental conditions specified in Tables 2, 3, and 4. The Tier II Plus System will be capable of being supported using common military air base facilities and utilities. The Tier II Plus System will be capable of being controlled from land and maritime based sites

3.0.4.9 Deployment. The Tier II Plus System will be capable of being forward deployed to land bases. The Tier II Plus System will be designed to enable the Ground and Support Segments to be transported via a maximum of three C-141 aircraft. The Tier II Plus Air Vehicle will be capable of ferry operation.

The Tier II Plus System will be capable of being prepared for deployment within 24 hours from receipt of order. The deployed Tier II Plus System will be capable of being setup and made ready for operation within 24 hours after arriving at an operating location.

3.0.5 Qualification. The qualification tests will be used to assure that the Tier II Plus System complies with the physical, functional, and performance requirements. Tests will be conducted in accordance with the Quality Assurance provisions of this and subordinate specifications, as detailed in the Tier II Plus System Master Test Plan, Report No. 367-5000-67R 001. The system level qualification tests are identified and discussed in 4.0.

3.1 (10000) AIR VEHICLE SEGMENT CHARACTERISTICS

3.1.1 Air Vehicle Segment Composition. The Tier II Plus Air Vehicle Segment consists of all the components which comprise the complete mission capable air vehicle, including the airframe, payload, and avionics elements. The composition of the Tier II Plus Air Vehicle Segment elements is summarized below:

a. Airframe Element: Fuselage, wings, empennage, nacelles, landing gear, fairings, radomes, antennas, EO/IR window, and propulsion subsystems. Each of these subsystems contain components of the electrical, hydraulic, flight control, environmental control, pneumatic, and fuel subsystems.

b. Payload Element: SAR sensor, EO/IR sensor, self-defense subsystem, airborne data recorder, communication datalinks, integrated processor systems, and growth payload provisions.

c. Avionics Element: Integrated Mission Management Subsystem, Identification Friend or Foe (IFF) subsystem, Air Traffic Control and flight termination subsystems, flight control actuators, and avionics software.

3.1.1.1 Air Vehicle Capability. The Tier II Plus Air Vehicle will provide a high altitude-long endurance capability with the specified area and time coverage, and with the required guidance and navigation accuracy, as specified herein.

3.1.1.1.1 Standard Mission Performance Requirements. The Tier II Plus Air Vehicle will be capable of fulfilling the mission performance described herein on a 1976 ICAO standard day and zero winds while carrying full operational payload.

3.1.1.1.1.1 Cruise/Loiter Capability. The Tier II Plus Air Vehicle will provide a capability to loiter on station for a duration of 24 hours at an initial loiter altitude of at least 60,000 feet at an operating radius of 3,000 nmi or the equivalent. Power extraction will be based on a SAR payload operating 100 percent of the time during the 24 hour loiter period and all communications equipment operational throughout the mission.

3.1.1.1.1.2 Initial Climb Capacity. The Tier II Plus Air Vehicle will be capable of climbing to an altitude of 50,000 feet within 200 nmi after takeoff.

3.1.1.1.1.3 Fuel Allowances. The Tier II Plus Air Vehicle standard mission includes a takeoff fuel allowance of 25 minutes at ground idle and 5 minutes at takeoff power setting and usable fuel remaining after the mission to fly at sea level for one hour.

3.1.1.1.1.4 Payload Configuration. The payload configuration for the Tier II Plus standard mission consists of SAR and EO/IR sensors, survivability system, data recorder and integrated communication subsystem (including duplex Ku-band SATCOM, duplex CDL, duplex UHF SATCOM and duplex UHF LOS).

3.1.1.1.2 Takeoff and Landing Capability. The Tier II Plus System will provide the capability to operate the Tier II Plus Air Vehicles from improved runways no longer than 5,000 feet in length, and will be capable of takeoff and landing operations during a steady 20 knots, mean cross wind component, and will utilize self-contained takeoff and landing gear. The Tier II Plus System will provide the capability for automatic (without man-in-the-loop) takeoff and landing of the Tier II Plus Air Vehicles.

3.1.1.1.3 Takeoff Abort. The Tier II Plus System will be capable of manual or automatic termination of the takeoff sequence in the event that takeoff conditions or an equipment failure prevent successful takeoff. Manual termination will be possible after the takeoff sequence has been initiated but before takeoff speed has been attained. Such takeoff termination of the Tier II Plus Air Vehicle will not result in a hazard to the Tier II Plus System elements.

3.1.1.1.4 Landing Abort/Wave-Off The Tier II Plus System will be capable of manual or automatic termination of the landing sequence in the event taht landing conditions or an equipment failure prevent successful landing. Manual termination shall be possible after the landing sequence has been initiated. Minimum manual wave-off will be a procedural limit. Under no condition will a wave-off be possible after the air vehicle is on the ground. Wave-off of the Tier II Plus Air Vehicle shall not result in a hazard to the Tier II Plus System elements.

3.1.1.1.5 Air Vehicle Payload Capacity. The Tier II Plus Air Vehicle will be capable of carrying the following equipment simultaneously, which collectively comprises the Prime Mission Equipment (PME): SAR, EO/IR, data recorder subsystem, survivability subsystem, and communication subsystem as follows.

Sensor Data	Command and Control
Wideband Ku-band SATCOM	Ku-band
X-Band LOS CDL	X-Band LOS CDL
	UHF LOS
	UHF SATCOM

3.1.1.1.6 Payload Removal/Replacement. The Tier II Plus System elements will provide ease of payload removal/ replacement for maintenance and support, test flights, and mission reconfiguration. The Tier II Plus Air Vehicle payload will be capable of payload removal/replacement at the MOB/FOB, and will not require readjustment or recalibration of hardware or software. Access and/or removal of the payload is included in the Tier II Plus System maintenance time (both scheduled and unscheduled).

3.1.1.1.7 Propulsion Performance. The Air Vehicle Segment will utilize a modified off-the-shelf propulsion subsystem that is capable of achieving the mission profile performance objectives specified in paragraph 3.1.1.1.1.

3.1.1.2 Air Vehicle Payload The air vehicle will have the capability to carry simultaneously an EO/IR sensor and SAR sensor, and all other equipment necessary to acquire, process, and transmit high quality imagery data (as measured at the output of the MCE) to the MCE exploitation systems, and small mobile terminals in support of the tactical user. The Air Vehicle Segment will also have the capability to simultaneously carry a survivability suite and relay the collected data to the air vehicle avionics and to the MCE. The actual sensor suite may vary to suit specific mission needs as determined by Mixed Fleet Analysis and UFP. Communications from the air vehicle will be via SATCOM and LOS communications links, although not necessarily simultaneously. The air vehicle will provide the capabilities to add growth payloads. Volume and power and cooling reserves will be allocated to accept further growth. Growth payloads may include (but not limited): SIGINT, ABIT, or communications relay subsystems.

3.1.1.2.1 Imaging Sensors. The air vehicle imaging sensors will include a SAR and a dual band EO/IR sensor. Each of the sensors will be capable of being retasked dynamically from the MCE or from another appropriately configured exploitation center or user terminal.

3.1.1.2.1.1 SAR Sensor Characteristics. The Air Vehicle Segment will carry an X-band SAR sensor which operates in the following three modes: Wide Area Search mode, Spotlight mode, and Ground Moving Target Indication (GMTI) mode. The SAR will be capable of strip map, full image quality image formation processing. Additionally, the SAR sensor will have the capability to change the field of regard to either side of the flight path. In the presence of a 2mm/hr rain cell, located between the radar and target area, with 25 km extent in slant range, the maximum range at which the radar achieves the noise equivalent reflectivity, as specified in 3.1.1.2.1.1.4, shall not degrade by more than 10% of the clear weather performance. Methods of image quality enhancements will be used where appropriate. The specific performance capabilities and characteristics are specified herein.

3.1.1.2.1.1.1 Wide Area Search Mode. In wide area search mode, the SAR sensor will be capable of obtaining a continuous strip of imagery from either side of the air vehicle. In this mode, the SAR will have a ground imaging range of between 20 and 200 km. At ground ranges of greater than 40 km, the SAR sensor will be capable of collecting imagery at the rate of 5720 square km/hour (40,000 sq nmi/day). SAR imagine shall meet the image quality requirements listed in 3.1.1.2.1.1.4, over the full 20-200 km ground range. Strip map SAR imagery will have a mainlobe impulse response width (IPR) of 1 meter in range and cross range when measured at the - 3dB level. Additionally, at the - 15dB level, the range and cross range IPR will be no greater than 2.5 meters.

3.1.1.2.1.1.2 Spot Light Mode. The SAR sensor will be capable of collecting spotlight SAR imagery over a 90 degree azimuth sector from either side of the air vehicle, at a rate of at least 1,900 spots per day. In this mode, the SAR will be capable of imaging at ground ranges from 20 km to 200 km. At ground ranges between 20 and 50 km, spot size will be 1 km by 2 km with full image quality. At ground ranges greater than 50 km, spot size shall be 2 km by 2 km with full quality maintained to 200 km ground range. Spot light imagery will have an IPR of 0.3 meter in range and cross range when measured at the -3 dB level and an IPR no greater than .75 meters at the -15 dB level.

3.1.1.2.1.1.3 GMTI Mode. In the GMTI mode, the SAR sensor will be capable of scanning a 90 degree sector from 20 km to 200 km ground range on either side of the air vehicle reporting the location of moving ground targets within this sector in less than 120 seconds. For a 10 dBsm target in a clutter sigma zero = -10dB, the SAR GMTI mode will have a Minimum Detectable Velocity (MDV) of at least 4 knots. The range resolution will be 10 meters out to 100 km and may degrade at ranges between 100 km and 200 km.

3.1.1.2.1.1.4 SAR Image Quality Requirements. The SAR sensor imagery quality will be defined by the following factors: multiplicative noise ratio (MNR), impulse sidelobe levels, linear dynamic range, noise equivalent reflectivity, spurious response, image intensity non-uniformity, and geometric distortion. These imagery quality factors are specified below. The multiplicative noise ratio (MNR) will be less than -13dB. Sidelobe levels will be constrained to be less than that given by the expression "$-35 + 20\log[1 + (3/u)^2]$", where u is the distance from the peak in 3 dB resolution units. The linear dynamic range will be sufficient to simultaneously accommodate a 50 dBsm point target and a uniform clutter reflectivity = -5 dB (sigma zero). In wide area search (WAS), the noise equivalent reflectivity will be better than -25 dB out to 185 km ground range and may degrade at ranges to 200 km. In spot light mode, the noise equivalent shall be better than -25 dB out to 140 km ground range and may degrade to no worse than 20 dB at ranges out to 200 km. Image intensity non-uniformity, spurious responses and geometric distortion across the image will be minimized. All SAR performance and image quality requirements will be met with the radome in place.

3.1.1.2.1.1.5 SAR Geo-Location. The SAR sensor will be capable of providing geo-location of fixed targets to a CEP of 20 meters at a range of 100 km broadside from the air vehicle, given DTED level 1 terrain data. CEP of 20 meters is defined as greater than 0.5 probability of obtaining a geo location within 20 meters of its actual position. Geo-location accuracy will vary with range and azimuth viewing angle.

3.1.1.2.1.2 EO/IR Sensor Characteristics. The Air Vehicle Segment will carry an EO/IR sensor which operates in the following four operating modes: wide area search mode, spot collection mode, point target collection mode, and stereo collection mode. The EO/IR sensor will be capable of imaging in dual spectral bands: Visible (nominally 0.5-1.0 micron) and Mid wave Infrared (MWIR; nominally 3.0-5.0 microns). The EO/IR will use on-board processing consistent with system modes and data link bandwidth constraints.

3.1.1.2.1.2.1 EO/IR Environmental Constraints. The EO/IR sensor will be capable of the performance and functional requirements specified herein under the following environmental constraints: mid-latitude summer, rural target locations, target reflectivity of 15 percent, background reflectivity of 7 percent, target temperature of 302 degrees Kelvin, background temperature of 300 degrees Kelvin, and a meteorological range of 23 km. The sun is assumed to be 60 degrees from zenith in the along-track direction. The turbulence is defined by Fried's parameter Ro = 0.8m at a wavelength of 0.75 microns and Ro=7.5m at a wavelength of 4 microns. The EO/IR sensor performance will be achieved with the optical window installed.

3.1.1.2.1.2.2 Wide Area Search Mode. In the Wide Area Search mode, the EO/IR sensor will be capable of obtaining a continuous strip of imagery from either side of the air vehicle. The EO/IR sensor will be capable of collecting imagery with the image quality specified herein at a rate of 5,720 sq-km/hr or better. In the visible band, the EO/IR sensor will be capable of providing daytime imagery with a NIIRS equal to or greater than 6.0 at 45 degrees. In the MWIR band, the EO/IR sensor will be capable of providing nighttime imagery with a NIIRS equal to or greater than 5.0 at 45 degrees.

3.1.1.2.1.2.3 Spot Collection Mode. In the Spot Collection Mode, the EO/IR sensor will be capable of collecting spot mode imagery with a spot size at 45 degrees of at least 2 km x 2 km from either side of the air vehicle. The spot size shall grow or shrink at angles other than 45 degrees; the number of pixels will be held constant. The EO/IR sensor will be capable of collecting at least 1900 spot images a day. The daytime NIIRS for visible band spot imagery will be equal to or greater than 6.5 at 45 degrees, and in the MWIR band the nighttime NIIRS will be equal to or greater than 5.5 at 45 degrees.

3.1.1.2.1.2.4 Point Target Mode. In the Point Target Mode, the EO/IR sensor will be capable of continuous collection of imagery for a fixed point on the ground.

3.1.1.2.1.2.5 Stereo Mode. In the Stereo Mode, the EO/IR sensor will be capable of producing stereo spot images. The stereo images will be developed based on overlapping spot images.

3.1.1.2.1.2.6 EO/IR Geo-Location. The EO/IR Sensor will be capable of providing geo-location of fixed targets to a CEP of 20 meters at 45 degrees look angle, given terrain altitude accuracy data of 2.5m (1σ). CEP of 20 meters is defined as greater than 0.5 probability of obtaining a geo-location within 20 meters of its actual position. Geo-location accuracy will vary with range and azimuth viewing angle.

