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19 NOV 1974

MEMORANDUM FOR Secretaries of the Military Departments
Director of Defense Research and Engineering
Assistant Secretary of Defense (Comptroller)
Assistant Secretary of Defense (Installations and Logistics)
Assistant Secretary of Defense (Program Analysis and Evaluation)
Director, Telecommunications and Command and Control Systems
Director, Joint Staff

SUBJECT: DSCS III (SHF Space Segment) DSARC I

I have reviewed the Defense Satellite Communications System Phase III Space Segment Development Concept Paper dated 16 October 1974. In addition, I have reviewed with the Air Force their test plans for the recommended program, Alternative IV.

My review with the Air Force indicated a procurement strategy for the recommended alternative somewhat different from that presented in the DCP. The Air Force now proposes a two phased approach to the engineering development effort. Phase I, to be the subject of the December 5, 1974 DSARC I, would be a competitive effort designed to address primarily the critical questions identified in Section VIII, Test and Evaluation of the DCP, and to firm up costs for the full-scale development effort. This phase would extend from contract award through a preliminary design review (PDR). During this initial phase, the following significant tests would be accomplished by the two contractors selected:

a. Engineering model multi-beam antenna tests designed to demonstrate the electrical characteristics of the antenna over expected operating conditions, demonstrate antenna structural integrity and thermal sensitivity, and evaluate antenna beam switching capability.

b. Communications breadboard tests to determine the characteristics of the communications subsystem over expected operating extremes.

c. Survivability tests which address developing circuits and screening parts which can be expected to meet the established satellite hardening criteria.

Ten and 40 watt traveling wave tube amplifiers (TWTA) envisioned for this program are being developed under separate but concurrent programs. By PDR, the 40W TWTA would have completed considerable life test and the design of the 10W TWTA would have been proven. The test results of this phase would be available for DSARC II review to support a decision to proceed with the full-scale engineering development.

13-M-4605

The full-scale development phase (Phase II) provides three significant milestones by which progress through test can be evaluated. These are the Critical Design Review (CDR), first developmental flight model launch, and on-orbit test. By CDR, thermal/structural test, component survivability test, component qualification test, engineering model test, and preliminary Telemetry, Tracking and Command (TT&C) compatibility test will be completed. This will confirm the final design and establish the qualification model configuration. Prior to developmental flight model launch, the all-up qualification model test, developmental flight model acceptance test, and final TT&C compatibility test will be completed. This will be followed by a three month on-orbit technical evaluation and a three month on-orbit initial operational evaluation. Therefore, prior to DSARC III, all developmental and some operational on-orbit test will be completed. Thus a significant amount of test result information should be available prior to a major production decision.

As a result of my review, I conclude that although the schedule appears very tight, the recommended program has advantages over similar programs in that it does provide for on-orbit testing of a development flight model satellite prior to a DSARC III. This should provide greater assurance of successful on-orbit operation of production satellites than heretofore experienced.

Test plans for this program at the present time are only in the concept state. As the program and related efforts become better defined, the Air Force should update its Test and Evaluation Master Plan (TEMP) to specifically address test and evaluation to be accomplished during Phase I of the program and outline that test and evaluation expected to be accomplished during ensuing phases. This plan should be submitted to the Deputy Director, Test and Evaluation (DDT&E), ODDR&E 30 days prior to initial contract award. Subsequent to PDR and at least 20 days prior to the proposed DSARC II, the Air Force should provide to the DDT&E, ODDR&E an updated TEMP which indicates results of tests completed during Phase I and detailed testing to be accomplished during the full-scale development phase, to include on-orbit technical evaluation test. On-orbit technical testing should include verification of system compatibility with all expected user terminal equipment and modes of operation.

The Chairman, Joint Chiefs of Staff, should submit an initial joint on-orbit operational test and evaluation plan to the SECDEF for review at least 20 days prior to proposed DSARC II.

COORDINATION: 5 U.S.C. § 552(b)(6)

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