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as of 31 March 1979
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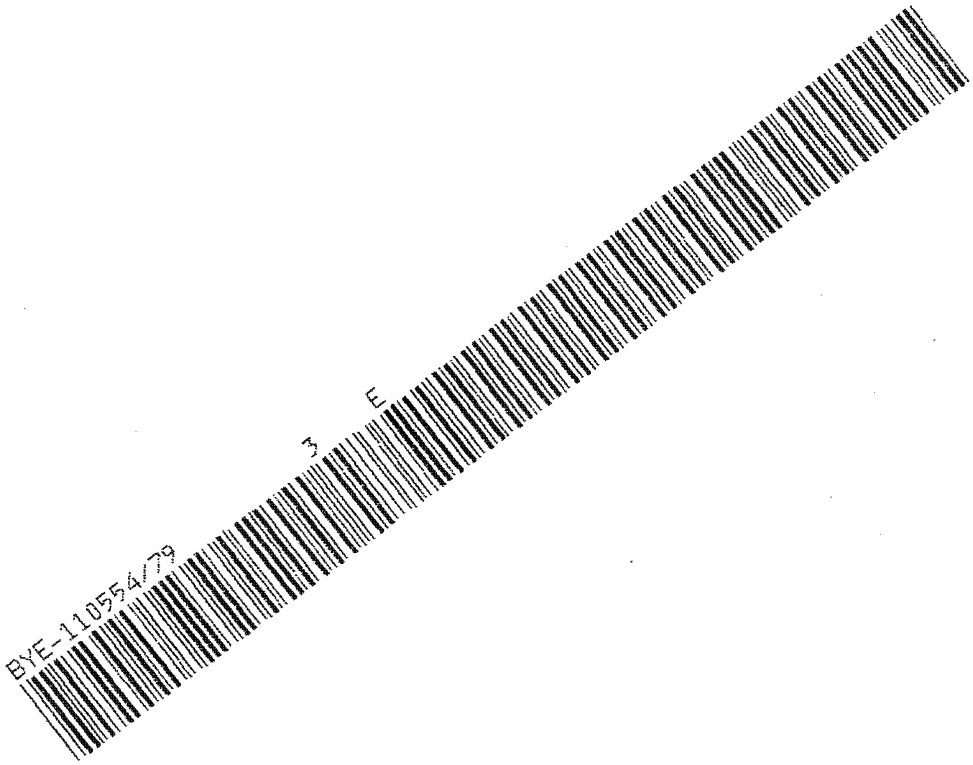
MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Quarterly Program Report

Attached is the Program A Quarterly Program Report for the period 1 January 1979 through 31 March 1979. Also attached is an Annex detailing Applied Research/Advanced Technology and Advanced Development contractual information.

JOHN E. KULPA, JR.
Major General, USAF
Director



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QUARTERLY PROGRAM REPORT

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QUARTERLY PROGRAM REPORT

PROGRAM 989 (P989)

Program Manager: Colonel John H. Dean

1. Summary

URSALA IV was launched at 1030 PST on 16 March 1979. Checkout of URSALA IV proceeded as planned and all subsystems are operating normally. RAQUEL 1A remained in excellent health, and RAQUEL 1 and URSALA III were in good to fair condition. All four missions are being tasked heavily. TOPHAT continued its Continuous Wave (CW) mission, and MABELI, after seven years on orbit and measurable system degradation, continued to provide unique intelligence information. Considerable operational support was provided to the U.S. exercises Post Oak and Reforger and to military activity or crisis situations.

The LORRI Palletized payload continued through its test program, and numerous FARRAH design reviews were conducted including the payload Critical Design Review.

2. Specific Status

a. On-Orbit Spacecraft

(1) Mission 7339/MABELI. MABELI reached seven years of successful orbit operation on 20 January 1979. Although significant degradation has occurred during these seven years, this mission continues to collect unique and valuable information from the Soviet ABM radars. Intermittent tape recorder operation remained a major limitation, and the shorting of two battery cells during this report period further reduced system effectiveness. MABELI is predicted to reenter the earth's atmosphere on approximately 18 April 1979.

(2) Mission 7340/TOPHAT. There has been no significant change in TOPHAT status during this report period. Tape recorder number one, which

had been the only operational recorder for about six months, failed on 21 January 1979, but operations continued using recorder number 3 which returned to operation on 24 January 1979. System utility remains somewhat constrained by the availability of only one recorder, but otherwise the system is operating normally after nearly five years on orbit. Orbit decay is predicted for April 1980.