3.1.1.2.2 Communication Functions. The Tier II Plus Air Vehicle will provide the capability to facilitate the following communications functions: command and control data, sensor data, and air traffic control communications. The functional and performance capabilities and requirements for each of the these communications functions are specified herein. The communication data links required to support the air vehicle communications capabilities are summarized below.

Data Link	Functions	Link Capacity	Data Rate	
LOS CDL	C2, Imagery Data Threat, Voice	274 Mbps (Downlink) 200 Kbps (Uplink)	Adaptive	(1.5 to 274 Mbs)
Ku SATCOM	C2, Imagery Data Threat, Voice	50 Mbps (Downlink) 200 Kbps (Uplink)	Adaptive	(1.5 to 50 Mbs)
UHF SATCOM	C2, Threat, Voice	19.2 Kbps		
UHF LOS	C2, Threat, Voice	19.2 Kbps		
VHF/UHF LOS	Voice/ATC/AWACS			

3.1.1.2.2.1 Command and Control Communications. The air vehicle will provide the capability to receive command and control data, including sensor control, communication control, and flight control commands, and transmit command and control acknowledgment as well as health and status messages from the air vehicle. This communication capability will be bi-directional. The air vehicle command and control communication functions will utilize UHF SATCOM, X-Band CDL, and Ku-band SATCOM and UHF/VHF LOS links. All C^2 messages will be routed to the IMMC for interpretation and routing to other subsystems. The Tier II Plus System will be capable of isolating red/black data.

3.1.1.2.2.2. Airborne Relay Provisions. The Tier II Plus Air Vehicle will provide growth capabilities to enable an airborne relay communication link. This capability will be compatible with the Common Data Link (CDL). The LOS CDL data link will incorporate jam resistant capability and accommodate growth to the ABIT airborne relay configuration.

3.1.1.2.2.3. LOS CDL Imagery Link. The LOS CDL imagery link will be a COMSEC encrypted full duplex data link between the air vehicle and the MCE and other suitably equipped ground terminals. The LOS CDL link components will be compatible with a Class 1 link having a maximum capability of 274 Mbps, in accordance with the System Capability Document Data Link (Document No. 7681990).

The downlink data comprises imagery data, air vehicle maintenance and status data, ATC voice and threat data. The LOS CDL uplink will be compatible with a 200 Kbps link capacity for ATC, C2, mission planning and mission retasking data.

3.1.1.2.2.4. Ku SATCOM Imagery Link. The Ku SATCOM imagery link will be a COMSEC encrypted full duplex data link between the air vehicle and the MCE and other suitably equipped ground terminals. The Ku SATCOM link components will support adaptive data rates up to 50 Mbps (downlink) and 200 Kbps (uplink). Remote sensor retasking may be commanded via the uplink.

3.1.1.2.3 Data Storage Capability The air vehicle will include an airborne data recorder subsystem. The data recorder will be capable of accepting and recording data from all imaging sensors. The recorder will have the capability of recording multiplexed sensor data for 2 hours, minimum, at a 50 Mbps data rate. Upon command, the data recorder will have the capability to playback recorded imagery data from an airborne air vehicle for transmission to the ground.

3.1.1.2.4 Survivability Capability. The air vehicle will have the capability to carry self-defense subsystems As a minimum, the self-defense subsystem will include a threat warning receiver to identify and localize hostile fire control and seeker radars. As necessary, it may also include a threat deception subsystem The threat deception subsystem will be comprised of onboard jammers and expendable decoys, and appliques. Data from the threat warning receiver will be data linked via the IMMC to the MCE for presentation to the operator.

3.1.1.3 Avionics Capability. The Avionics Element will provide the necessary air vehicle guidance, navigation and control capability, including sensor control, to execute the mission plan, will provide the capability for Ground Segment control of the air vehicle and will provide the capability for flight termination. Execution of the mission plan includes taxi, takeoff and landing, flight control throughout the mission, payload control and subsystem control. The avionics element will provide Mode 4 IFF capability for operational military flights and routine flight functions.

3.1.1.3.1 Air Vehicle Guidance. The avionics guidance function will provide air vehicle steering commands to successfully execute the mission plan in a fully automatic mode. Steering commands and control modes will be generated onboard the air vehicle based on the mission plan and inputs from the navigation system. The guidance function will also be capable of accepting vehicle steering commands from the Ground Segment.

3.1.1.3.1.1 Flight Termination Subsystem. The flight termination subsystem will provide the air vehicle with a non-explosive flight termination capability for range safety and for operational use which would prevent the air vehicle from becoming a hazard or penetrating prohibited air space. Flight termination will also include zeroing all cryptographic devices and classified data stored in computer memory. The non-explosive flight termination system, when activated will result in a predictable air vehicle descent/trajectory

3.1.1.3.1.2 Mission Termination. The air vehicle will have the capability of issuing a mission termination command causing an automatic return to base. This command will be executed if data from the health monitoring and status system indicate that mission critical components or subsystems are not functioning properly precluding the air vehicle from executing the mission plan and completing the mission Prior to issuing the auto mission termination command, the air vehicle will poll the Ground Segment for permission to terminate the mission. In the event of loss of communications, the air vehicle will attempt to establish a link with the Ground Segment prior to executing the mission termination process.

3.1.1.3.2 Air Vehicle Navigation. The air vehicle navigation system will provide air vehicle position and speed to an accuracy sufficient to execute the mission plan in a fully autonomous manner.

3.1.1.3.2.1 Takeoff and Landing Navigation Accuracy. The navigation system will be capable of providing air vehicle position and speed to an accuracy sufficient to support precision automatic takeoff and landing operations from an improved 5,000 foot long and 150 foot wide runway.

3.1.1.3.2.2 Controlled Airspace Navigation Accuracy. The navigation system will be capable of providing air vehicle position and speed to an accuracy sufficient to support operations under FAA/ICAO regulations.

3.1.1.3.3 Air Vehicle Control. The Avionics Element will provide the capability for control of the air vehicle throughout its mission.

3.1.1.3.3.1 Air Vehicle Flight Control. The flight control function will regulate the air vehicle aerodynamic control surfaces and engine thrust in order to follow the steering commands generated by the guidance function Adequate air vehicle stability margins will be maintained throughout the flight envelope.

3.1.1.3.3.2 <u>Air Vehicle Taxi, Takeoff and Landing Control on the Ground</u>. The ground control function will regulate the air vehicle nose gear steering, landing gear brakes, aerodynamic control surfaces and engine thrust in order to control the air vehicle during taxi and runway operations in a safe manner. Adequate air vehicle stability margins will be maintained for all ground operations.

3.1.1.3.3.3 <u>Air Vehicle Sensor Control</u>. The Avionics Element will provide command and control capability for the Payload sensors subsystems through an onboard Mission Management Computer with commands derived from pre-planned stored missions, or in near-real time from the MCE or suitably equipped exploitation or user sites via the command and control links.

3.1.1.3.3.4 <u>Air Vehicle Communication Control</u>. The Avionics Element will provide a command and control capability for all air vehicle communications and telemetry subsystems through an onboard Mission Management Computer (MMC) with commands derived from pre-planned stored missions, or in near-real time from the Ground Segment via the command and control links. The command and control and telemetry links will be active at all times from pre-launch to completion of landing and engine shut down.

3.1.1.3.3.5 <u>Air Vehicle Subsystem Control</u>. All air vehicle subsystems (i.e. ECS, landing gear) will be controlled throughout the mission to ensure successful completion of all mission objectives.

3.1.1.3.3.6 <u>Air Vehicle Subsystem Status Reporting</u>. The air vehicle will continuously, at a designated rate, report subsystem, i.e. payloads, fuel system, etc., health and status to the LRE and MCE

3.1.1.3.4 <u>Air Vehicle Mission Updates</u>. The avionics element will be capable of receiving the mission plan and updates to the mission plan either while on the ground or during flight.

3.2 (20000) GROUND SEGMENT CHARACTERISTICS

3.2.1 <u>Ground Segment Capability</u>. The HAE UAV LRE and MCE (hereafter referred to as the Ground Segment) will be capable of air vehicle command and control, communications control and sequencing, sensor data processing, mission planning, and interfacing and dissemination of imagery reconnaissance to exploitation systems and tactical users. This capability will be provided for both the Tier II Plus and the Tier III Minus Air Vehicles.

The Ground Segment will be self sustaining, including power generation, and environmental control. Each element will be enclosed in a C-141 transportable ISO type shelter. Mission operations does not require that the LRE and MCE be collocated.

The LRE and MCE will support Tier III Minus interoperability. The LRE will contain a subset of the MCE functionality, and components, as described below:

a. Workstations: Mission Planning (LRE, MCE), Command and Control (LRE, MCE), Communications (MCE), Image Quality Control (MCE).

b. Communication Subsystems: UHF SATCOM (LRE, MCE), Ku-band SATCOM (MCE), CDL Common Datalink (MCE), VHF/UHF Radio (LRE, MCE), UHF Line-of-Sight (LRE).

c. Server Subsystem: Digital Storage RAID (MCE), Server (MCE).

d. Facilities: Ancillary equipment, cables, environmental control subsystems, power generation/distribution subsystems, racks, and shelters.

e. Differential GPS (LRE).

3.2.1.1 <u>Launch and Recovery Element (LRE)</u>. The LRE will provide the ability to prepare, launch, and recover Tier II Plus and Tier III Minus Air Vehicle assets. Tier II Plus and Tier III Minus Air Vehicle health status and download of prepared mission plans will be accomplished by the LRE prior to mission execution. The LRE will also provide the ability to modify launch and recovery mission plans according to local ATC and threat conditions. The LRE will provide the ability to coordinate air vehicle assets with local air traffic control and hand-off control to the MCE.

3.2.1.1.1 Self-Sustaining Operations. The LRE will be self-sustaining, including power generation and environmental control. The environmental control will be compatible with the environmental conditions as specified in Tables 3 and 4.

3.2.1.1.2 LRE Command and Control. The LRE command and control position/operator will perform air vehicle configuration start-up, configuration and management of communications links, air vehicle flight control and monitoring, and mission support - ground system maintenance as stated below.

3.2.1.1.2.1 Takeoff Abort. The LRE will be capable of monitoring automatic termination or initiating manual termination of the takeoff sequence in the event that takeoff conditions or an equipment failure prevents successful takeoff. Manual termination will be possible after the takeoff sequence has been initiated but before takeoff speed has been attained. Such takeoff termination of the Tier II Plus Air Vehicle will not result in a hazard to the Tier II Plus System elements.

3.2.1.1.2.2 Landing Abort/Wave-Off. The LRE shall be capable of monitoring automatic termination or initiating manual termination of the landing sequence in the event that landing conditions or an equipment failure prevent successful landing. Waveoff shall be possible after the landing sequence has been initiated. Minimum manual waveoff altitude will be a procedural limit. Under no condition will a waveoff be possible after the Air Vehicle is on the ground. Waveoff of the Tier II Plus Air Vehicle shall not result in a hazard to the Tier II Plus system elements.

3.2.1.1.2.3 Air Vehicle Command and Control. The LRE will be able to monitor, control, and make real time updates to the Tier II Plus and Tier III Minus Air Vehicles ground and flight paths during taxi, takeoff, initial mission flyout, and approach and landing phases.

3.2.1.1.2.4 LRE-UAV Checkout. The LRE will be capable of performing and verifying data link and subsystem operability prior to initiation of a mission, and verify the integrity of the required communication connectivities prior to hand-off to the MCE.

3.2.1.1.3 LRE Mission Planning. The LRE mission planning position/operator will perform local/MCE interface functions, mission plan modification/generation, mission plan finalization, dynamic retasking/replanning, and mission support as described below.

3.2.1.1.3.1 Mission Plan Download Capability. The LRE will be capable of receiving a planned mission from the MCE, and loading the mission plan to either a Tier II Plus or Tier III Minus Air Vehicle. The required interface equipment will be included in the LRE to facilitate mission plan loading.

3.2.1.1.3.2 Mission Planning Capability. The LRE will be capable of developing or modifying the flight plan portion of the air vehicle mission plan in response to ATC instructions or updates to threat information. After the mission plan generation/update has been accomplished, the LRE will be capable of communicating this information to the air vehicle.

3.2.1.1.4 LRE Communications. The LRE will provide the capability to communicate with Tier II Plus and Tier III Minus Air Vehicles, the MCE, and the ATC, in support of mission operations.

3.2.1.1.4.1 Command and Control Communication Links. The LRE will provide the following communication links:

Data Link	Purpose
UHF SATCOM	C2, Voice, Telemetry
UHF LOS	C2, Voice, Telemetry
VHF DGPS	Differential GPS
VHF/UHF Voice	ATC Voice

3.2.1.1.4.2 ATC Communication Capability. The LRE will be capable of receiving, acknowledging, and responding to ATC instructions that are communicated via the radio and/or landline communications links.

3.2.1.2 Mission Control Element (MCE). The MCE will provide the ability to plan the Tier II Plus and Tier III Minus Air Vehicle missions, including flight planning, communications planning and sensor planning. The MCE will provide the ability to monitor and control the Tier II Plus and Tier III Minus Air Vehicle assets, including dynamic retasking and replanning, and their payloads during mission execution. The MCE will provide the ability to receive imagery data from Tier II Plus and Tier III Minus Air Vehicle assets via line-of-sight and commercial satellite datalinks, and support the processing, management and dissemination of the imagery data to exploitation systems.

3.2.1.2.1 MCE Mission Planning. The MCE will provide the capability to perform mission planning, coordination, and deconfliction for effective employment of the Tier II Plus and Tier III Minus Systems. The MCE will employ maximum use of existing mission planning system capabilities. The MCE mission planning capability will exploit the low-observable radar cross-section (RCS) of the Tier III Minus Air Vehicle and reduce Tier II Plus detectability.

3.2.1.2.1.1 Mission Management. Mission management will be provided that includes mission planning, upload, verification, monitoring, control and dynamic replanning and retasking. This system will provide a seamless end-to-end mission management capability.

