5 November 1971

EOI PROGRAM PLAN

OPTION 1

INTRODUCTION

The Electro-Optical Imaging System is configured for continuous capability to obtain high quality imagery to satisfy both the Technical Intelligence and Strategic Intelligence requirements. The system provides daily access to all Sino-Soviet targets. The principal elements of the system consist of the following segments: Imaging Satellites (I/S), Relay Satellites (R/S), Receiving Facility (R/F), Operations Facility (O/F) and Processing Facility (P/F). Implementation of the system will consist of installation of the three ground facilities in [redacted] activation of the R/S net and launch of the I/S into the required elliptical, sun-synchronous orbit. The O/F will have a capability of commanding the I/S through a R/S to acquire the desired targets. As the I/S accesses the target of interest, the data will be transmitted in [redacted] via a R/S to the R/F. The data will be transferred from the R/F to the P/F where the information will be reconstructed for initial photointerpretation. Production and distribution of imagery for community users will be accomplished after the initial interpretation.

The baseline schedule has been established for a realistic funding program conforming to both contractor and Program Office estimates of system costs. The goal established is achievement of the Initial Operational Capability in 1976. The principal milestones for achieving operational capability are: start system acquisition, 1 December 1971; start R/F installation, March 1974; complete ground facilities, July 1975; launch R/S #1, August 1975; launch R/S #2, October 1975; launch I/S #1, January 1976.

The following sections of the Program Plan describe the necessary management activities, system implementation procedures and funding requirements to achieve the EOI System capability.

MANAGEMENT PLAN

The EOI System Program Office has been established to implement the operational system. The EOI System Program Office has been staffed to carry out the full responsibilities of managing the development, testing and operation of all segments of the system. Management and technical direction for the system acquisition will be developed and implemented by the organization shown in Figure 1. Project Managers for each element of the organization will be responsible for the necessary planning, analysis and engineering efforts to meet the system development milestones. Authorized representatives of each element, designated by the element Project Manager, will participate in all system management meetings. The support activities such as I/S Launch Vehicle Program Office, Western Test Range and others will be designated by the System Management Organization. The authorized representative for each element will have the authority to make decisions and to obligate his organizational element to carry out the necessary actions. System management meetings will include the following system level tasks: scheduling, technical direction, requirement interpretation, performance evaluation, interface definition and cost evaluation as appropriate.

The management of each element of the system organization will be organized to provide the capability for implementing those responsibilities assigned to each element in accordance with the overall system plans and schedules. Activities within each element are to be controlled by the responsible element Project Manager. Scheduling and reporting will be structured to support integration of each element into the overall system.

SYSTEM IMPLEMENTATION

The System Requirements Document has been utilized to define the characteristics of the hardware and software for each element of the EOI System. Interface Control Documents (ICD) have been generated to identify and characterize the interrelationships of each segment as necessary to achieve the overall system performance. Specifications have been produced for each segment to implement the system requirements and the ICD's and to insure that sufficiently detailed performance characteristics can be demonstrated and measured.

The design, analysis and planning within each segment has been carried to the subsystem level as well as to components of the subsystems. Segment data for generation of the specifications and ICD's has been developed by detailed planning in each subsystem of each segment. Figure 2 summarizes the design, development, fabrication and test activities for the Communications Subsystem of the I/S Segment and the milestones to be met in support of segment and system development. The principal items to be developed in the Communications Subsystem are the

are initiated in the second half of 1973.

Items tested in the qualification program include: new components, new subassemblies and the complete subsystem. Tests comprise physical integrity, performance and environmental conditions. The principal components to be tested include: mixer, diode circuits, varactors and couplers. Testing will include checks of sealing where applicable, on-off power cycling. stability, vibration and thermal vacuum. Subassemblies to be tested include: antennas, transmitters, amplifiers, receivers, switches and power supplies. Testing of these subassemblies is similar to component testing but with more emphasis on performance and environmental tests. Communications Subsystem level testing will emphasize measurement of overall parameters including wideband and narrow band signal-to-noise ratios, phase noise, spurious outputs, ranging, frequency acquisition and tracking characteristics.