(3) Mission 7341/RAQUEL 1. RAQUEL I, on orbit since October 1974, remains in fair status. The pulse receiver works normally, but the technical intelligence (TI) receiver remains inoperative. Tape recorder number two failed on 3 February 1979 after over 5000 cycles. Since tape recorder number three has some operating restrictions, there is only one fully operational recorder remaining. This will reduce tasking slightly. Orbit decay is predicted for August 1980.

(4) Mission 7343/URSALA III. There is no change in URSALA III status. The previously reported intermittent and varying receiver attenuation continues to exist and affects a small percentage of the collected data.

(5) Mission 7345/RAQUEL/1A. This system continues to be in excellent status and is tasked heavily. The previously reported loss of data on three occasions has been diagnosed as being probably caused by intermittent malfunction of the payload read-in relay. No further instances of this condition occurred during the reporting period. Selection of a redundant payload oscillator on 16 January 1979 was required to return the Continuous Wave (CW) receiver to proper operation following failure of the primary oscillator.

(6) Mission 7344/URSALA IV. URSALA IV was successfully launched on 16 March 1979. The injection, deployment, and checkout activities were all normal, and all systems are operating properly. There has been no evidence of either of the intermittent Band 2 Tunnel Diode Amplifier (TDA)

anomalies which were observed during final system testing. Payload data was recovered on day two and was processed flawlessly by the ground data processing system. Routine shipment of operational data began on 30 March 1979 following the necessary calibration and verification.

b. Vehicles under Development and Test

(1) Mission 7345/LORRI. Testing of the payload by the payload contractor, Argo Systems, neared completion. Only the acquisition of calibration data and the making of test tapes for testing ground data processing remained to be done prior to delivery of the payload. Preparations continued at Lockheed to receive the payload on 15 May 1979, integrate it with the other components of LORRI, and conduct system test. Development of the ground data processing system continued as planned. The project remained on schedule for launch on SV-16 of the host program in March 1980.

(2) Mission 7346/FARRAH I. The FARRAH I system is progressing satisfactorily toward a launch date in March 1981. In this reporting period, subsystem Critical Design Review (CDR's) were completed on the On-Board Processor software, solar arrays, stored command sequencer, antennas (Phase I), payload, and ground data processing system (GDPS) preprocessor. This completes all CDR's except the antennas (Phase II), GDPS processor, and total system wrapup, all to be completed early in the next quarter. One of the more significant problems to date has been limited volume in the payload subsystem. Difficulties were encountered in packaging all of the necessary components in the allocated volume, and this resulted in a detailed review by the government and the prime contactor. Additional volume has now been obtained and allocated to the payload, thus eliminating this major problem.

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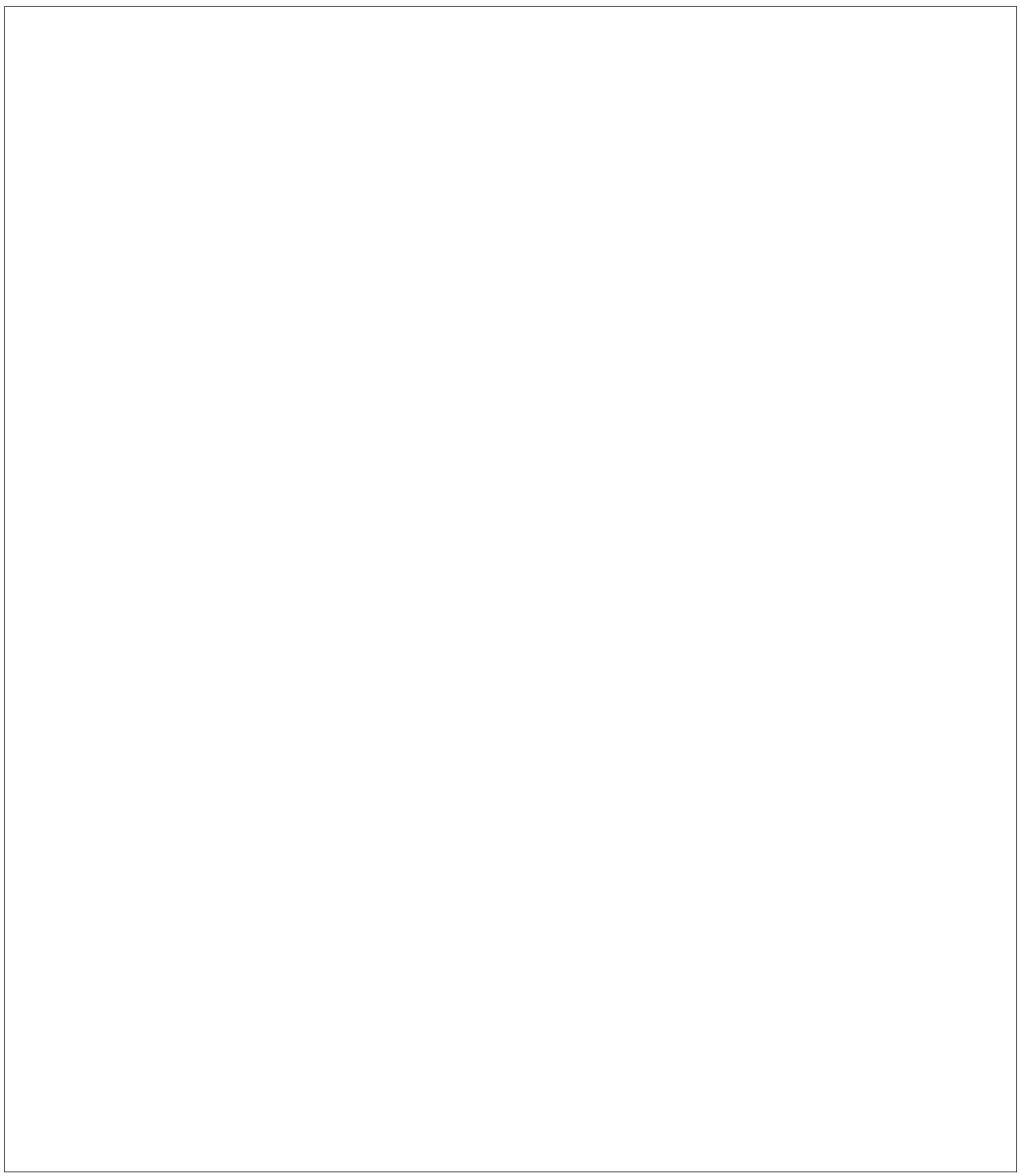

