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SYSTEM ENGINEERING SUPPORT (PHASE II) FOR SYSTEM EFFECTIVENESS --ETC(U)

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FINAL REPORT

LEVEL II

Technical Operating Report

SYSTEM ENGINEERING SUPPORT (PHASE II) FOR
SYSTEM EFFECTIVENESS DIRECTORATE
OF SPACE DEFENSE SYSTEMS PROGRAM

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June 1979

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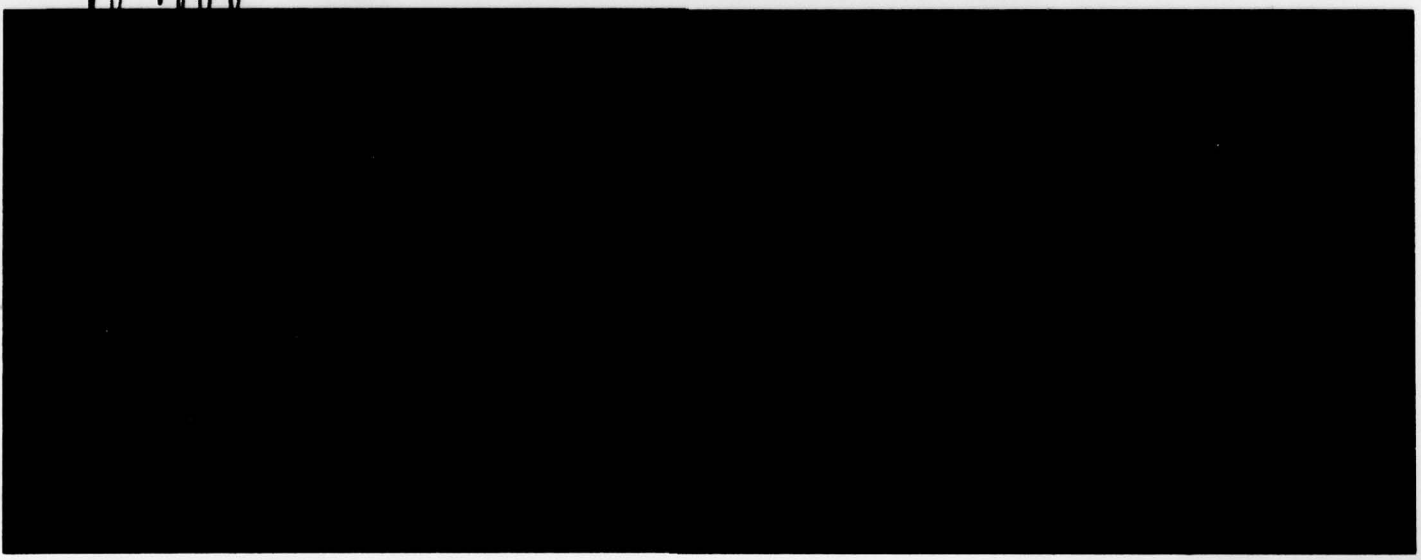
SPACE AND MISSILE SYSTEMS ORGANIZATION
El Segundo, California

Under Contract F04606-76-A-0087-TB02

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ABSTRACT

Technical activities performed by ARINC Research Corporation in support of the Systems Effectiveness Directorate of the Space Defense Systems program are described herein. This work, conducted for the Space and Missile Systems Organization, was performed from 30 March through 30 June 1979.

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1 INTRODUCTION

1.1 SCOPE

Under Contract F04606-76-A-0087-TB02 with the Space and Missile Systems Organization (SAMSO), El Segundo, California, ARINC Research Corporation has performed technical support activities for the System Effectiveness Directorate (YNM) of the Space Defense Systems (SDS) Program Office. The period of performance was 30 March through 30 June 1979.