3.2.1.2.1.2 Mission Planning Software. The Air Force Mission Support System (AFMSS) will be used as the Mission Planner. An HAE UAV Aircraft, Weapons, and Electronics (A/W/E) module will be developed for the Tier II Plus and Tier III Minus Air Vehicles to support complete planning and dynamic replanning.

The HAE UAV mission planner will facilitate the collection of the maximum amount of requested data subject to mission constraints which include survivability, air vehicle performance, sensor performance, and communications (internal and dissemination).

3.2.1.2.1.3 Automatic Routing. Integrated autorouting will be used to maximize the survivability of both the Tier II Plus and Tier III Minus. The Common Low Observable AutoRouter (CLOAR) within the AFMSS Core will be used to provide survivability analysis and automated routing of the Tier II Plus and Tier III Minus Air Vehicles. The automated routing system will integrate sensor collection characteristics and signature characteristics to provide routes which maximize sensor collection opportunities and air vehicle survivability. As a minimum, the mission autoRouter will facilitate the collection of 1900 spot targets per day or terrain mapping (WAS) of 40,000 sq nmi per day for the Tier II Plus Air Vehicle.

3.2.1.2.1.4 Dynamic Replanning/Retasking. The MCE will provide for sensor retasking of the air vehicle in 30 seconds or less. This timeline begins with receipt of the last bit of the request at the MCE and ends when the last bit of the retask is transmitted to the UAV. Replanning will be accomplished in a timeline commensurate with the scope of the plan change.

3.2.1.2.2 MCE Command and Control. The MCE command and control operator/position will perform configuration start-up, ATC voice interface, air vehicle flight control and monitoring, and mission support as described below.

3.2.1.2.2.1 Navigation and Flight Control. The MCE will be capable of defining and updating the air vehicle mission sensor and flight plans to support air vehicle retasking. These mission plan updates will be communicated to the air vehicle via a UHF SATCOM link or a backup C2 link. The MCE will be capable of simultaneous control of any combination of up to three Tier II Plus and Tier III Minus Air Vehicles.

3.2.1.2.2.2 ATC Clearance Operations. The MCE will provide the capability to receive, acknowledge, and respond to radio and/or landline Air Traffic Control (ATC) instructions.

3.2.1.2.3 MCE Communications. The MCE will provide the capability to receive and transmit all data required to perform and support the Tier II Plus and Tier III Minus reconnaissance and surveillance mission operations.

3.2.1.2.4 Sensor Data Processing and Monitoring. The MCE imagery quality control position/operator will perform primary image product quality control, Quick Look reports, selected image routing, and mission support.

3.2.1.2.5 Primary Product Generation and Dissemination. The MCE server and data store will perform input and storage of compressed imagery data, data compression, image formation, primary imagery distribution, and mission support.

3.2.1.2.5.1 Product Generation and Dissemination. The MCE will be capable of translating EO/IR and SAR sensor data into a format that may be disseminated to designated exploitation systems, including:

a. Common Imagery Ground/Surface Station (CIG/SS)

b. Joint Imagery Exploitation Processing System (JSIPS), JSIPS-N, JSIPS-M/TEG

c. Modernized Imagery Exploitation System (MIES)

d. U-2 Contingency Airborne Reconnaissance System (CARS)

e. Enhanced Tactical Radar Correlation (ETRAC)

f. Theater JICs, NMJIC, NPIC

The MCE will have the capability to provide the imagery output in a format that complies with National Imagery Transmission Format Standards (NITFS).

3.2.1.2.5.2 Image Data Sorting, Storage and Retrieval. Image storage within the MCE will be sized to support at least 24 hours of full mission collection at the highest date rate consistent with the 1900 spot mode and 40,000 sq nmi WAS mode. The MCE will provide means for rapid recovery and uploading to an MCE workstation for dissemination to a tactical requester based upon descriptors such as scene number or coordinates.

3.3 (30000) SUPPORT SEGMENT CHARACTERISTICS

3.3.1 System Support Operations. The Support Segment will prepare the system for operation, refurbish the system after operation, maintain the system in a mission capable condition, and deploy the system to operating locations. Operation will include data acquisition missions, ferry missions and training missions. Mission capable condition is defined as a circumstance in which the air vehicle, MCE and LRE are fully assembled, fueled and capable of operating with no known faults, but have not been configured or programmed for a particular mission.

The Support Segment will consist of eleven elements, as follows: maintenance planning, analysis and test; manpower and personnel; supply support; support equipment; technical data; training and training support; computer resources support; facilities; packaging, handling, storage and transportation; design interface; and support software.

3.3.1.1 Mission Operations Preparation. The Support Segment will provide a capability to prepare the air vehicle, MCE and LRE for operation. Preparation for operation will include configuration of system hardware and software for the assigned mission, checkout of hardware and software to verify performance to assigned mission requirements, loading and verification of mission programs, and initialization of hardware and software to a mission-start condition.

3.3.1.2 Refurbishment. The Support Segment will provide a capability to refurbish the air vehicle, MCE and LRE after completion of operation. Refurbishment will include safing to enable post operational servicing, removal of expended and/or contaminated residual materials, replenishment of consumables, and post-operational checkout/test to return the air vehicle, MCE and LRE to operation-assignment-ready condition.

3.3.1.3 Maintenance. The Support Segment will provide a capability to maintain the air vehicle, MCE, LRE, and support system in an operational condition. The maintenance capability will provide the resources to accomplish on-equipment and off-equipment maintenance.

3.3.1.4 Deployment. The Support Segment will provide a capability to prepare the MCE, LRE and support system for deployment between home and forward bases. The Support Segment will provide a capability to setup and ready the MCE, LRE and support system for operation at the deployed location. The Support Segment will provide a capability to prepare the air vehicle for a ferry mission.

4.0 SYSTEM VERIFICATION

4.1 Responsibility for Verification. Unless otherwise specified in the agreement, TRA is responsible for performing all verifications. All items must meet the applicable requirements of Section 3. The verification requirements set forth in this specification will become a part of TRA's overall verification program.

4.1.1 Verification Methods. Verification methods presented herein will apply to the Tier II Plus System. The verification of the requirements stated herein for the Air Vehicle Segment, the Ground Segment and the Support Segment are provided in the applicable segment specification.

The following verification methods are defined:

1. Inspection: An operation performed on an item, to critically examine it, and to verify its physical conformance to established and measurable criteria.

2. Analysis: An operation performed on an item by breaking it down and examining its parts and studying related data in order to determine the item's function and interrelationship; and in so doing, verify the item's ability to perform in accordance with established and measurable criteria.

3. Similarity: The application of elements of a similar system or subsystem of verified performance and equivalent environments.

4. Demonstration: An operation performed on an item under controlled conditions using defined procedures to verify the item's predicted response.

5. Test: An operation performed on an item under controlled conditions, using well-defined procedures to verify the item's performance in accordance with established and measurable criteria.

TRA and its team members will consider the following verification methods for decreasing costs.

a. Performing and submitting similarity data in lieu of testing. Equipment of similar design must have previously met its functional and performance requirements.

b. Submitting previous test results in lieu of duplicate testing.

c. Combining tests whenever applicable

4.1.2 Test Plan, Methods and Procedures Verification tests and demonstrations identified in this section by TRA will be performed in accordance with detailed test methods and procedures The test procedures will include the tests, test sequence, test criteria, and number of test units TRA will identify GFE and facility requirements. Testing will be accomplished in accordance with the program Integrated Master Schedule and the Master Test Plan. If an item has been previously tested and has met the requirements of this specification, additional testing is not required, if substantiating data/reports so indicate.

4.1.3 Test Equipment and Facilities. TRA will ensure that equipment and facilities allow for adequate accuracy, quality and have sufficient capacity to permit performance of required tests. Government facilities will be provided for Tier II Plus flight tests, and subject to approval, may be used for ground tests

4.1.4 Classification of Tests and Inspections. The inspections specified herein will be classified as follows:

a. Ground tests

b. Flight tests and Field Demonstrations

c. Quality conformance Tests and Demonstrations

4.1.5 Ground Tests. Engineering ground testing will be performed at the component, subsystem, element, and segment level on the Air Vehicle Segment, the Ground Segment and the Support Segment to support the development of the system. System level ground tests will be performed to verify integration and integrity of the system and to demonstrate that it is ready for flight test.

4.1.6 Flight Tests. Phase II flight tests, utilizing two development air vehicles, a development ground segment, and logistics support, will be performed to verify system characteristics and adequacy of design and construction of the system during checkout, taxi & takeoff, mission performance, landing, refurbishment, and maintenance. An approved General Flight Test Plan for Phase II flight tests will describe all flight testing to be performed and will list any Government material, services, and facilities required to support flight testing. In addition to verifying performance, the testing will acquire data for use in estimating the flight-life expectancy of the Tier II Plus System, and in evaluating operational safety, reliability, maintainability, availability, and supportability throughout the flight test program. The contractor flight test program will include, air worthiness and payload flights. Payload flights will verify end to end system functionality and performance.

4.1.6.1 Flight Test Instrumentation. Deleted. (Refer to Air Vehicle Segment Specification.)

4.1.7 Field Demonstrations. Field demonstration tests of the total Tier II Plus System will be performed to evaluate system effectiveness and system suitability. Field demonstration tests will be conducted with Phase III program resources that incorporate any changes resulting from Phase II testing and any preplanned upgrades identified in Phase II. Single and simultaneous deployments of the system, up to 30 days duration, will be conducted, during which the mobility and transportability requirements will be verified. Field demonstrations will be conducted by TRA in accordance with the Master Test Plan, the IMP, and the IMS The field demonstration program details will be defined by TRA and mutually agreed to by the government.

4.2 Qualification Tests and Examinations Quality conformance tests and inspections will be conducted to insure fit, form, function and performance requirements of this specification.

4.2.1 Qualification. The suitability of a system component for service in the applicable combinations of environments, as specified in 3.0.3.3, will be verified by test, analysis, or previous use. Flight critical components will be verified prior to flight tests. Non-flight critical components will be verified during Phases II and/or III prior to full rate production.

4.2.2 Quality Conformance Inspections. All items will have completed inspections and/or performance testing to demonstrate conformance with engineering and manufacturing requirements. Quality conformance inspections and tests will be documented and records retained. Quality operations will be open for government verification at any time, and the government will be notified of all significant tests, such as segment level acceptance, in sufficient time to witness such activity. TRA will be responsible for correction of defects.

Acceptance of segment items will be at the factory level. Acceptance test flights will be the responsibility of the government. Conduct of acceptance test flights will be supported by TRA.

4.2.3 Requirement-Verification Cross Reference. The following Requirements -Verification Cross Reference Table, (Table 5), indicates those System Level requirements and applicable verification methods that will be conducted in either Phase II or Phase III. Additional information on system level verification is defined in the Master Test Plan (TRA Report No. 367-5000-67R-0001).

Table 5. Requirement-Verification Cross Reference

REFERENCE PARAGRAPH	PARAGRAPH DESCRIPTION	VERIFICATION METHOD				
		INS	ANAL	SIM	DEM	TEST
3.0	(00000) HAE UAV (TIER II PLUS) SYSTEM CHARACTERISTICS					
3.0.1	Design to Price Requirement	III	II			
3.0.2.1	ATC VHF/UHF Communications		II		II, III	
3.0.2.2	Commercial Ku-band SATCOM		II		II, III	
3.0.2.3	DoD UHF SATCOM		II		II, III	
3.0.2.4	LOS Common Data Link (CDL)		II		II, III	
3.0.2.5	UHF LOS		II		II, III	
3.0.3.1.1	Transport and Storage		II		III	
3.0.3.2.1	Reliability		II, III			
3.0.3.2.1.1	Mission Reliability		II, III			
3.0.3.2.1.2	Flight Safety Reliability		II, III			
3.0.3.2.1.3	Storage Reliability		II, III			
3.0.3.2.2.1	Mission Turn Around Time		II		III	
3.0.3.2.2.2	Unscheduled Maintenance		II		III	
3.0.3.2.2.3	Scheduled Maintenance	II				
3.0.3.2.2.4	Inspections and Tests	II	II		II, III	
3.0.3.2.2.5	Built in Test (BIT)		II		II, III	
3.0.3.2.3	Operational Availability		III			
3.0.3.3.1	Transportation Environments		II		III	
3.0.3.3.1.1	P,H, S & T Shock/Acceleration Environments		II		III	
3.0.3.3.2	Ground and Support Segment Surface Environment		II		III	
3.0.3.3.3	Flight Environment		II		III	II
3.0.3.3.4	Electromagnetic Environment		II		III	II
3.0.3.3.5	Single Event Upset		II	II		
3.0.3.4	Transportability		II		III	
3.0.3.5.1	Electrical Growth		II			
3.0.3.5.2	Environmental Control Growth		II		II	
3.0.3.5.3	Processor Growth		II			
3.0.3.6	Portability	II				
3.0.3.7.1	Materials	II	II			
3.0.3.7.2	Electromagnetic Radiation		II	II	II, III	
3.0.3.7.3	Safety				II, III	
3.0.3.7.4	Human Engineering		II		II, III	
3.0.3.7.5	System Security	II	II			
3.0.3.7.6	Computer Resource Reserve Capability		II			
3.0.4.1	Maintenance		II		III	
3.0.4.2	Manpower and Personnel		II		III	
3.0.4.3	Supply Support		II		III	
3.0.4.4	Support Equipment		II		II, III	
3.0.4.5	Technical Data		II		III	
3.0.4.6	Training and Training Support		II		III	
3.0.4.7	Computer Resources Support		II		III	
3.0.4.8	Facilities		II		III	
3.0.4.9	Deployment		II		III	

Where : INS = Inspection, Anal = Analysis, Sim = Similarity, Dem = Demonstration, and Test = Test
Phase II Verification is indicated by II, Phase III Verification is indicated by III

Table 5. Requirement-Verification Cross Reference (Continued)