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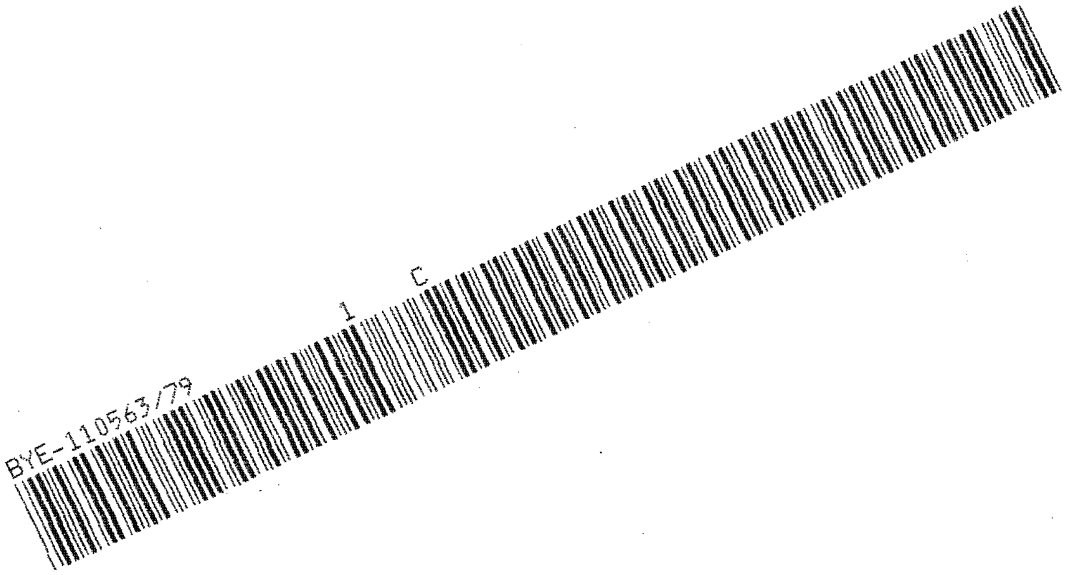
MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Quarterly Program Report

Attached is the Program A Quarterly Program Report for the period 1 April 1979 through 30 June 1979. Also attached is an Annex detailing Applied Research/Advanced Technology and Advanced Development contractual information.

