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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 31 January 1980 through 31 March 1980. Also attached is an Annex detailing Reconnaissance Technology contractual information.

JOHN E. KULP

Major General, USAF Director 2 Atch 1. Quarterly Program Report, As of 31 Mar 80 2. Annex, Reconnaissance Technology



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QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager:

Colonel Paul F. Foley

1. Summary

Five 989 satellites were operational at the beginning of this reporting period. On 23 January, RAQUEL 1 re-entered the atmosphere; on 22 February TOPHAT II did the same. URSALA III and URSALA IV both experienced tape recorder failures. The failure on URSALA III occurred at the Type 23 estimated end of life, while URSALA IV's Type 38 recorder failure occurred prematurely. Each vehicle has two operational recorders remaining. The URSALA IV Band 2 DELTA anomaly continued on an intermittent basis, but the percent of time the anomaly was present decreased from 100 percent to less than 1 percent. This was attributed to vehicle cooling as a result of passing the 100 percent sun period. For the quarter, the average combined tasking of the three remaining vehicles was approximately 655 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 troposcatter communication signals in the 450 to 1000 MHz region. It re-entered on 22 February 1980 at 35.5 degrees N. Lat., 318.9 degrees E. Long. It had completed 32693 orbits and had been operational for 70 months. Tape recorder number three continued to operate; however, the quality of readout data had been noisy and non-processable since 26 Jan 80.

(2) <u>Mission 7341/RAQUEL I</u>. RAQUEL I was launched 29 Oct 1974. It burned in on 23 Jan 80 at 72.6 degrees N. Lat., 100 degrees W. Long. Its mission was technical intelligence, directed and general search, and operational ELINT collection in the 4-18 GHz region. RAQUEL I had completed 29,086 orbits and provided a



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total of 301,290 read-in minutes of data. At the time of re-entry, RAQUEL I had experienced a loss of Band 5 (8-10 GHz), the loss of its TI receiver and the complete failure of one tape recorder. It had been providing approximately 150-185 read-in minutes of data per day. With the loss of RAQUEL I the P-989 program loses coverage of 14-16 GHz until the FARRAH I vehicle is launched in March 1981.

(3) <u>Mission 7343/URSALA III</u>. This mission was launched 8 Jul 1976 and is in its 43rd month of operation. It continues to support operational ELINT and general search requirements across the 2-12 GHz band. URSALA III's status remains good except for the 5 to 9 db loss in collection sensitivity across its entire operating bandwidth and the more recent failure of tape recorder #2. TR #2 failed on 31 Dec 79 after 5671 cycles. The estimated end of life for a Type 23 recorder is 5540 cycles. Currently, URSALA III is in a 100 percent sun condition and the daily tasking has increased to approximately 290 minutes per day.

(4) Mission 7345/RAQUEL IA. This mission is nearly identical to RAQUEL I and supports the same collection requirements. Analysis of two Type 38 tape recorder failures is continuing. Engineering tests on a relay from the same lot as the one which was suspected of failure on tape recorder #1 has indicated no lot related problem exists. As a result of data obtained during the failure of the Type 38 tape recorder on URSALA IV, a new failure mode is suspected in the loss of tape recorder #3. The most probable cause of the problem is a lack of clearance between the negator spring on the supply reel and the tape recorder housing (third leg). This problem has been seen on some recorders during build-up and resulted in changes being made on S/N 008 and up (recorders for FARRAH I and II). As a result, the recorder will not be permitted to operate within 30 sec of either end of tape. This precautionary measure provides additional clearance between the negator spring and the transport housing. The operational effects of this tasking constraint are minimal.

(5) <u>Mission 7344/URSALA IV</u>. The mission of URSALA IV is general search, operational ELINT and

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technical intelligence for the 2-12 GHz band. URSALA IV is in its 12th month of operation and is being tasked at approximately 220 minutes per day. The intermittent occurrence of the Band 2 DELTA anomaly described in the Sep 79 Quarterly Report has been reduced to negligible frequency as a result of spacecraft cooling. The remainder of the payload has performed flawlessly. On 2 March, tape recorder 3 failed to read out. Current plots indicated the most probable cause to be tape wrapping around a capston causing recorder stall and tape breakage. The source of this problem was discussed under RAQUEL IA. The corrective actions being taken are two fold. For the remaining Type 38 recorders on-orbit, read-ins and read-outs are being terminated at least 30 seconds before end of tape. For the new recorders, S/N 008 and up, adequate clearance between a full negator spring supply reel and the third leg is being assured by reducing the size of the third leg and by providing a consistent negator spring form factor via improved heat treating and improved spring clearing procedures.

b. Vehicles under Development and Test

(1) <u>Mission 7243/LORRI</u>. LORRI was removed from storage on 14 Feb 80 and preparations for mating it to the host vehicle were initiated. This mate was accomplished on 5 Mar 80. Two launch rehearsals have been conducted. Mission planning for post launch operations is continuing. The system is awaiting launch on SV-16, scheduled for not earlier than 30 April 1980.