REFERENCE PARAGRAPH	PARAGRAPH DESCRIPTION	VERIFICATION METHOD				
		INS	ANAL	SIM	DEM	TEST
3.0.5	Qualification				II	III
3.1	(10000) AIR VEHICLE SEGMENT CHARACTERISTICS					
3.1.1	Air Vehicle Segment Composition	II				
3.1.1.1.1	Standard Mission Performance Requirements		II		III	II
3.1.1.1.1.1	Cruise/Loiter Capability		II		III	II
3.1.1.1.1.2	Initial Climb Capacity		II		III	II
3.1.1.1.1.3	Fuel Allowances		II		III	II
3.1.1.1.1.4	Payload Configuration	II				
3.1.1.1.2	Takeoff and Landing Capability		II		III	II
3.1.1.1.3	Takeoff Abort		II		II, III	
3.1.1.1.4	Landing Abort/Waveoff		II		II, III	
3.1.1.1.5	Air Vehicle Payload Capacity				II, III	
3.1.1.1.6	Payload Removal/Replacement		II		II, III	
3.1.1.1.7	Propulsion Performance		II			
3.1.1.2	Air Vehicle Payload	II	II			
3.1.1.2.1	Imaging Sensors				II	
3.1.1.2.1.1	SAR Sensor Characteristics		II		II, III	
3.1.1.2.1.1.1	Wide Area Search Mode		II		II, III	II
3.1.1.2.1.1.2	Spot Light Mode		II		II, III	II
3.1.1.2.1.1.3	GMTI Mode		II		II, III	II
3.1.1.2.1.1.4	SAR Image Quality Requirements		II			
3.1.1.2.1.1.5	SAR Geo-Location		II		III	II
3.1.1.2.1.2	EO/IR Sensor Characteristics	II	II			
3.1.1.2.1.2.1	EO/IR Environmental Constraints		II			
3.1.1.2.1.2.2	Wide Area Search Mode		II		III	II
3.1.1.2.1.2.3	Spot Collection Mode		II		III	II
3.1.1.2.1.2.4	Point Target Mode		II		II, III	
3.1.1.2.1.2.5	Stereo Mode		II		II, III	
3.1.1.2.1.2.6	EO/IR Geo-Location		II		III	II
3.1.1.2.2	Communication Functions	II	II			
3.1.1.2.2.1	Command and Control Communications		II		II, III	
3.1.1.2.2.2	Airborne Relay Provisions	III				
3.1.1.2.2.3	LOS CDL Imagery Link		II		II, III	
3.1.1.2.2.4	Ku SATCOM Imagery Link		II		II, III	
3.1.1.2.3	Data Storage Capability				III	II
3.1.1.2.4	Survivability Capability				II	
3.1.1.3	Avionics Capability	II			II, III	
3.1.1.3.1	Air Vehicle Guidance		II		II, III	
3.1.1.3.1.1	Flight Termination Subsystem		II			
3.1.1.3.1.2	Mission Termination		II			
3.1.1.3.2.1	Takeoff and Landing Navigation Accuracy		II		III	II
3.1.1.3.2.2	Controlled Airspace Navigation Accuracy		II		II, III	
3.1.1.3.3.1	Air Vehicle Flight Control		II		II, III	

Where : INS = Inspection, Anal = Analysis, Sim = Similarity, Dem = Demonstration, and Test = Test
Phase II Verification is indicated by II, Phase III Verification is indicated by III

Table 5. Requirement-Verification Cross Reference (Continued)

REFERENCE PARAGRAPH	PARAGRAPH DESCRIPTION	VERIFICATION METHOD				
		INS	ANAL	SIM	DEM	TEST
3.1.1.3.3.2	Air Vehicle Taxi, Takeoff and Landing Control on the Ground		II		II, III	
3.1.1.3.3.3	Air Vehicle Sensor Control		II		II, III	
3.1.1.3.3.4	Air Vehicle Communication Control		II		II, III	
3.1.1.3.3.5	Air Vehicle Subsystem Control		II		II, III	
3.1.1.3.3.6	Air Vehicle Subsystem Status Reporting		II		II, III	
3.1.1.3.4	Air Vehicle Mission Updates		II		II, III	
3.2	(20000) GROUND SEGMENT CHARACTERISTICS					
3.2.1.1.1	Self-Sustaining Operations	II			III	
3.2.1.1.2	LRE Command and Control	II				
3.2.1.1.2.1	Takeoff Abort				II, III	
3.2.1.1.2.2	Landing Abort Waveoff				II, III	
3.2.1.1.2.3	Air Vehicle Command and Control				II, III	
3.2.1.1.2.4	LRE-UAV Checkout				II, III	
3.2.1.1.3	LRE Mission Planning	II				
3.2.1.1.3.1	Mission Plan Download Capability				II, III	
3.2.1.1.3.2	Mission Planning Capability				II, III	
3.2.1.1.4	LRE Communications	II				
3.2.1.1.4.1	Command and Control Communication Links	II			II, III	
3.2.1.1.4.2	ATC Communication Capability				II, III	
3.2.1.2.1	MCE Mission Planning				II, III	
3.2.1.2.1.1	Mission Management				II, III	
3.2.1.2.1.2	Mission Planning Software				II, III	
3.2.1.2.1.3	Automatic Routing		II			
3.2.1.2.1.4	Dynamic Replanning/Retasking				III	II
3.2.1.2.2.1	Navigation and Flight Control				II, III	
3.2.1.2.2.2	ATC Clearance Operations				III	
3.2.1.2.3	MCE Communications				II, III	
3.2.1.2.4	Sensor Data Processing and Monitoring				II, III	
3.2.1.2.5	Primary Product Generation and Dissemination				II, III	
3.2.1.2.5.1	Product Generation and Dissemination		II		II, III	
3.2.1.2.5.2	Image Data Sorting, Storage and Retrieval		II		III	II
3.3	(30000) SUPPORT SEGMENT CHARACTERISTICS					
3.3.1	System Support Operations		II		III	
3.3.1.1	Mission Operations Preparation		II		II, III	
3.3.1.2	Refurbishment		II		II, III	
3.3.1.3	Maintenance		II		II, III	
3.3.1.4	Deployment		II		III	

Where : INS = Inspection, Anal = Analysis, Sim = Similarity, Dem = Demonstration, and Test = Test
Phase II Verification is indicated by II, Phase III Verification is indicated by III

TIER II PLUS
HIGH ALTITUDE ENDURANCE
UAV SYSTEM

Attachment 3 — Contracts Security Classification Specification (DD254)

AGREEMENT MDA972-95-3-0013

31 JULY 1995

ATTACHMENT 3 -- CONTRACTS SECURITY CLASSIFICATION SPECIFICATION (DD 254)

A. SECURITY OVERVIEW

Teledyne Ryan Aeronautical (TRA) has a TOP SECRET Facility clearance granted by the Defense Investigative Service (DIS) on 26 January 1971 with TOP SECRET storage capability. TRA meets or exceeds all of the security requirements of this agreement. TRA and its primary team of subcontractors hold TOP SECRET Facility clearances with the Department of Defense. All classified work will be done in compliance with the Industrial Security Manual, DoD 5220.22M, or the NISPOM and in accordance with the guidelines set forth in the DD 254.

Computers used for collateral classified processing will be accredited by DIS and contained within DIS approved closed areas. All information is provided total protection at all times. All program personnel requiring access to classified program material will possess at minimum a DoD granted SECRET clearance. All program personnel with a need to access SCI material have TOP SECRET clearances based on a single scope background investigations. TRA does not allow any foreign national employees or employees of subcontractors to have access to information of this type. The SCI Management structure will include CSSO designated personnel at each level of contract performance, e.g., TRA/subcontractors. Our access management structure will be organized by technical requirements. An annual reassessment of the need for each SCI access requirement at TRA and the subcontractors will be conducted.

The TRA team is comprised of leaders in the defense industrial community and have years of involvement with Sensitive Compartmented Information and Department of Defense classified programs. Their knowledge and experience will enhance program efforts to develop a compatible and interoperable product with existing systems while ensuring protection of the program and compliance with DoD regulations.

E-Systems, Inc. will utilize its Sensitive Compartmented Information Facilities (SCIF) for receipt and storage of SCI. There is adequate space available in the existing SCIF to accommodate all anticipated SCI processing. All SCI work is conducted within the SCIF. Procedures are in place to manage SCI-related visits and to preclude hand carrying any SCI material aboard aircraft flights without the prior approval of the Special Security Officer (SSO). An SCI management structure and operating procedures are in place. The Contractor's Special Security Officer (CSSO) will monitor any requests for SCI, performance or technical, and access requests will be submitted through proper channels. Upon completion and accreditation of TRA's SCIF at 2701 North Harbor Drive, San Diego, California, all SCI will be transmitted and stored at this facility.

Procedures for the proper classification of information generated in this contract are in place. Special provisions for the classification of SCI information are well understood and we have an active Defense Courier Service account. We have in place operating procedures for the management of access to store, reproduce, release, and dispose of all intelligence data. Compliance with these procedures is inspected regularly.

Teledyne Ryan Aeronautical and its team members recognize ARPA's need to provide protection to the Essential Elements of Friendly Information pertaining to the Tier II Plus Program. The events and their components which occur during the planning, preparatory and execution stages of this activity from development to acquisition create vulnerabilities that even in the securest environment may be subject to adversary exploitation. TRA and its team will analyze the actions and data relating to these stages and assess planned actions for detectable indicators, evaluating vulnerability to hostile exploitation and develop effective security measures and intelligence countermeasures.

DEPARTMENT OF DEFENSE

CONTRACT SECURITY CLASSIFICATION SPECIFICATION

(The requirements of the DoD Industrial Security Manual apply to all security aspects of this effort.)

1. CLEARANCE AND SAFEGUARDING

a. FACILITY CLEARANCE REQUIRED
TOP SECRET

b. LEVEL OF SAFEGUARDING REQUIRED
TOP SECRET

2. THIS SPECIFICATION IS FOR: *(X and complete as applicable)*

X	a. PRIME CONTRACT NUMBER: MDA972-95-3-0013	
	b. SUBCONTRACT NUMBER	
X	c. SOLICITATION OR OTHER NUMBER: PS94-33	Due Date (YYMMDD): 940601

3. THIS SPECIFICATION IS: *(X and complete as applicable)*

			Date (YYMMDD)
X	a. ORIGINAL *(Complete date in all cases)*		941018
X	b. REVISED *(Supersedes all previous specs)*	Revision No. 1	950731
	c. FINAL *(Complete Item 5 in all cases)*		

4. IS THIS A FOLLOW-ON CONTRACT? [ ] YES [X] NO. If Yes, complete the following:

Classified material received or generated under ____________ *(Preceding Contract Number)* is transferred to this follow-on contract.

5. IS THIS A FINAL DD FORM 254 ? [ ] YES [X] NO. If Yes, complete the following:

In response to the contractor's request dated ____________, retention of the identified classified material is authorized for the period of ____________.

6. CONTRACTOR *(Include Commercial and Government Entity (CAGE) Code)*

a. NAME, ADDRESS, AND ZIP CODE
TELEDYNE RYAN AERONAUTICAL
P.O. BOX 85311 (MAILING)
SAN DIEGO, CA 92186-5311
2701 N. HARBOR DRIVE (PHYSICAL)
SAN DIEGO, CA 92101-5311

b. CAGE CODE
78022

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*
PACIFIC REGION, DIS
SOUTHERN SECTOR
3605 LONG BEACH BLVD., SUITE 405
LONG BEACH, CA 90807 4013

7. SUBCONTRACTOR

a. NAME, ADDRESS, AND ZIP CODE

b. CAGE CODE

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*

8. ACTUAL PERFORMANCE

a. LOCATION

b. CAGE CODE

c. COGNIZANT SECURITY OFFICE *(Name, Address, and Zip Code)*

9. GENERAL IDENTIFICATION OF THIS PROCUREMENT

HIGH ALTITUDE ENDURANCE UNMANNED AERIAL VEHICLE (TIER II+) (HAE UAV) DESIGN AND DEVELOPMENT CONTRACT
TIER II+ PROGRAM MANAGER: DR. JOHN ENTZMINGER
ESTIMATED COMPLETION DATE (PHASE I): February 1998

10. THIS CONTRACT WILL REQUIRE ACCESS TO:

		YES	NO
a.	COMMUNICATIONS SECURITY (COMSEC) INFORMATION	X	
b.	RESTRICTED DATA		X
c.	CRITICAL NUCLEAR WEAPON DESIGN INFORMATION		X
d.	FORMERLY RESTRICTED DATA		X
e.	INTELLIGENCE INFORMATION:		
	(1) Sensitive Compartmented Information (SCI)	X	
	(2) Non-SCI	X	
f.	SPECIAL ACCESS INFORMATION		X
g.	NATO INFORMATION		X
h.	FOREIGN GOVERNMENT INFORMATION		X
i.	LIMITED DISSEMINATION INFORMATION		X
j.	FOR OFFICIAL USE ONLY INFORMATION	X	
k.	OTHER (Specify) TIER II+ PROGRAM SENSITIVE INFORMATION	X	

11. IN PERFORMING THIS CONTRACT, THE CONTRACTOR WILL:

		YES	NO
a.	HAVE ACCESS TO CLASSIFIED INFORMATION ONLY AT ANOTHER CONTRACTOR'S FACILITY OR A GOVERNMENT ACTIVITY		X
b.	RECEIVE CLASSIFIED DOCUMENTS ONLY		X
c.	RECEIVE AND GENERATE CLASSIFIED MATERIAL	X	
d.	FABRICATE, MODIFY, OR STORE CLASSIFIED HARDWARE	X	
e.	PERFORM SERVICES ONLY		X
f.	HAVE ACCESS TO U.S. CLASSIFIED INFORMATION OUTSIDE THE U.S., PUERTO RICO, U.S. POSSESSIONS AND TRUST TERRITORIES		X
g.	BE AUTHORIZED TO USE THE SERVICES OF DEFENSE TECHNICAL INFORMATION CENTER (DTIC) OR OTHER SECONDARY DISTRIBUTION CENTER	X	
h.	REQUIRE A COMSEC ACCOUNT	X	
i.	HAVE TEMPEST REQUIREMENTS	X	
j.	HAVE OPERATIONS SECURITY (OPSEC) REQUIREMENTS	X	
k.	BE AUTHORIZED TO USE THE DEFENSE COURIER SERVICE	X	
l.	OTHER (Specify)		

12. PUBLIC RELEASE. Any information (classified or unclassified) pertaining to this contract shall not be released for public dissemination except as provided by the Industrial Security Manual or unless it has been approved for public release by appropriate U.S. Government authority. Proposed public releases shall be submitted for approval prior to release

[ ] Direct [X] Through (Specify)

ARPA/TIO, 3701 N. FAIRFAX DRIVE, ARLINGTON, VA 22203-1714

NO PUBLIC RELEASE OF SCI AUTHORIZED

to the Directorate for Freedom of Information and Security Review, Office of the Assistant Secretary of Defense (Public Affairs)* for review.