JOHN E. KULPA, JR.
Major General, USAF
Director



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QUARTERLY PROGRAM REPORT

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QUARTERLY PROGRAM REPORT

P-989 Program

Program Manager: Colonel Paul F. Foley

1. Summary

Six P989 satellites were operational during this reporting period; however, MABELI reentered the earth's atmosphere in mid-April. Although more than seven years old, MABELI continued to operate successfully and to provide a unique mission capability against Soviet ABM radars until its reentry. TOPHAT II was inoperative for a brief period due to a tape recorder problem and a data downlink problem; but it is currently operating satisfactorily. RAQUEL I and URSALA III operated well throughout the entire period. RAQUEL IA is in good condition and was tasked heavily even though it experienced its first major problems in over one year on orbit. Verification and calibration of URSALA IV were completed and the system is performing flawlessly.

The system test of the LORRI Pallet began in June and is continuing successfully. The critical design reviews scheduled for FARRAH I have been successfully completed and manufacturing of all subystems has begun for the flight unit.

2. Specific Status

a. On-Orbit Spacecraft

(1) Mission 7339/MABELI. MABELI was launched on 20 January 1972 with a primary mission to intercept Soviet ABM signals in the .15 to 2.5 GHZ range. Data collected by MABELI has lead to a very thorough evaluation of several Soviet radars. The unique capability provided by this system to measure mainbeam power, polarization, and scan characteristics of large phased and/or frequency steered array radars has resulted in MABELI being a major contributor in the assessment

of Soviet capabilities for more than seven years. Burn-in occurred on 17 April 1979.

(2) Mission 7340/TOPHAT II. TOPHAT II was launched in April 1974 to provide information on troposcatter communications signals in the 450 to 1000 MHZ region. On 3 May 79, the only operating tape recorder failed to readout data, rendering the mission totally inoperative. During the subsequent several days the spacecraft attitude was altered to increase tape recorder temperatures and the recorder resumed operations on 13 May. The mission continued normal operations until 8 June, when the intermittent loss of modulation on the data downlink was reported by the tracking stations. This condition persisted until approximately 16 June and it has not occurred since then. TOPHAT II is expected to reenter the earth's atmosphere in February 1980.

(3) Mission 7341/RAQUEL I. RAQUEL I continues to support technical intelligence, directed and general search, and operational ELINT collection in the 4-18 GHZ range. Launched in October 1974, this mission remains operational and continues to be tasked over 150 minutes per day. Orbit decay is predicted for February 1980.

(4) Mission 7343/URSALA III. This mission, now approaching three years on orbit, continues to support operational ELINT and general search requirements. URSALA III status remains excellent except for the 5 to 9 db loss of collection sensitivity across the entire 2-12 GHZ collection band. Tasking continues to remain at or near 200 minutes per day.

(5) Mission 7345/RAQUEL IA. This mission is nearly identical to RAQUEL I and supports the same collection requirements. On 30 April, band 7 of the payload (14-16 GHZ) failed completely for both pulse and CW. Subsequent investigation localized the failure to the receiver and the prognosis is that band 7 will remain inoperative for the remainder of the RAQUEL IA mission. The long term

impact is that, with the reentry for RAQUEL I in February 1980, a gap will exist in the coverage of the 14-16 GHZ RF region until the launch of FARRAH I in March 1981. On 14 May, tape recorder #3 failed to readout. This problem was isolated to the tape recorder, but subsequent attempts to correct the problem have been unsuccessful. Tape recorder #3 had accumulated over 2500 readin-readout cycles prior to failure. All of the mission objectives can be accomplished with the two remaining recorders.

(6) Mission 7344/URSALA IV. Launched on 16 March 1979, URSALA IV has successfully completed its scheduled 60 day evaluation period. All spacecraft and payload subsystems continue to operate properly and to exhibit excellent performance.

b. Vehicles Under Development and Test

(1) Mission 7241/LORRI. The payload contractor, Argo Systems, delivered the payload to Lockheed on 15 May 1979. Lockheed integrated the payload with the spacecraft structure, antennas, and tape recorders and began system test in early June. Electromagnetic compatibility (EMC) testing, the first of the system tests for the LORRI system, was completed on 15 June. Simulated mission data generated during the EMC test were successfully processed by the ground data processing system. The project remained on schedule for launch on SV-16 of the host program in March 1980.

(2) Mission 7346/FARRAH I. The FARRAH I system is progressing satisfactorily toward a launch date in March 1981. All critical design reviews (CDRs) have now been completed; there is a review of the ground data processing system (GDPS) integration function scheduled for later in the development. All antenna designs have been completed and most of the state-of-the-art integrated circuits have been developed and tested. All subsystems are in the manufacturing cycle for the flight units. The first of the three flight tape recorders has been delivered and the on-board computer is near

completion. The payload development continues to be the most critical facet of the FARRAH I program. Delivery of the payload to the prime contractor is scheduled for 31 July 1980.