This contract, for System Engineering Support Phase II (SES II), was a continuation of the Phase I support activities performed from 22 December 1978 through 30 March 1979 under a similar contract. The tasks performed included review and revision of SDS specifications and program documents; preparation of configuration management and interface control documentation; and development of program control standards. These tasks were performed on the Operational Miniature System (OMS), the Operational Conventional System (OCS), the Space Defense Command and Control System (SPADCCS), Talon Gold, the Satellite Infrared Experiment (SIRE), and the Instrumental Test Vehicle (ITV).

In April 1979, the contractual task statement was appended by means of a Task Change Proposal (TCP) to include the ARINC Research engineering efforts required to develop a top-level test plan for the Infrared Background Sensor (IRBS) sounding rocket and payload. This project utilized information obtained from the Air Force Geophysics Laboratory (AFGL).

1.2 BACKGROUND

The SDS Program Office (SAMSO/YN), chartered early in 1978, is responsible for managing a variety of space defense hardware and software programs currently in varying stages of development. Some programs, such as SIRE and OCS, are in early development stages; while others, such as OMS and ITV, are in advanced development.

In view of the variations in system maturity, an integrated and comprehensive approach to program documentation and control is required to ensure overall SDS program compatibility and system interoperability. SAMSO/YNM is responsible for the configuration, data, and product assurance disciplines on all SDS programs.

In support of YN, ARINC Research has performed the following tasks:

- a. Reviewed, evaluated, and provided recommendations on system and subsystem specifications.
- b. Reviewed, evaluated, and provided recommendations on system interface control documents (ICDs).
- c. Developed SDS program documentation for YNM, such as charter agreements, standards, guidelines, and specifications.
- d. Provided data analysis support to process SDS program milestone, schedule, and CDRL data in the SAMSO data processing system. The resultant computer output provides YNM with a schedule overview of all SDS program deliverable documentation.
- e. Developed a top-level test plan for the IRBS sounding rocket and payload.

2 IMPLEMENTATION OF TASKS

YNM prioritized the tasks to be performed by ARINC Research on the basis of the urgency of each SDS project and the availability of pertinent documentation. This section summarizes the Corporation's efforts related to these tasks. A complete list of documentation delivered, in sequential order, is presented in Section 3.

2.1 SPECIFICATION REVIEWS

Fourteen SDS specifications have been reviewed by ARINC Research during SES II. The criteria for review of the specifications included compliance with MIL-STD-490, MIL-STD-483, and other prescribed applicable documents. Where appropriate, format and content comments were amended, based upon instruction or exclusion clauses in the reviewed document DD form 1423. Technical commentary on specifications was based upon ARINC Research's knowledge of state-of-the-art hardware and software relative to the system or subsystem undergoing review, as well as the adequacy of the information in the specifications. The specifications reviewed are as follows:

<u>Specification Title</u>	<u>Review Date</u>	<u>Applicable ARINC Research Engineering Note</u>
Foreign Launch Assessment (FLA) Specification	April 1979	EN-001
Operational Miniature System (OMS) Specification	April 1979	EN-002
Modular Responsive Defense System (MRDS) System Specification	April 1979	None (specification rewritten/reformatted by ARINC Research)
Miniature Vehicle (MV) Dispenser - Prime Item Development Specification	May 1979	EN-004
Miniature Vehicle (MV) - Prime Item Development Specification	May 1979	EN-005

<u>Specification Title</u>	<u>Review Date</u>	<u>Applicable ARINC Research Engineering Note</u>
Prototype Miniature Air Launch System (PMALS) - Air Launched Missile - Prime Item Development Specification	May 1979	EN-006
Operational Miniature System (OMS) Inventory Item Specification	May 1979	EN-007
Prototype Miniature Air Launch System (PMALS) - Mission Operations Element (MOE) - System Specification	May 1979	EN-008
Prototype Miniature Air Launch System (PMALS) - Carrier Aircraft Equipment (CAE) - System Specification	June 1979	EN-013
Prototype Miniature Air Launch System (PMALS) - Aircraft Addendum Specification	June 1979	EN-014
Miniature Vehicle (MV) Prime Item Development Specifications for the Maneuver Propulsion Assembly (MPA), Guidance Processor Electronics Assembly (GPE), and Roll Rate Sensor Assembly (RRS)	June 1979	EN-015
Prototype Miniature Air Launch System (PMALS) - Support Equipment - System Specification	June 1979	EN-016
SDS System Specification	June 1979	None (specification completely rewritten by ARINC Research)
SIRE System Specification	June 1979	None (specification completely rewritten by ARINC Research)

2.2 INTERFACE CONTROL DOCUMENT (ICD) REVIEWS

During this period, ARINC Research reviewed 15 ICDs. The criteria for review included SDS program directives and guidelines as well as appropriate government standards such as MIL-STD-483. The ICDs reviewed are listed on the following page.