The subsystem plan provides for vigorous effort leading to a Preliminary Design Review (PDR) with documentation which confirms interface requirements and all performance goals. The detailed design, extending from PDR to Critical Design Review (CDR), is supported by fabrication of engineering test equipment which is subjected to a series of tests to validate basic design criteria. After CDR, final qualification test procedures are prepared and fabrication of qualification components, subassemblies and assemblies is initiated. All activities are phased to support delivery of the Communications Subsystem equipment to the I/S Qualification Test Vehicle early in 1974. Work has been programmed so that testing at the component, equipment and subsystem level has been completed before initiation of segment level qualification testing. This sequence minimizes technical risk and increases confidence of

satisfactory completion of segment level qualification testing. Planning for each subsystem of each segment has been detailed in the same manner as the I/S Communications Subsystem.

The I/S Segment qualification test program including assembly and test activities is summarized in Figure 3. Delivery of qualification tested subsystems in the early part of 1974 supports final assembly of the I/S Qualification Test Vehicle by mid-1974.

The I/S Qualification Test Vehicle will consist of flight-type subassemblies fabricated to flight quality specifications and drawings. Initial tests will be conducted at ambient conditions to verify the performance of each principal subsystem. The transducer operation will be monitored using the communications link. The electrical power and distribution subsystem will be verified using test equipment to provide battery charging power and command response. Pyrotechnic events will be tested with squib simulators. The Attitude Control Subsystem tests will be conducted to evaluate the star sensors and the attitude control electronics. Optical Subsystem tests will verify capability of that subsystem to accept, condition and distribute command signals. Additional optics tests include focus adjustment of the field group and alignment of the secondary mirror verified with telemetry data as well as operation of the thermal control heaters. The Propulsion Reaction Control Subsystem will be exercised utilizing a simulated flight sequence with verification of response to all commands. The Command and Control Subsystem will be exercised to demonstrate flight-type sequences of transmitting attitude control signals, antenna pointing commands, attitude reference updating, telemetry sequence and formatting and failure diagnosis.

A complete electro-magnetic compatibility test will be performed with subsystems operating to simulate all phases of flight including launch, ascent, deployment and acquisition, imaging and deorbit. Both transient and steady state interference will be measured and evaluated. Acoustic testing will be conducted on the I/S Qualification Test Vehicle with the system electrically and mechanically conditioned for the launch and ascent modes. The equipment normally powered during those phases will be active and

all test points will be monitored. Shock tests will be carried out to evaluate environment associated with shroud separation, booster adapter separation, solar array and antenna deployment and fairing jettison. Combined thermal vacuum qualification testing will include cold temperature, hot temperature, thermal cycling and functional performance testing. This series of tests will confirm the design established in the CDR and verify the specifications established for fabrication of the flight vehicle equipment. Assembly of the first flight vehicle is not initiated until the end of 1974, when approximately six months of qualification testing have been completed. Qualification testing of the I/S is completed by mid-1975 prior to the acceptance test of the first flight vehicle.

Figure 4 shows the time-phased activities and principal milestones for integration of the segments into the overall EOI System. The interrelationships between segment PDR activities and overall system design reviews are indicated as well as qualification test vehicles and important software activities.

System level activities include essential compatibility tests between segments. The most important compatibility tests are I/S to R/S, R/S to R/F and O/F to I/S. Simulators will be utilized for development and factory-level testing, and as much actual equipment as possible for final acceptance testing. System-level validation and testing of all software components is conducted during system-level tests. Launch vehicle fabrication, test and integration are programmed to support other system-level activities. Launch test equipment, software and procedures are scheduled as well as crew training for all phases of the operation.

FUNDING

The essential element of the Option I EOI Program Plan leading to minimum technical risks and maximum schedule confidence is early completion of the system, segment, subsystem and component detailed design activities. The funding described in Tables 1 through 3 is the level necessary to meet required milestones at subsystem, segment and system levels and to support the EOI System design reviews in 1972-1973. Since the progress in each segment is dependent upon the progress of each other