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JOHN E. KULFA, JR.
Major General, USAF
Director

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QUARTERLY PROGRAM REPORT

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QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager: Colonel Paul F. Foley

1. Summary

Five P989 satellites were operational during this reporting period. TOPHAT II's intermittent loss of modulation on the data downlink continued during this reporting period. However, two-thirds of the planned collections were deemed processable. RAQUEL I, RAQUEL IA and URSALA III operated well throughout the entire period. After six months of on-orbit operation, URSALA IV experienced its first two major anomalies. With the increase in vehicle temperature, the expected intermittent loss of the Band 2 delta channel occurred on 29 June 1979. On 9 September 1979, the primary Band 3 local oscillator became intermittent which caused the complete loss of Band 3 data. The latter problem was corrected by commanding the backup local oscillator for Band 3. By the end of the quarter, the combined tasking of all five satellites reached nearly 900 minutes per day.

The system tests on the LORRI Pallet are nearly complete, with only a portion of the thermal vacuum test and the Pallet/Host Electromagnetic Compatibility Test remaining. All tests are scheduled to be completed by the end of October.

2. Specific Status

a. On-Orbit Spacecraft

(1) Mission 7340/TOPHAT II. TOPHAT II was launched in April 1974 to provide information on troposcatter communications signals in the 450

to 1000 MHZ region. The loss of modulation on the data downlink, reported in the last report, continued to be intermittent. Two possible causes for the intermittent loss of modulation are: (1) a bad FET in the payload and/or, (2) tape/tape head separation due to a build-up of debris on the recorder head. Because the vehicle's thermal environment has been stabilized, it is felt that the latter is the cause of the problem. Tape Recorder #3 is continuing to operate satisfactorily since the vehicle's attitude has been changed to maintain elevated tape recorder temperatures. As of 21 September 1979, the TOPHAT II Tape Recorder #3 has accumulated 11344 record-read-out cycles.

(2) Mission 7341/RAQUEL I. RAQUEL I continues to support technical intelligence, directed and general search, and operational ELINT collection in the 4-18 GHZ range. Launched in October 1974, this mission remains operational and continues to be tasked over 180 minutes per day. Orbit decay is predicted for February 1980.

(3) Mission 7343/URSALA III. This mission, now approaching three years on orbit, continues to support operational ELINT and general search requirements. URSALA III status remains excellent except for the 5 to 9 db loss of collection sensitivity across the entire 2-12 GHZ collection band. Tasking has increased to approximately 280 minutes per day.

(4) Mission 7345/RAQUEL IA. This mission is nearly identical to RAQUEL I and supports the same collection requirements. All of the mission objectives are being satisfactorily accomplished despite the loss of Tape Recorder #3. Probable cause for the failure has been narrowed to either: (1) a split or broken drive belt, or (2) a slipping or dislocation of the motor drive pully. There is no history of similar failures on previous types of

recorders. The long term effect of the loss of Tape Recorder #3 will be a reduction in tasking flexibility and a minor reduction in mean system life. With this failure, the usage of recorders #1 and #2 has been reduced to 14 cycles/day each from their previously planned 16 cycles/day. Currently, RAQUEL IA is being tasked approximately 135 min/day.

(5) Mission 7344/URSALA IV. The mission of URSALA IV is general search, operational ELINT or technical intelligence for the 2-12 GHZ band. URSALA IV was launched 16 March 1979. On 29 June 1979, the intermittent loss of Band 2, (4-6 GHZ) delta channel data, occurred. This anomaly, which was originally detected in thermal vacuum chamber tests, was expected to occur as the vehicle's temperature increased. The anomaly is caused by a malfunctioning tunnel diode amplifier in the Band 2 delta channel. When this condition is present, monopulse geopositioning, with better than 0.4 degree accuracy, is not possible. Instead, the monopulse geopositioning is accomplished via a centroiding technique with, at best, 1.2 degree accuracy. Automatic certification of anomalous Band 2 delta data began on 12 July, whereby these signals are automatically detected as being anomalous and are geopositioned using the centroiding technique. Over the past 11 weeks the anomalous condition has been present approximately 87% of the time.