<u>Document Title</u>	<u>Review Date</u>	<u>Applicable ARINC Research Engineering Note</u>
Prototype Missile Operation Center (PMOC) Computer Program-to-CAE Computer Program (Data Interface), ICD No. D349-25122	June 1979	EN-011
AP-1 Computer Program-to-CAE Computer Program/Missile Guidance Computer Program (Data Interface), ICD No. D349-25123	June 1979	EN-011
Flightline System Test Set-to-CAE Computer Program/Missile Guidance Computer Program (Data Interface), ICD No. D349-25124	June 1979	EN-011
Missile Guidance Computer-to-CAE Computer (Data Interface), ICD No. D349-25127	June 1979	EN-011
PMOC Computer Program-to-Missile Guidance Computer Program (Data Interface), ICD No. D349-25129	June 1979	EN-011
CAE Hardware-to-CAE Computer Program (Data Interface), ICD No. D349-25134	June 1979	EN-011
Pylon/Missile-to-F-15A, Aircraft Envelope (Drawing), ICD No. 349-25100	June 1979	EN-012
Pylon-to-F-15A Aircraft, Mechanical/ Environmental (Drawing), ICD No. 349-25101	June 1979	EN-012
Tape Recorder-to-F-15A Aircraft, Mechanical/Environmental (Drawing), ICD No. 349-25102	June 1979	EN-012
Pylon-to-Cryogen Dewar System (Drawing), ICD No. 349-25103	June 1979	EN-012
Cryogen Dewar-to-Pylon, Mechanical/ Electrical (Drawing), ICD No. 349-25104	June 1979	EN-012
Pylon-to-Missile, Mechanical/ Environmental (Drawing), ICD No. 349-25106	June 1979	EN-012

<u>Document Title</u>	<u>Review Date</u>	<u>Applicable ARINC Research Engineering Note</u>
Missile Upper Stage-to-Missile Lower Stage, Joint-Mechanical/Envelope/Environmental (Drawing), ICD No. 349-25109	June 1979	EN-012
Missile Interstage Assembly-to-SRAM Motor, Joint-Mechanical/Envelope/Environmental (Drawing), ICD No. 349-25110	June 1979	EN-012
CAE Pallet-to-F-15 Aircraft, Mechanical/Environmental/Envelope (Drawing), ICD No. 349-25117	June 1979	EN-012

2.3 SPECIAL SDS PROGRAM DOCUMENTS

Four special documents were prepared for SDS/YNM, as listed below.

<u>Document Title</u>	<u>Preparation Date</u>	<u>Applicable ARINC Research Engineering Note</u>
Interface Control Working Group/ Interface Control Steering Group Charter. YNM-79-12	January 1979 (original) June 1979 (revision)	EN-009
SDS Software Development Methodology Plan. YNM-79-162	June 1979	None
SDS System Level Specification Tree	June 1979	EN-003
Recommended ICD List for the Miniature System Project (MSP)	June 1979	EN-010

2.4 CDRL DATA MANAGEMENT

ARINC Research provided data analysis support to SDS/YNM in collecting, assembling, assessing, and processing CDRL and milestone data from several SDS projects. The data were entered on specialized computer coding sheets delivered to YNM personnel for entry into the SAMSO data processing system. The data processing

system output consists of collective data printouts of CDRL dates, milestone dates, and key program events, which provide SDS/YN with an overview of each program. Data processed to date include those for the OCS, OMS, SIRE, Talon Gold, and ITV projects.