* In the case of non-DoD User Agencies, requests for disclosure shall be submitted to that agency.

13. SECURITY GUIDANCE. The security classification guidance needed for this classified effort is identified below. If any difficulty is encountered in applying this guidance or if any other contributing factor indicates a need for changes in this guidance, the contractor is authorized and encouraged to provide recommended changes; to challenge the guidance or the classification assigned to any information or material furnished or generated under this contract; and to submit any questions for interpretation of this guidance to the official identified below. Pending final decision, the information involved shall be handled and protected at the highest level of classification assigned or recommended. *(Fill in as appropriate for the classified effort. Attach, or forward under separate correspondence, any documents/guides/extracts referenced herein. Add additional pages as needed to provide complete guidance.)*

10d. COMSEC information required for STU-III, network interfaces, and communications links.

10e. (1) ARPA SCI guidance (attached).
10e. (2) ARPA Policy on Release of Classified Intelligence Material to U.S. Contractors - Collateral (attached).

10.k. TIER II+ Program Sensitive Information - Will be handled in the same manner as FOR OFFICIAL USE ONLY (FOUO) material (see Chapter 13, Section 6, ISM). Electronic transmission of all TIER II+ program sensitive information must be accomplished in such a manner that the information is always under control (i.e. faxing between program site locations, using the TIER II+ CAVNet, encrypted modem link between TRA and its suppliers).

11c. Classified documents generated by this contract must be marked in accordance with the DoD 5220.22-M, "National Industrial Security Program" Operating Manual, ARPA SCG 154, or the source document used. Classification guidance has been provided in the ARPA Security Classification Guide No. 154 "High Altitude Endurance Unmanned Aerial Vehicle," (Tier II+). The contractor is authorized to release classified information up to the Secret level under this contract to the associated Tier II+ contractors (see attached list).

11d. Classified equipment and COMSEC equipment will be modified, stored, and/or used.

11.i. TEMPEST maybe required for SCI. See ARPA SCI Guidance (attached).

11j. OPSEC requirements, to include the need for an OPSEC PLAN, will be identified, as necessary, during the contract performance the HAE UAV Joint Program Office.

14. ADDITIONAL SECURITY REQUIREMENTS. Requirements, in addition to ISM requirements, are established for this contract. *(If Yes, identify the pertinent contractual clauses in the contract document itself, or provide an appropriate statement which identifies the additional requirements. Provide a copy of the requirements to the cognizant security office. Use Item 13 if additional space is needed.)* [X] Yes [ ] No

DIAM 50-5, Volumes I and II.

15. INSPECTIONS. Elements of this contract are outside the inspection responsibility of the cognizant security office. *(If Yes, explain and identify specific areas or elements carved out and the activity responsible for inspections. Use Item 13 if additional space is needed.)* [X] Yes [ ] No

DIA has security cognizance over the SCIF.

16. CERTIFICATION AND SIGNATURE. Security requirements stated herein are complete and adequate for safeguarding the classified information to be released or generated under this classified effort. All questions shall be referred to the official named below.

a. TYPED NAME OF CERTIFYING OFFICIAL	b. TITLE	c. TELEPHONE (Include Area Code)
Kathleen Pulzone	Contracting Officer for Security Matters	(703) 696-2389

d. ADDRESS (Include Zip Code)
Advanced Research Projects Agency (ARPA)
3701 N. Fairfax Drive
Arlington, VA 22203-1714

e. SIGNATURE
Kathleen Pulzone

17. REQUIRED DISTRIBUTION

- [X] a. CONTRACTOR
- [ ] b. SUBCONTRACTOR
- [X] c. COGNIZANT SECURITY OFFICE FOR PRIME AND SUBCONTRACTOR
- [ ] d. U.S. ACTIVITY RESPONSIBLE FOR OVERSEAS SECURITY ADMINISTRATION
- [ ] e. ADMINISTRATIVE CONTRACTING OFFICER
- [X] f. OTHERS AS NECESSARY ARPA S&TO

ATTACHMENT TO DD FORM 254: MDA972-95-3-0013

TIER II+ Associated Contractors:

Loral
CAGE: 1V436
P.O. Box 16225
Salt Lake City, UT 84116-0225

E Systems (Melpar Division)
CAGE: 04071
7700 Arlington Blvd.
Falls Church, VA 22046-1572

Hughes Aircraft Company
Aerospace & Defense Sector Radar
CAGE: 4U884
P. O. Box 92426
Los Angeles, CA 90009-2426

Hughes Aircraft Company
Aerospace & Defense Sector Elect-Opt
CAGE: 3U331
2000 East El Segundo Blvd.
El Segundo, CA 90245

GDE Systems
CAGE: 0C9M0
16250 Technology Drive
San Diego, CA 92127-1816

E Systems (Garland)
CAGE: 97871
P.O. Box 660023
Dallas, TX 75266-0023

Allied Signal Aerospace Hqs.
CAGE: 72599
2525 West 190th Street
Torrance, CA 90509-6099

Ascent Logic Corporation
CAGE: 0A4G5
180 Rose Orchard Way
Suite 200
San Jose, CA 95134

National Technologies Association
CAGE: 2Y994
3645 Ruffin Road, Suite 230
San Diego, CA 92123-1868

ATTACHMENT TO DD FORM 254: MDA972-95-3-0013

(CONTINUED) TIER II+ Associated Contractors:

B&M Associates
CAGE: 3S217
199 Cambridge Road
Woburn, MA 01801

Litton
5500 Canoga Ave.
Woodland Hills, CA 91367 6698

E Systems (Raytheon)
Goleta, CA

ATTACHMENT TO DD FORM 254 FOR CONTRACT NO: MDA972-95-3-0013

SUBJECT: Policy on Release of Classified Intelligence Material to U.S. Contractors - (Collateral)

References:
(a) DIAR 50-1, Release of Classified Intelligence Material to U.S. Contractors, 24 August 1976
(b) DIAR 50-20, Visits of Contractor Personnel to Defense Intelligence Agency (DIA), 27 August 1982
(c) DoD 5220.22-M, National Industrial Security Program Operating Manual, dated January 1995

This attachment to DD Form 254 sets forth DoD policy and procedures governing the disclosure of visual, oral, or documentary classified intelligence material to eligible ARPA sponsored contractors as follows.

1. Requests for visits to Defense Intelligence Agency (DIA) and release of classified material to contractors should be submitted through ARPA Technical Information Officer (TIO) to DIA/S 03C as early as possible after the contract has been awarded. The recipient should be prepared to receive and use microfiche copies in lieu of hard-copy documents. All requests for services must contain the following information:

   a. Document title (full and short), number and date.

   b. Document classification.

   c. Identification of the contractor, contract number, expiration date, purpose of the contract and justification (advantage to the government, relevancy of the contract, etc.) for release.

   d. Identification and address of the accredited facility authorized to receive and store the material.

   e. Name of responsible official document custodian.

   f. Name of person(s) to whom the material is to be released.

   g. Whether or not the material is on hand or will have to be forwarded.

   h. Current DD Form 254.

   i. Statement of Work (only the scope and applicable task required).

i. Contracting Officer's Representative appointment letter to include organization and phone number.

2. The security procedures for visitor authorization are as follows:

a. DIA Point of Contact.

b. Contract number.

c. Contractor's name.

d. Date of visit.

e. Need-to know/justification.

f. Requests for visits require 10 working days prior notification to DIA/OS (Visitor Control).

3. The following DIA/S-03C services are available in support of contracts:

a. Preliminary consultation.

b. Bibliography of applicable publications.

c. Document loans:

(1) 30-day loans.

(2) Duration of Contract loans (10 months or longer).

d. Routine documents should be ordered thru ARPA Account A013.

e. Assistance in obtaining release authority on documents marked:

(1) Dissemination and Extraction of Information Controlled by Originator (ORCON).

(2) Caution - Proprietary Information Involved (PROPIN).

f. Prearranged disclosure of documents to contractors

(1) Personal visits are authorized only through ARPA/TIO

(2) Contractors should be instructed to call ARPA/TIO

instead of DIA/S-03C or DIA's analytical offices for guidance.

(3) Special mailing instructions.

(4) Contractors cannot have access to the Library.

ARPA/TIO can give permission to mail directly to the contractor's facility providing proper facility clearances are provided. This should appear in the contractor's letter of request.

4. It is the responsibility of the ARPA/TIO to maintain records of all classified information provided to a contractor and to retrieve and/or ensure proper disposition of the material upon completion and/or expiration of the contract.

5. Requirements on termination of the contract:

a. All intelligence information furnished by the contractor remains the property of the originating agency. Unless retention or destruction is authorized by DIA, all material will be returned by ARPA/TIO or the contractor to DIA upon completion of the contract.

b. Copies of the disposition instructions provided by the ARPA/TIO on completed contracts will be maintained by the user agency for record purposes. If disposition instructions are not received within 60 days of contract completion or if retention is not authorized by the DD Form 254 for a follow-on contract, the Contractor Security Officer will initiate a request to the ARPA/TIO for disposition instructions.

6. In addition to the requirements set forth in reference c. the following controls must be maintained by the contractor.

a. The contractor will maintain accountability for all intelligence material released to their custody.

b. The contractor may not reproduce intelligence material without written permission from ARPA/TIO. If permission is granted, all copies will be controlled in the same manner as the originals.

c. The contractor will not destroy any intelligence information without the permission of ARPA/TIO.

d The contractor must restrict access to only those individuals who possess the necessary security clearance and who are actually providing services under the contract. Further dissemination, to include subcontractors, or other Government agencies, is prohibited unless authorized in writing by ARPA/TIO.

e Intelligence information will not be released to foreign nationals or to immigrant aliens, regardless of their level of security clearance, without written permission of the originator.

f. The contractor will assure that each individual having access to intelligence information is fully aware of the special security requirements involved.

g. Reports produced by contractors incorporating intelligence information will not be distributed prior to written approval obtained from the ARPA/TIO. A DRAFT copy of the report, together with a tentative security classification and a suggested distribution list, will be submitted to ARPA/TIO.

h. Reports produced by contractors, incorporating intelligence information will not be deposited in the Defense Technical Information Center (DTIC). If practicable, a separate annex containing the intelligence information should be considered so that the basic study may be placed in DTIC.

7. Questions regarding the foregoing should be referred to ARPA/TIO (703) 696-2301.

Continuation from Item 13

Contract No. MDA972-95-3-0013

Ref. Item 14: DIAM 50-5
Ref. Item 15: The Cognizant Security Authority for SCI is the Defense Intelligence Agency, through the Special Security Contact Office (SSCO), Advanced Research Projects Agency (ARPA), 3701 North Fairfax Drive, Room 922, Arlington, VA 22203-1714.

Item 10. e. (1):
This contract requires access to Sensitive Compartmented Information (SCI). The Advanced Research Projects Agency has exclusive security responsibility for such information released to the contractor or developed under this contract. DCID 1/21 and DIAMs 50-4 and 50-5 provide the necessary guidance for physical, personnel, and information security measures and is a part of the security specifications for this contract. Defense Investigative Services is relieved of responsibility for all SCI material/information released to the contractor under this contract. SCI will not be released to contractor employees without specific release approval of the originator. Prior approval and certification of need-to-know shall be obtained from the appropriate Contract Monitor on all such releases of SCI material furnished in support of this contract. All SCI material remains the property of the releasing Government User Agency. Upon completion or cancellation of the contract, SCI materials previously furnished will be returned to the direct custody of the SSCO/ARPA (unless other disposition instructions have been issued through the SSCO/ARPA). Should the contract require a final report produced at the SCI level, contact the ARPA SSCO for instructions.

SSCO/ARPA 8/1/95
Date

TIER II PLUS
HIGH ALTITUDE ENDURANCE UAV SYSTEM

Attachment 4 — Government Furnished Property

AGREEMENT MDA972-95-3-0013
31 JULY 1995

I:TLCREV.DOC[T2PH2]

AGREEMENT

ATTACHMENT 4 — GOVERNMENT FURNISHED PROPERTY

The following Government-Furnished Property (GFP) is to be provided in support of Phases II and III in accordance with Article XV.

A.1. **Government-Owned Special Test Equipment.** Government-owned special test equipment (Table A4-1) is currently available at the Loral Communication System facility in Salt Lake City, Utah under Contract F09604-95-C-0011, and authorization will be obtained for its use in performance of Phases II and III on a rent-free, non-interference basis.

Table A4-1. Government-Owned Special Test Equipment

ITEM	DESCRIPTION	QUANTITY	
1	MIST Test Bed (w/KMS Computer), P/N 7650787-00	1 Set	May 96
2	TMET Test Bed, P/N 8100600	1 Set	May 96
3	Common Data Link (CDL) Test Equipment Set	1 Set	June 96

A.2 **Deliverable System GFP.** Government-furnished property to be integrated into the deliverable systems (Tables A4-2A, -2B and -2C) will be requisitioned for delivery to E-Systems, Melpar Division, Falls Church, Virginia or Loral Communication Systems, Salt Lake City, Utah, as indicated on the respective tables.