On 9 September 1979, the intermittent loss of Band 3, (6-8 GHZ) data from both the 3 and 6 foot antennas, began. By 14 September 1979, the intermittent condition had turned into a hard failure. The failure was subsequently isolated to the Band 3 local oscillator. On 17 September, the redundant local oscillator was switched in. Band 3 was regained and operation has been satisfactory ever since. URSALA IV is being tasked in excess of 280 minutes per day.

b. Vehicles Under Development and Test

(1) Mission 7241/LORRI. System test of the LORRI space segment continued. Compatibility with the Satellite Control Facility was demonstrated, acoustic and pyro shock tests were performed, and a check was made of the mechanical interfaces with the host vehicle. All of the tests of the LORRI space segment met their acceptance criteria. This testing also provided data to support the checkout of the LORRI ground data processing systems. At the close of the reporting period the system thermal vacuum test was in process. Detailed planning for the operational phase of the project has begun. The project remained on schedule for launch on SV-16, of the host program, in March 1980.

(2) Mission 7346/FARRAH I. The design of the FARRAH I payload is complete. Integration of the payload engineering model is in progress with several subsystems through test. The payload flight unit is currently in assembly. The antennas are in final assembly and initial test and the onboard computer has passed qualification testing. The computer flight unit is in final assembly. The first two, of three, recorders have been delivered. All spacecraft subsystems are progressing satisfactorily toward a spacecraft/payload integration in August 1980.

(3) Mission 73XX/FARRAH II. FARRAH II long lead procurement was initiated on 10 August 1979. Initial efforts concentrated on the procurement of critical long lead microelectronic piece parts and RF subassemblies for the payload segment, and microelectronic and CMOS devices for the stored command sequencer and command memory within the spacecraft segment. In November 1979, the remainder of the long lead material is expected to be authorized. The emphasis of this effort will be the

procurement of the residual hi-rel material needed for the payload, and the initiation of the development of the long lead subsystems of the spacecraft kit, which are not presently available off-the-shelf. This will provide a basis for the fabrication and assembly of FARRAH II payload modules and spacecraft subsystems starting in July 1980.

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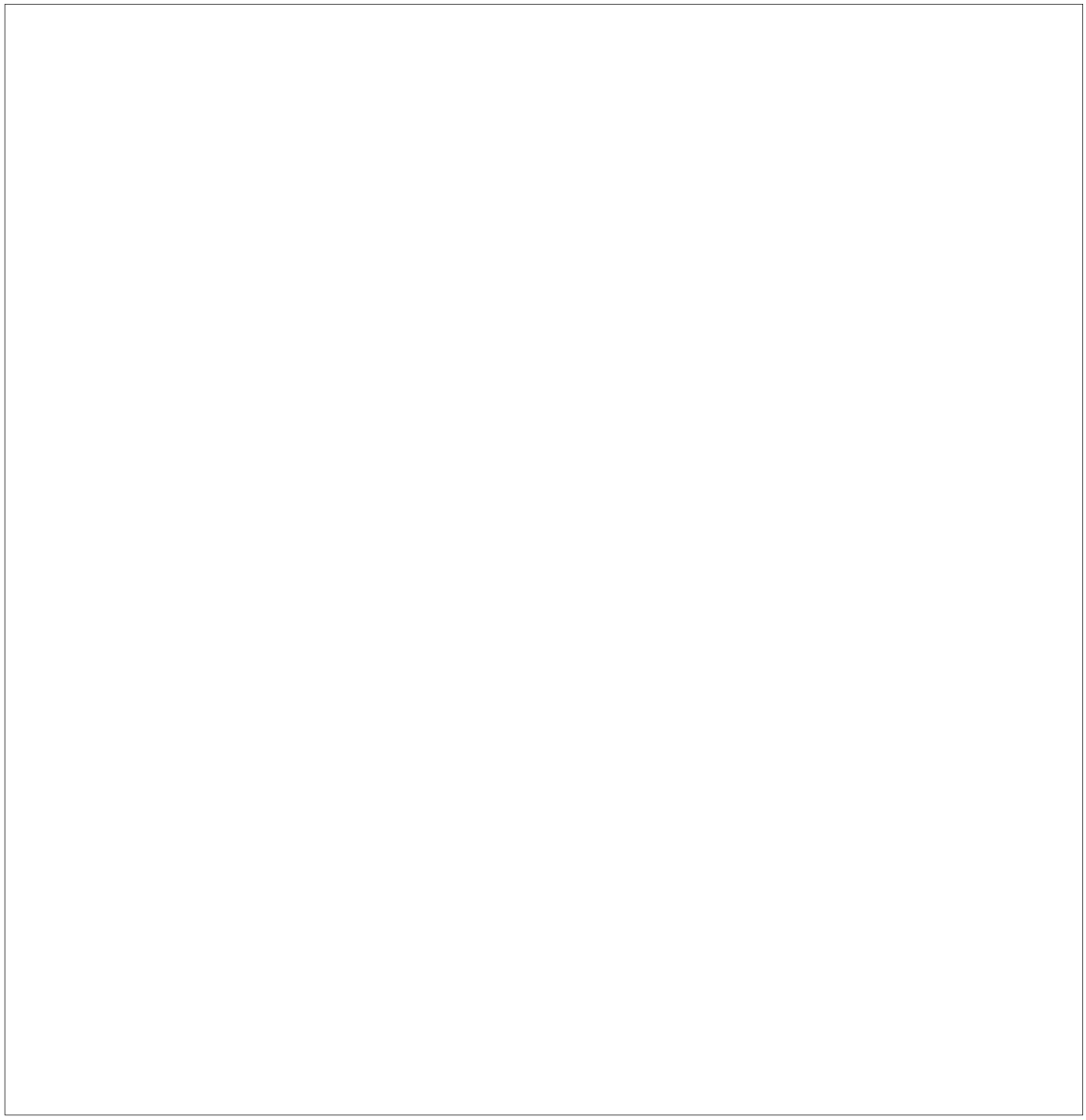