2.5 AFGL TECHNICAL SUPPORT

For the Air Force Geophysics Laboratory (AFGL), ARINC Research prepared a top-level test plan defining a test program for enhancing the mission success of the Infrared Background Sensor. ARINC Research representatives discussed recent in-flight failures with AFGL personnel, examined data from unsuccessful flights, and evaluated quality assurance aspects of the program. The resultant test plan was developed based upon the findings of this investigation.

The test plan was designed to provide AFGL with demonstrable assurance that the IRBS equipment is designed to function in natural environments as well as those environments created by system operations, and to provide SAMSO with the assurance that the equipment is operationally ready to function at time of launch and will have a high probability of mission success.

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DOCUMENTATION DELIVERED

The documents delivered as part of this contract are listed below in sequential order.

<u>ARINC Engrg. Note</u>	<u>Document Title</u>	<u>Date</u>
001	FLA Specification Critique, Specification No. R79-5000-104	April 1979
002	Review Comments for the System Specification for Operational Miniature System (OMS)	April 1979
003	Space Defense Systems Specification Tree (Preliminary Draft)	April 1979
004	Critique of the Prime Item Development Specification for the Dispenser Assembly, Specification No. 109-CI-085E	May 1979
005	Critique of the Prime Item Development Specification for the Miniature Vehicle, Specification No. 209-CI-011D	May 1979
006	Critique of the Prime Item Development Specification for the Prototype Miniature Air Launch System (PMALS) Air Launched Missile, Specification No. S100-P-200	May 1979
007	Critique of the OMS Inventory Item Specification Review (Preliminary Draft)	May 1979
008	Critique of the System Specification for the Mission Operations Element (MOE) for the Prototype Missile Air-Launch Segments (PMALS)	May 1979
009	Comments on Suggested Changes to Document YNM-79-12 (ICWG/ICSG Charter)	May 1979
010	Recommended ICD List for the Miniature System Project (MSP)	May 1979
011	Critique of Miniature System Project (MSP) Interface Control Documents Group 1	June 1979
012	Critique of Miniature System Project (MSP) Interface Control Drawings Group 1	June 1979

<u>ARINC Engrg. Note</u>	<u>Document Title</u>	<u>Date</u>
013	Critique of the System Specification for PMALS Air Launched Carrier Aircraft Equipment (CAE), Specification No. S100-P-100, dated 2 March 1979	June 1979
014	Critique of the PMALS Addendum Specification to System Specification No. SS76301A328A001A, dated 2 March 1979	June 1979
015	Critique of Miniature Vehicle Prime Item Development Specifications for the Maneuver Propulsion Assy (MPA), Guidance Processor Electronics Assy (GPE), and Roll Rate Sensor Assy (RRS)	June 1979
016	Critique of the System Specification for PMALS Air Launched Missile Support Equipment Specification No. S100-P0300, dated 7 March 1979	June 1979
017	Specifications and Interfaces Associated with Various SDS Programs	June 1979
018	CPDS Part 1 - Missile Guidance Computer Program for MSP, Boeing/Vought Specification No. S100-P0220, dated 24 May 1979	June 1979
019	Critique of the Prime Item Development Specification for Miniature Vehicle (U), Specification No. S100-P0250, dated 7 June 1979	June 1979
020	Critique of the Operational Miniature System (OMS) System Specification No. SS-OMS-100A, dated 23 April 1979	June 1979
021	Critique of the Flight Sensor Assembly (FSA) Prime Item Development Specification No. S100-P0251, dated 7 June 1979	June 1979
022	Critique of the Prime Item Development Specification for the Dispenser Assembly (U), Specification No. S100-P0260, dated 5 June 1979	June 1979
None	MRDS System Specification	April 1979
None	SDS System Specification	June 1979
None	SIRE System Specification	June 1979
None	SDS System Level Specification Tree	June 1979
None	SDS Software Development Methodology Plan	June 1979
None	Top Level Test Plan for the Infrared Background Sensor (IRBS)	June 1979