Table A4-2A. Deliverable System GFP (E-Systems)

ITEM	SYSTEM	DESCRIPTION	QUANTITY	DATE REQUIRED
1	Core Automated Maintenance System (CAMS)	Software and Documentation	1 Lot	August 1995
2	Air Force Mission Support System (AFMSS)	AWE-to-Common Interface C2.0 including: Volume 1 AWB Developer's Guide Volume 2 – AWE to Common Interface Control document (#1 - 15 or most current) and future upgrades	1 Each	August 1995 and ASAP
3	Air Force Mission Support System (AFMSS)	AFMSS C2.0 Tapes, current and future upgrades	1 Each	August 1995 and ASAP
4	AFMSS Software User's Manual	#PTO 31S5-4-2362-18-1 and C2.0 updates	1 Each	August 1995 and ASAP
5	AFMSS Computer System Operations Manual	#PTO 31S5-4-2362-11 and C2.0 updates	1 Each	August 1995 and ASAP
6	Air Force Mission Support System (AFMSS)	DAFIF CD-ROM, current and future updates	1 Each	August 1995 and ASAP
7	Air Force Mission Support System (AFMSS)	CMS Phase II data (GNC-1, DTED (1-42), JNC (1-5), JOG (1-25), ONC (1-9), TPC (1-27))	1 Each	August 1995
8	Two (2) diesel generators for remote power to ground equipment. Houston Fearless' 76 redundant 30 KW and 90 KW, 200 V, 3-Phase units	—	1 Set (consisting of one (1) 30 KW and one (1) 90 KW generator)	August 1996
9	Commander's Tactical Terminal Hybrid/Receive Only	R-2536/USR 5	1 Each	April 1996
10	Air Force Dial-In Service Weather Software	—	1 Each	August 1995

Table A4-2B. Deliverable System GFP (E-Systems)

ITEM	PART NUMBER	EQUIPMENT	QUANTITY	DATE REQUIRED
1	KIV-7	4061222-0504; MCE interface with JFACC tasking authority	2 Each	April 1996
2	KIV-7 Rack Kit	4061242-0501; installs items in MCE	1 Each	April 1996
3	KG-194A	T1 lines to exploitation systems, LRE, JDISS	4 Each: 2 in MCE 1 in LRE 1 Spare	April 1996
4	KG-95-R	T3 lines to exploitation systems	2 Each; contains two KG-95-2 each.	April 1996
5	KOI-18	Keying Device	2 Each: 1 for LRE 1 for MCE	April 1996
6	KYK-13	Keying Device	2 Each: 1 for LRE 1 for MCE	April 1996
7	Crypto Rack Mount Kits and Hardware	TBD	TBD	April 1996

Table A4-2C. Deliverable System Crypto GFP (Loral) *

ITEM	LINK NAME	KGV-68B	KGV-135	INDICTOR	RAILMAN	CTIC
1	A/B LOS CDL Link	2	2	—	—	—
2	A/B SATCOM Ku Link	4	—	—	—	—
3	A/B LOS UHF Link	—	—	4	—	2
4	A/B UHF SATCOM Link	—	—	4	—	2
5	GND LRE SATCOM UHF	—	—	—	1	1
6	GND LRE LOS UHF	—	—	2	1	1
7	GND MCE SATCOM UHF	—	—	—	3	1
8	GND MCE LOS UHF	—	—	2	1	1
9	GND MCE SATCOM Ku	2	—	—	—	—
10	GND MIST	—	2	—	—	—
11	Spares	2	2	2	2	2
	Total with Spares	10	6	14	10	10

* Delivery required at Loral no later than December 1995

Table A4-3. Government-Inventory Support Equipment

ITEM	HANDLING / SERVICE / TEST EQUIPMENT	TRA SAN DIEGO FACTORY QTY. & NEED DATE	EAFB QTY. & NEED DATE	PHASE II TOTAL	USAGE / REMARKS
1	10001 and 30003 - 61A108J1-1 Preoiler NSN 4930-00-688-5119 $3060	1 June 1996	0 —	1	Load oil into UAV
2	28871 - H250-1 Hydraulic Fluid Service Unit NSN 1730-00-181-4716 $670	1 June 1996	1 Sept 1996	2	Load hydraulic fluid into UAV
3	07878 - A/S32A-30 Aircraft Towing Tractor NSN 1740-01-099-6294 $13,000	0 —	1 Sept 1996	1	Tow UAV and support eqmt. 6,000 lbs drawbar pull, gasoline engine. Also P/N JG40PT
4	10001 - NAN-3 Nitrogen Service Unit NSN 3655-01-112-4943 $27,500	1 June 1996	1 Sept 1996	2	Fill tires, purge compart-ments. Also P/N 322AS100-1.
5	81349 - B-1 Personnel Maintenance Platform NSN 1730-00-529-6235 $12,000	0 —	2 Sept 1996	2	Access high UAV eqmt. 3-10 ft height. P/N 1560EG100
6	82386 - NC-10B Electric Power Plant NSN 6115-00-933-5397 $12,800	0 —	2 Sept 1996	2	External power source for test. 115VAC, 3 phase, 400 Hz
7	80058 - AM27T-11 Hydraulic Test Stand NSN 4920-01-169-4744 $23400	1 June 1996	1 Sept 1996	2	Engine-off hydraulic pressure
8	BT400-10 Heater P/N 8997094 NSN 4920-00-620-4055 $2518	0 —	1 Sept 1996	1	Warm fuel in external heat exchanger for cold weather operation. 400 KBTU, 810 cu ft/min, gasoline engine
9	76823 Aircraft Towbar P/N 6-76013-1 NSN 1730-00-017-8885 $1001	1 June 1996	1 Sept 1996	2	Adapt nose wheel to tow vehicle
10	00994 Aircraft Jacks P/N 810D1100 NSN 1730-01-182-0231 $4830	4 June 1996	4 Sept 1996	8	Gear drop checks, airframe repair
11	Aircraft Scale Set NSN 6670-00-805-6779 $4830	1 June 1996	1 Sept 1996	2	UAV weight and CG
12	Battery Charger/Analyzer P/N CASP 2000H(M) P/N 121644-001 Model PP-8333/U NSN 6130-01-341-2073 $9625	1 June 1996	1 Sept 1996	2	Charge UAV batteries
13	Deleted	0 —	0 —	0	Deleted
14	81755 Test Set, Preload Armament Circuits NSN 4920-01-006-1088 P/N 16U75060-1 $31077	1 Oct 1996	0 —	1	Check circuits before installing decoy release pyros
15	Borescope P/N 2002AS100-1 NSN 6650-01-283-3771 $6410	1 June 1996	1 Sept 1996	2	Inspect engine interior
16	Light Source for Borescope P/N 21C8559P01 NSN 6650-01-138-1711 $4390	1 June 1996	1 Sept 1996	2	
17	Ground Strap P/N 2560302 NSN 1730-00-102-7176 $26.42	2 June 1996	2 Sept 1996	4	Static ground UAV
18	Handling/Maintenance Dolly (Use GSU-124/E Truck, Guided Missile, NSN 4935-00-870-1837)	3 June 1996	1 Sept 1996	4	Mobilizer for handling adapters
19	Tiedown Aircraft Mooring TD-1A P/N 61A101D NSN 1730-00-572-7370 $73	12 June 1996	12 Sept 1996	24	Moor UAV at parking spot
20	MJ-3-3B1J6 Loading Trailer NSN 1730-00-843-4997 $29910	1 June 1996	1 Sept 1996	2	Remove/install SAR antenna, processor and Xmitter, EO/IR turret, SATCOM antenna
21	Wheel Dolly P/N PDG 2172B AHU-24/E NSN 1730-01-344-3545 $15600	3 May 1996	3 Sept 1996	6	Position UAV in cramped spaces

Table A4-3. Government-Inventory Support Equipment (continued)

ITEM	HANDLING / SERVICE / TEST EQUIPMENT	TRA SAN DIEGO FACTORY QTY. & NEED DATE	EAFB QTY. & NEED DATE	PHASE II TOTAL	USAGE / REMARKS
22	01413 - 100628A Model 4000 Engine Handling Trailer, NSN 1730-00-294-3397 $5838	2 June 1996	2 Sept 96	4	Transport/handle engine
23	36024 - 8446000 Engine Start Unit NSN 3825-01-213-9272 $80,903	1 June 1996	1 Sept 96	2	Supply engine start air
24	Serial Protocol Analyser HP-4957A NSN 6625-01-364-6355 $10995	1 May 1996	1 Sept 96	2	
25	45413 - AN/APM-424(V)2 IFF Test Set NSN 6625-01-152-6705 $27,110	1 June 1996	1 Sept 96	2	IFF RF link check
26	Bus Analyser SBA-100F NSN 6625-01-256-6026 $20000	1 June 1996	1 Sept 96	2	
27	Time Delay Reflectometer TEK AN/USM 437(V1) NSN 6625-01-030-0993 $7119	1 June 1996	1 Sept 96	2	
28	81349 - TTU-205D Air Data Test Set NSN 4920-01-141-0974 $54,787	1 June 1996	1 Sept 96	2	Check pitot and static plumbing and transducer system
29	TEK22342 Oscilloscope w/10, 12, 3R NSN 6625-01-110-9586 $32,735	1 Aug 1995	1 Sept 96	2	FIT all SAR LRUs
30	HP8563E Spectrum Analyzer, w/Option 6 NSN 6625-01-355-8241 $27,320	1 Aug 1995	1 Sept 96	2	FIT all SAR LRUs and data links
31	HP1661A Logic Analyzer, NSN6625-01-386-6575, $10,028	1 Aug 1995	1 Sept 96	2	FIT all SAR LRUs and data links
32	Power Meter HP-437B NSN 6625-01-316-6448 $2,600	1 Aug 1995	1 Sept 96	2	FIT SAR transmitter and data links
33	Power Sensor HP-8481H NSN 6625-01-297-2594 $1,161	1 Aug 1995	1 Sept 96	2	FIT SAR transmitter
34	HP4778-50 Attenuator NSN 5995-01-183-9668 $36.72	1 Aug 1995	1 Sept 96	2	FIT SAR transmitter
35	Deleted. Use Items 45 and 32	0 —	0 —	0	Deleted. Use Items 45 and 32
36	Deleted. Use Item 45	0 —	0 —	0	Deleted. Use Item 45
37	KOI-18 Cryptographic Unit	1 Oct 1996	0	1	Insert crypto code
38	KYK-13 Cryptographic Unit	1 Oct 1996	0 —	1	Insert crypto code
39	Deleted. Use Item 40.	0 —	0 —	0	Deleted. Use Item 40.
40	Signal Generator w/1E1, HP83732A NSN 6625-01-379-8874 $12735	1 Aug 1995	1 Sept 96	2	FIT Data Link, Range Safety Receiver Check.
41	Deck Crane P/N 1262AS100-1 NSN 1730-01-070-6876 $20000	1 Aug 1995	1 Sept 96	2	Engine and radome removal/installation
42	Digital Multimeter P/N HP E2377A NSN 6625-01-353-7824	1 May 1996	1 Sept 96	2	SAR test equipment
43	Replaced by Item 40	0 —	—	0	Replaced by Item 40
44	Coder BCC-30	1 May 1996	—	1	Range Safety Receiver Test

Table A4-3. Government-Inventory Support Equipment (continued)

ITEM	HANDLING / SERVICE / TEST EQUIPMENT	TRA SAN DIEGO FACTORY QTY. & NEED DATE	EAFB QTY. & NEED DATE	PHASE II TOTAL	USAGE / REMARKS
45	Power Sensor HP8481B NSN 6625-01-094-2364 $1925	1 May 1996	1 Sept 1996	2	Measure transmitter power for SAR and ICS. Replaces item 35 and 36.
46	Pressurization Set TE 147G-02-0014-1	1 Apr 1996 and June 1996	—	1	Test seals on equipment compartments - loan from BQM-34S production line
47	Probe Power Supply 1103 NSN 6130-01-331-4897 $675	1 Oct 1996	0 —	1	FIT SAR LRUs
48	Ground Recording Group 1294014 NSN 7025-01-375-4684 $250,950	1 April 96	0	1	SAR flight test
49	Error Correction Code Assembly 1291420-03	1 April 1996	0	1	SAR flight test
50	Digital Recorder, Airborne 1301760-01	1 Dec 1995	0	1	SAR flight tests

A.4 **Base Facilities, Equipment and Services**. Base facilities, equipment and services (Table A4-4) will be provided by the Government, at Edwards Air Force Base, in support of Phase II flight testing. Dates required will be specified in range documentation (RCC/UDS Program Introduction). Base support starts approximately 1 November 1996.

Table A4-4. Base Facilities, Equipment and Services

ITEM	DESCRIPTION
1	Hangar space for 2 UAVs (minimum 11,000 sq. feet), with commercial power, HVAC, and compressed air.
2	Commercial power for ground segment at hangar – 220 V, 3 phase (two circuits – one 30 KW and one 90 KW)
3	Secure logistics warehouse contiguous to the hangar facilities (900 sq. ft. minimum) for PSE, CSE, and GFE.
4	Storage for COMSEC equipment.
5	Office space for technical management and logistics personnel (up to 25 personnel)
6	Work space with benches for mechanics and technicians (up to 25 personnel)
7	Outdoor storage for ground segment equipment (one unit 8' x 10', one unit 8' x 22')
8	Outdoor space for UAV engine operations with tiedowns (moorings) to hold back 8000 lb sea level thrust capacity.
9	Storage for small quantities of AN/ALE-50 decoy assemblies containing pyro-initiated cable cutters.
10	Forklift (rough-terrain, 10,000 pound) and cranes for unloading assets from transportation trailers upon delivery to Edwards. (Crane capacity 6,000 pounds with 30 foot boom)
11	Stationary and Moving Imagery Targets; Characteristics TBD
12	"Aggressor" Aircraft' AI Radar (2 missions, 2 hours flight time)
13	Threat Ground Radar (2 missions, 2 hours per mission)
14	JP-8, diesel fuel and gasoline for UAV and support equipment.
15	Telemetry facilities and support for receiving, recording, processing and data reduction.
16	Ground communications to support flight operations.
17	Photo / safety chase aircraft for selected flights. (8 missions, 32 hours flight time) (U-2 Trainer preferred)
18	G-Band beacon tracking and TSPI services.
19	Beacon Laboratory and Checkout support for TRA-provided AN/DPN-90 beacons.
20	Fueling/defueling services.
21	Photographic services.
22	Meteorologyservices.
23	Janitorial services.
	SATCOM SERVICES
1	To Support ground testing at E-Systems, Loral, TRA— 9/96 - 11/96 a. Ku-band communication requirements. INTELSAT Series 700 – Approx. 280 hours. b. UHF Communication requirements. FLTSATCOM (Fleet SATCOM) – Approx. 280 hours.
2	To support flight test at Edwards Air Force Base — 11/96 - 11/97 a. Ku-band communication requirements. INTELSAT Series 700 - Approx. 300 hours (2/97 - 11 /97). b. UHF communication requirements. FLTSATCOM – Approx. 450 hours (11/96 - 11 /97).