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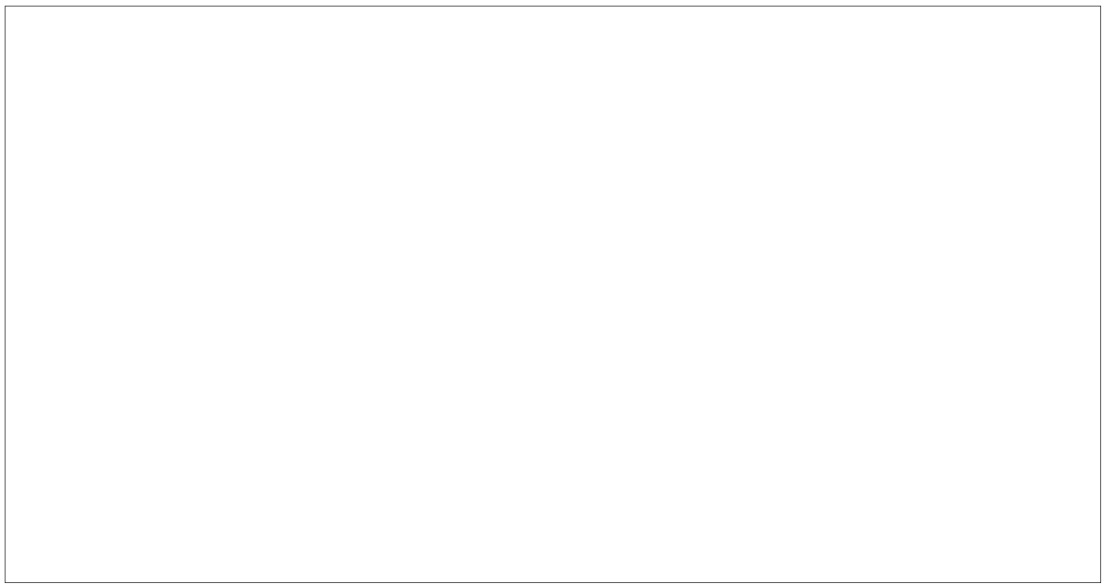

QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager: Colonel Paul F. Foley

1. Summary

Five P-989 satellites were operational during this reporting period. TOPHAT II experienced a total loss of all planned collection data on 15 Oct 79 when the sole remaining tape recorder apparently stalled. Following a series of large multi-orbit ACS maneuvers to thermally cycle the tape recorder, operations were reinitiated on 21 Nov 79 and have continued normally ever since. RAQUEL I, URSALA III, and URSALA IV operated well throughout the entire period. URSALA IV's Band 2 DELTA anomaly, reported in the previous reporting period, continued to be present on an intermittent basis. RAQUEL 1A experienced its second permanent tape recorder failure on 28 Oct 79. The immediate effect of the failure was to limit RAQUEL IA's tape recorder cycles to 10 per day from its previous limit of 14 and reduce RIA tasking to approximately 150 min/day. For the quarter, the average combined tasking of all five satellites was approximately 850 minutes per day.

2. Specific Status

a. On-Orbit Spacecraft

(1) Mission 7340/TOPHAT II. TOPHAT II was launched in April 1974 to provide information on tropo-scatter communications signals in the 450 to 1000 MHZ region. The loss of modulation on the data downlink intensified up until 15 Oct 79 when the remaining tape recorder (#3) apparently stalled. A 31 rev ACS maneuver was completed on 9 Nov 79 to lower the recorders temperature. None of the failed recorders responded. On 19 Nov 79, a second 31 rev ACS maneuver was completed to raise the recorders operating temperature. Initial results proved negative; but on 21 Nov 79 tape recorder #3 started operating and continues to operate normally.

As of 21 Dec 79, TOPHAT II's tape recorder #3 has accumulated 11759 record-read-out cycles and is being tasked at 40 minutes/day. Orbit decay for this satellite is estimated to take place on 22 Jan 80, plus or minus 8 days.

(2) Mission 7341/RAQUEL I. RAQUEL I continues to support technical intelligence, directed and general search, and operational ELINT collection in the 4-18 GHZ range. Launched in October 1974, this mission remains operational and continues to be tasked over 180 minutes per day. The current estimate of RAQUEL I's orbit decay is 13 Jan 80, plus or minus 5 days.

(3) Mission 7343/URSALA III. This mission, which is in its 39th month of operation, continues to support operational ELINT and general search requirements across the 2-12 GHZ band. URSALA III status remains excellent, except for the 5 to 9 db loss of collection sensitivity across its entire operating bandwidth. The present level of tasking is 260 minutes per day.

(4) Mission 7345/RAQUEL IA. This mission is nearly identical to RAQUEL I and supports the same collection requirements. On 28 Oct 79, the second of three tape recorders on-board the spacecraft failed. This recorder, tape recorder #1, had completed 3648 record-read-out cycles prior to its failure. Its projected design life was 8425 cycles. Results of a detailed failure analysis indicate that a relay in the recorder's control electronics assembly did not respond to the record end-of-tape signal and failed to turn off the recorder. The recorder was driven to its end of reel and either broke the tape or detached it from the reel. Engineering tests on the remaining relay from the same lot as the one which failed on-orbit are being conducted to determine if a lot problem exists. Despite this failure, RAQUEL IA, in its 19th month of operation, continues to meet its mission objectives. However, in an effort to extend the vehicle life as long as possible, tasking has been reduced to approximately 10 tape recorder cycles (145-165 minutes) per day. At this rate the remaining recorder would not achieve its design life until after the launch of FARRAH I in March 1981.

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(5) Mission 7344/URSALA IV. The mission of URSALA IV is general search, operational ELINT, and technical intelligence for the 2-12 GHZ band. URSALA IV is in its seventh month of operation and continues to operate satisfactorily. The intermittent occurrence of the Band 2 DELTA anomaly described in the Sep 79 Quarterly Report, continues to be present. Geopositioning of Band 2 signals via monopulse techniques was possible 70 percent of the time at 0.25 to 0.4 degrees direction of arrival accuracy. The remaining time, centroiding techniques are used with corresponding accuracy of 1.2 degrees. URSALA IV is currently being tasked in excess of 275 minutes per day.

b. Vehicles Under Development and Test

(1) Mission 7241/LORRI. LORRI system testing was completed in October and the satellite was placed into storage. On 4 December, the satellite was removed from storage and final preparations for mating it to the host vehicle were begun. On 13 December, notice was received that the launch of the host would be delayed. Plans were formulated to return the satellite to storage until early February 1980, and then to repeat the preparations for mating LORRI with the host vehicle. The system is rescheduled to launch on SV-16 of the host program in May 1980.

(2) Mission 7346/FARRAH I. The payload engineering model has been assembled and tested. It performed to the system level specification in all areas. The assembly and module test of the flight model payload is very near completion. Subsystem testing will be completed in the next quarter. All antenna qualification units (14) were assembled and testing is 67% complete. All flight units completed assembly and will be acceptance tested during the next quarter. The on-board processing system flight computer was assembled. All flight tape recorders have been completed. The basic spacecraft is currently on schedule and progressing satisfactorily toward a spacecraft/payload integration in August 1980, and a launch in March 1981.

(3) Mission 73XX/FARRAH II. FARRAH II long lead purchase orders for the critical long lead microelectronic piece parts and RF subassemblies for the payload segment and the microelectronics and CMOS devices for the TT&C subsystem of the spacecraft segment were placed during this reporting period. These orders covered appxoximately

480 piece part types. Authorization to proceed with Phase II of FARRAH II long lead procurement was given on 3 Dec 79. This phase of the procurement includes the purchasing of the remainder of the high-rel materials for both the payload and spacecraft segments; the fabrication of high-rel, custom built G_aA_sFET amplifiers, surface acoustic wave (SAW) filters and RF hybrids by the payload subcontractor; the incorporation of red line changes into the FARRAH drawing package and the procurement of new Type 27 and 28 transmitters. The completion of Phase II will provide the basis for fabricaction and assembly of FARRAH II payload modules and spacecraft subsystems starting in July 1980.

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