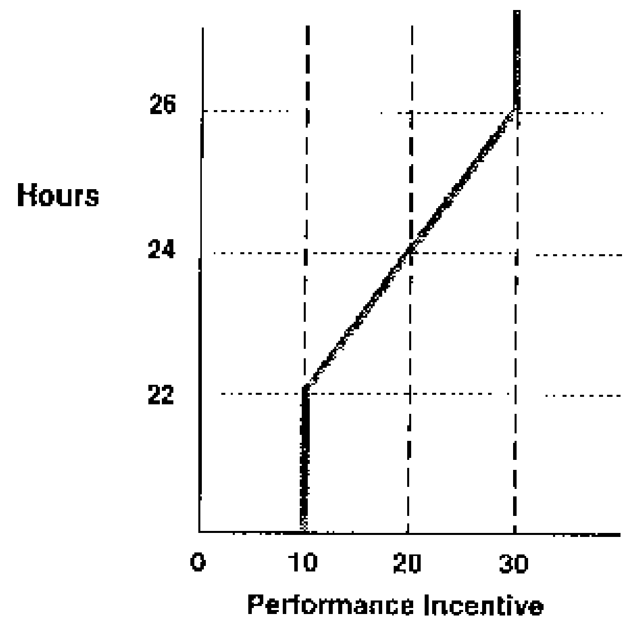
TIER II PLUS
HIGH ALTITUDE ENDURANCE
UAV SYSTEM

Attachment 5 — Technical Performance Incentive Parameters

AGREEMENT MDA972-95-3-0013
31 JULY 1995

Performance Incentives

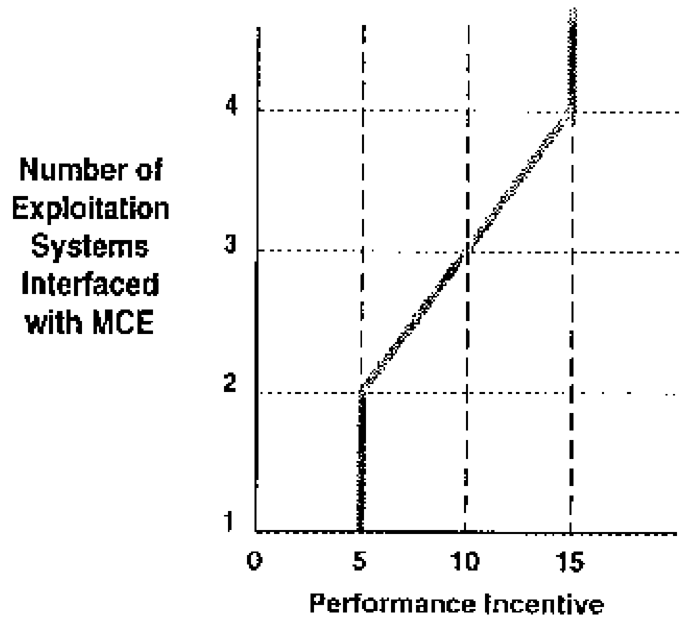
Total Time On Station at 3,000 Nm Radius or the Equivalent



Use Preliminary System Specification Standard mission and measure total time on station at 3,000 Nm radius or the equivalent at initial loiter altitude of 60K ft, standard day, no wind, and one hour fuel reserve. Mission performed with full payload complement (or equivalent weight) and a SAR payload operating 100 percent of the time (or equivalent power drain) during the 24 hr loiter period and all the communications equipment operational throughout the mission. There would be no decrement for engine.

Performance Incentives

Exploitation System Interfaces (Number of Systems)

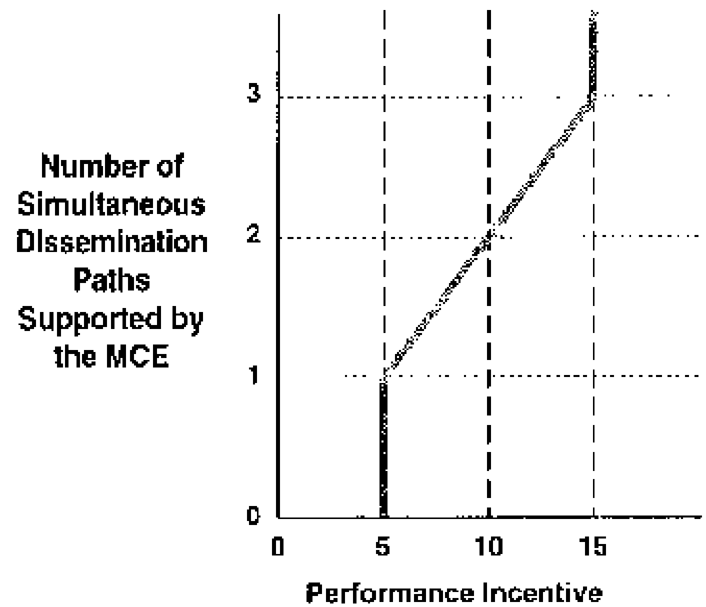


- 4 potential exploitation systems are CARS, ETRAC, JSIPS-N and MIES.
- Demonstration can be via a test harness at output of the MCE.

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

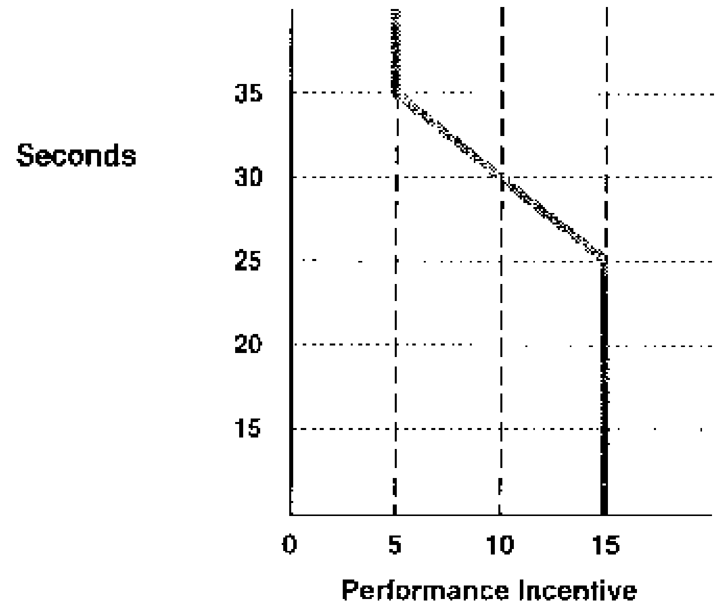
Number of Simultaneous Dissemination Paths (Combination T-3 and T-1 Links)



- The number of simultaneous dissemination paths is any combination of T-3 and T-1 interfaces that are available (2 T-3 and 4 T-1 max). Each T-3 and each T-1 are defined as a dissemination path.
- In the event that any of the four exploitation systems (CARS, ETRAC, JSIPS-N, MIES) cannot support wideband dissemination, the use of T-1 or the maximum rate supported by the exploitation center will be demonstrated.
- Demonstration of exploitation system interfaces can be accomplished via a test harness at the output of the MCE.

Performance Incentives

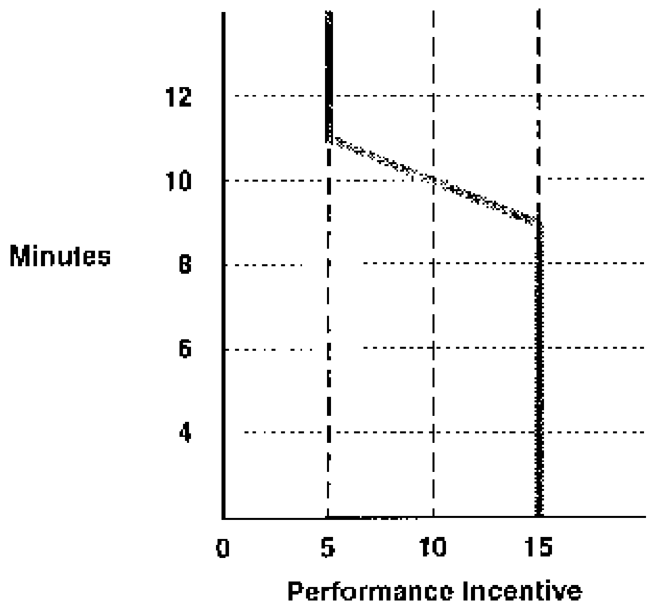
Dynamic Timeline SAR Sensor Retasking (Seconds)



The Timeline Is for Dynamic Sensor Retasking (i.e., Collect a New SAR Spot) within the Field of Regard and Involves No Flight Path Modification. This Timeline Begins with Receipt of the Last Bit of the Request at the MCE and Ends when the Last Bit of the Retask Is Transmitted to the UAV. Demonstration of the Retasking can be Accomplished via a Test Harness at both the Input and Output,of the MCE.

Performance Incentives

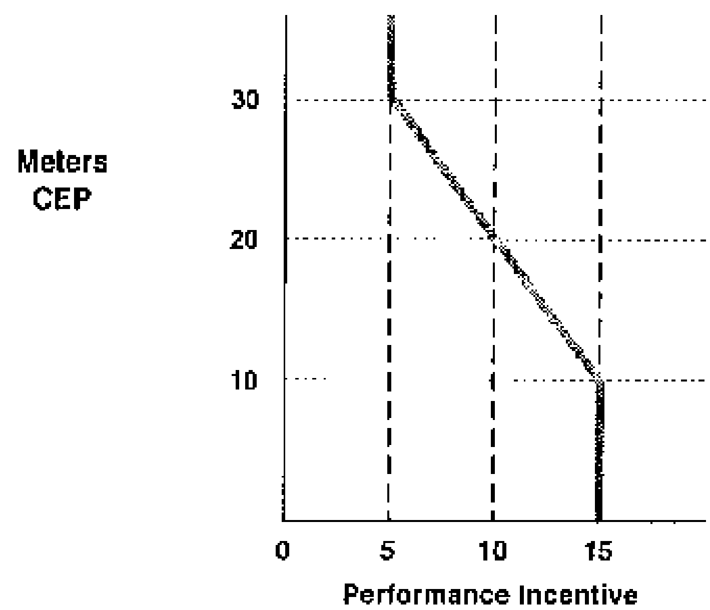
Dynamic Replanning (Minutes)



This Timeline is for the Addition of Ten Surveillance Requests in a Single Cluster to the Current Mission Plan. Timeline Initiates with Receipt of the Last Bit of the Request at the MCE and Ends When the Last Bit of the Replan Is Transmitted to the UAV. Demonstration of the Replanning can be Accomplished via a Test Harness at both the Input and Output of the MCE.

Performance Incentives

Target Geolocation CEP (EO/IR)

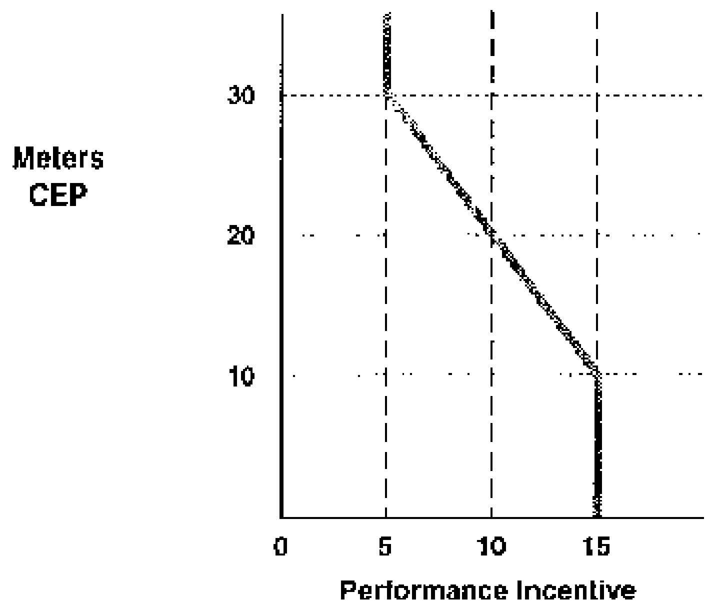


- Survey Ground Target to 1m SEP (Spherical Error Probable)
- 12 Measurements Taken in Spot Mode
  - 18 to 20 km Altitude
  - 18 to 20 km Stand-Off Range
- Average 12 Measurements

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

Target Geolocation CEP (EO/IR)



- Survey Ground Target to 1m SEP (Spherical Error Probable)
- 12 Measurements Taken in Spot Mode
  - 18 to 20 km Altitude
  - 18 to 20 km Stand-Off Range
- Average 12 Measurements

COMPETITION SENSITIVE - NOT RELEASABLE

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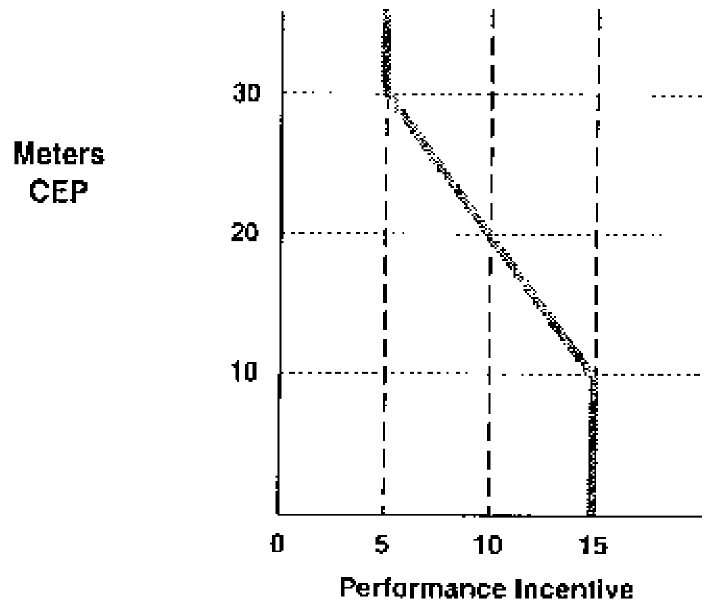
Performance Incentives

Target Geolocation CEP (SAR)

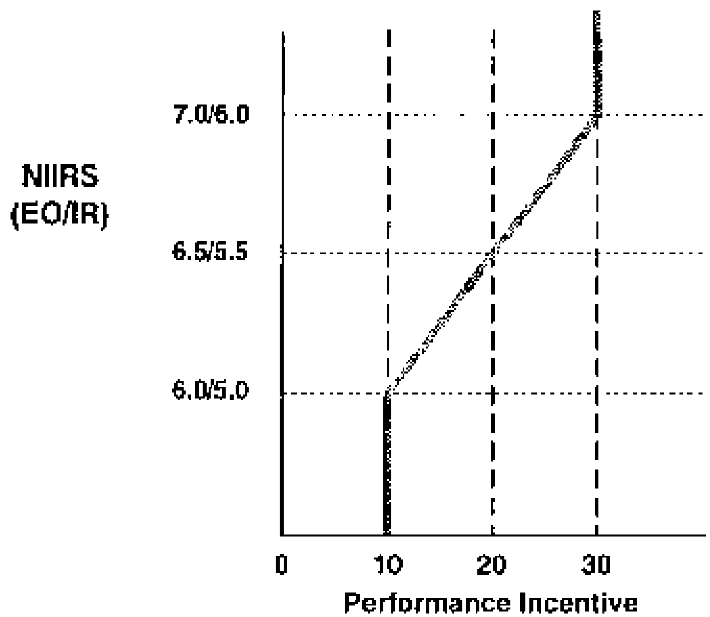


- Survey Ground Targel to 1m SEP (Spherical Error Probable)
- 12 Measurements Taken in Spot Mode
  - 18 to 20 km Altitude
  - 100 km Stand-Off Range
- Average 12 Measurements

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

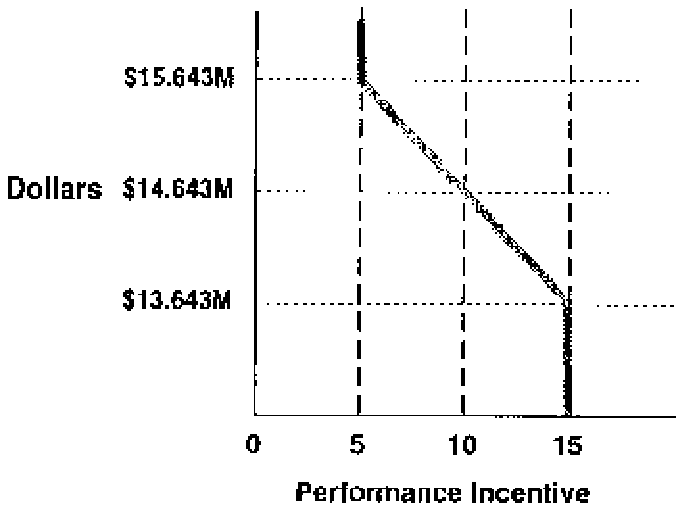
EO/IR NIIRS Rating (Includes Mosaicking) As Measured at the Output of The MCE



- Approximately 30 images of suitable targets taken of EO & approximately 30 images of suitable targets of IR in Spot Mode
  - 18 to 20 km Altitude
  - 18 to 20 km Stand-Off Range
- Data Mosaicked in MCE
  - Image Analysts Evaluate All Data
  - Approximately 300 independent NIIRS estimates (product of number of images times number of analysts) for both EO and IR.
  - Results Adjusted to Standard Environment per SCD
- Average All Measurements
  - Uncompressed data

Performance Incentives

Recurring Air Vehicle Unit Cost - Phase II



The Air Vehicle recurring cost for Phase II is measured by TRA's Cost Accounting System using the following groundrules:

- Quantities of hardware are an equal number per shipset with the following exceptions: only 1 each digital recorder, threat warning receiver, threat deception, towed decoy.
- All engineering labor is categorized as nonrecurring.
- The two air vehicles will be built in the October 1995 - February 1997 timeframe.
- Impact of customer approved ECPs is not parl of the baseline.
- Recurring labor starts when planning is released to the shop floor. Nonrecurring work orders may remain open to complete nonrecurring tasks.
- Measured as total cost without fee in then-year dollars.

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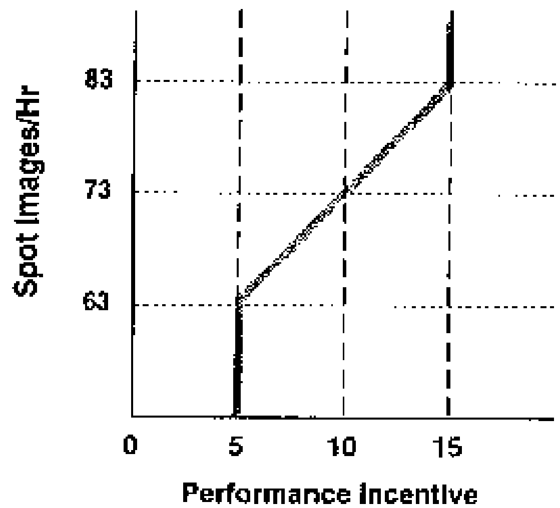
Performance Incentives

SAR Spot Image Rate

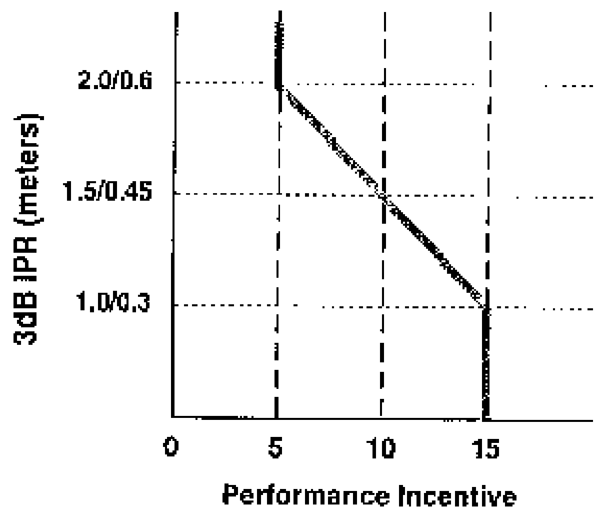


- Select a set of ranges and azimuths that are expected to nominally provide 80 spol images during 1 hour of straight line flight.
- Perform this mission plan twice (once outbound and once inbound).
- Measure the hourly rate of good spol images at output of MCE during two hours of straight flight.
- Excludes bad images caused by data dropout/equipment failure.
- Data transmitted via CDL.

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

SAR Search/Spot Mode Image Quality
IPR

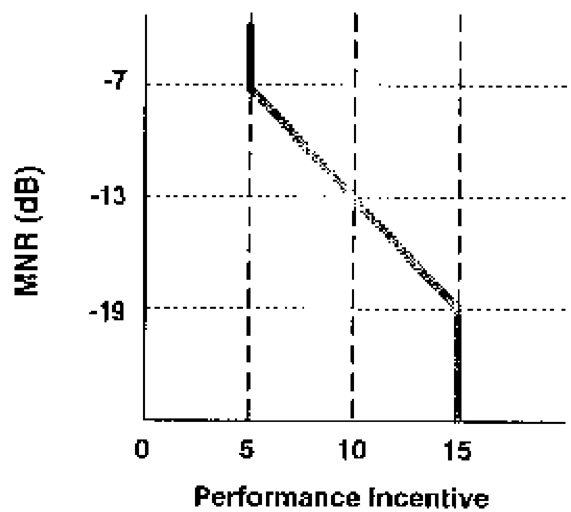


- Measured at output of MCE
- Average of 10 measurements
- 200 km standoff range
  2 bits/pixel transmitted via Ku-band SATCOM

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

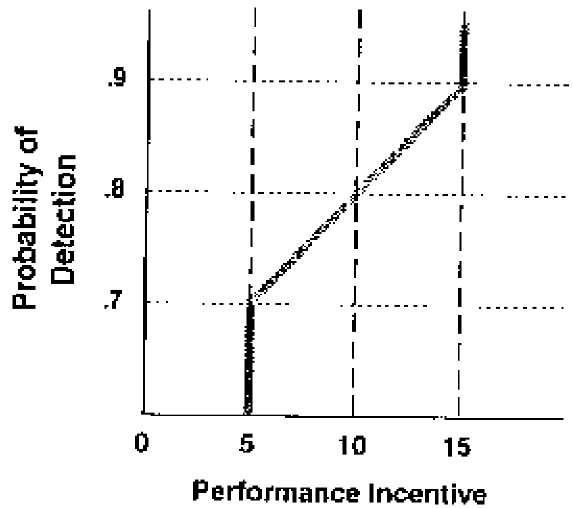
SAR Search/Spot Mode Image Quality
MNR



- Measured at output of MCE
- Average of 10 measurements
- 200 km standoff range
  2 bits/pixel transmitted via Ku-band SATCOM

Performance Incentives

Minimum Detectable Velocity

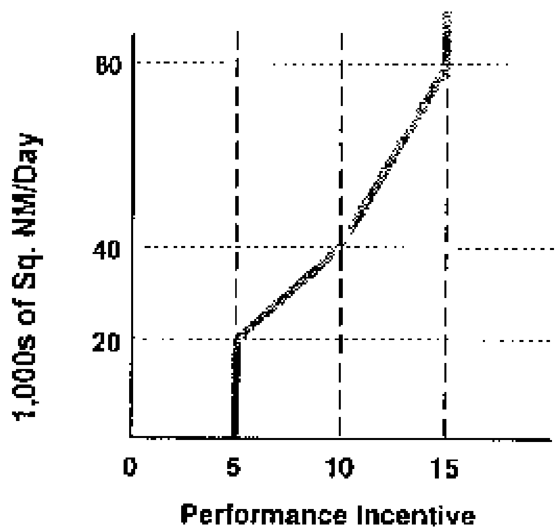


- Test conducted using a calibrated moving target simulator at 100 km ground range.
- 4 knot target velocity @ 10 dBsm target cross section.
- Controlled range; need to specify clutter.
- 20 trials.
- Performed at 30 scans per hour minimum.

COMPETITION SENSITIVE - NOT RELEASABLE

Performance Incentives

EO/IR Area Coverage Rate



- First determine the angle (a) from nadir at which NIIRS equals 6.0/5.0 for EO/IR in WAS mode.
  - NIIRS determination made at output of MCE
  - 2 bits/pixel transmitted via Ku band SATCOM
  - Results adjusted to Standard Environment per SCD.
- Fly sensor at calculated (a) for one hour.
  - Area rate determined at output of MCE.
  - Racetrack pattern.
  - Satisfactory Imagery (no dropouts, serious artifacts, noncontiguous imagery...

COMPETITION SENSITIVE - NOT RELEASABLE

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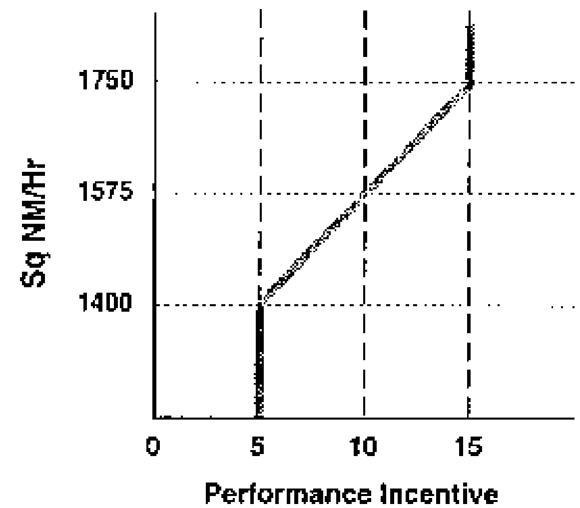
Performance Incentives

SAR Area Coverage Rate



- Airplane flies a racetrack pattern at 100 km standoff range and 90° squint angle
  - Measured at output of MCE
  - Data transmitted via CDL
  - Measured for 2 hours of collection time excluding turns and data link dropouts
  - Imagery is satisfactory (no dropouts, bad imagery, noncontiguous imagery, ...)

COMPETITION SENSITIVE - NOT RELEASABLE

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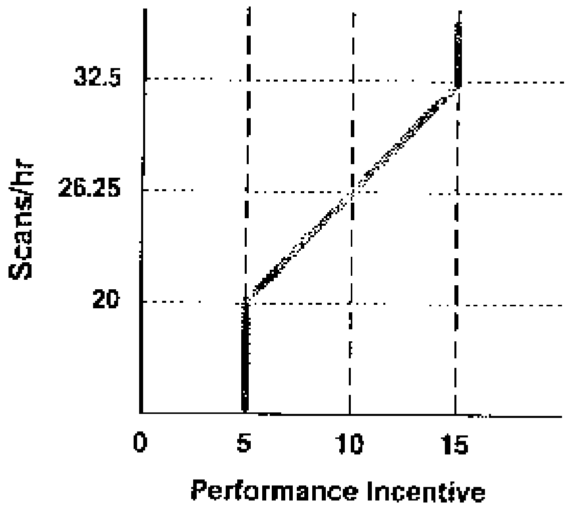
Performance Incentives

GMTI Search Rate



- Scan from 20-200 km ground range.
- 90° sector (90° ± 45°).
- Measured at the MCE output over 1 hr.

COMPETITION SENSITIVE - NOT RELEASABLE