(2) Mission 7346/FARRAH I. The payload system is progressing satisfactorily. During the last quarter, all but one of the major payload subsystems were assembled and tested. Five of those subsystems have completed acceptance testing and are ready for integration into the system. All the remaining subsystems will complete acceptance testing and are ready for integration Twelve of fourteen flight antennas have completed testing and are ready for the calibration scheduled for next quarter. All of the qualification antennas have completed qualification testing. The on board processing computer has completed testing and will be delivered early next quarter. The spacecraft support subsystems are on schedule and will support the system level integration in the fall of this year. The FARRAH I system is progressing toward a mate in Feb 1981 and a launch in March 1981.



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(3)Mission 73XX/FARRAH II. FARRAH II Phase I long lead materials continue to be received and inspected. Currently, 50 percent of the long lead materials required for the spacecraft have been received. Phase II activities of ordering the remainder of the high rel materials/piece parts for the payload segment are complete while the spacecraft segment is approximately 70 percent complete. The fabrication of high rel custombuilt surface acoustic wave filters, RF hybrids, and GaAs FET amplifiers are proceeding on schedule. A preliminary design review for the new Type 27 and 28 transmitters was completed 26-27 March 80. Fabrication of a prototype Type 38 transmitter will commence l April 80.

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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 1980 through 30 June 1980.

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Major General, USAF Director l Atch Quarterly Program Report



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QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager:

Colonel Paul F. Foley

1. Summary

Three 989 satellites were operational during the entire reporting period. In addition, the LORRI pallet, Mission 7241, was launched on 18 June 1980 and was declared operational on 25 June. LORRI will conduct directed and general search missions of the 26-42 GHz frequency spectrum. URSALA III experienced two occurrences of anomalous commanding during the reporting period. These were resolved by operating with alternative, back-up commands. The URSALA IV Band 2 delta anomaly continued on an intermittent basis. However, the percent of time in which the anomaly was present remained below the 1-2 percent level. For the quarter, the average combined tasking of the three 989 vehicles was approximately 610 minutes per day.

2. Specific Status

a. On-Orbit Spacecraft

Mission 7343/URSALA III. URSALA III, in its (1)46th month of operation, continues to support operational ELINT and general search requirements across its 2-12 GHz region at a daily tasking level of 250 minutes per day. URSALA III's overall status remains good. However, on 19 and 22 May 1980, two vehicle command anomalies occurred. The first anomaly involved the use of a command to enable the Primary Event/Companion Event matrix to the read-in. The proper values which had been previously commanded were not transferred. The use of alternate commands proved successful. On 22 May 1980 the primary spin reference control command failed. Again the alternate was used successfully. Further investigation indicated that a failure of a command relay located within the Telemetry Command Unit is the most probable cause of both problems.



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(2) <u>Mission 7345/RAQUEL IA</u>. RAQUEL IA was launched on 16 March 1978. Its mission is to provide technical intelligence collection, support directed and general search and operational ELINT requirements in the 4-18 GHz region. The vehicle has continued to operate satisfactorily during its reporting period. No new anomalies have occurred. The sole remaining recorder continues to be limited to 10 R/O cycles per day. Further, as a result of past type 38 recorder anomalies, the remaining recorder is being restricted from reaching either end of tape. This is to provide additional clearance between the negator spring and the transport housing. Currently, RIA is at 76 percent sun and increasing. Its average daily tasking level is 161 minutes per day.

(3) <u>Mission 7344/URSALA IV</u>. The mission of URSALA IV is general search, operational ELINT and technical intelligence for the 2-12 GHz region. URSALA IV is in its 15th month of operation and is being tasked at approximately 200 minutes per day. It continues to operate flawlessly. The intermittent occurrance of the band 2 delta anomaly described in the September 1979 Quarterly Report has remained at a negligible level (less than 2 percent). The operational restriction of not reaching end of tape on the recorders has also been imposed on UIV's remaining two recorders. The number of cycles per day has not been limited. Efforts to characterize the amount of growth and the mechanization for growth of the negator springs is continuing.

(4) <u>Mission 7241/LORRI</u>. Launch occurred at 1830Z on 18 June 1980. The satellite achieved orbit in good health. The high gain antenna was deployed during rev 14. Engineering evaluation began during rev 45 (21 June 1980) when power became available from HEXAGON. Routine tasking and data processing began on 23 June 1980. Turnover of operational control of LORRI to the

report of intercepts made by LORRI was transmitted from on 25 June 1980, one week after launch.

b. Vehicles Under Development and Test

(1) <u>Mission 7346/FARRAH I</u>. A major milestone was accomplished during this report period when the entire spacecraft was formally delivered from the manufacturing area to the test area on 27 June. This includes all subsystems

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except the antennas and payload which undergo most of their testing independent of the rest of the spacecraft. System level testing started on that date. All fourteen antennas have completed acceptance testing. The three high gain antennas are currently undergoing calibration and will be completed early July. At the beginning of this report period, the payload encountered a major setback. All of the subsystems had been assembled and acceptance tested when it was discovered that a silver ribbon used to connect substrate-to-substrate, substrate-to-component, and substrate-to-connector throughout the entire payload was faulty. Four thousand of the interconnect ribbons were used in the payload. The payload subcontractor implemented a plan to completely disassemble, rework, reassemble, and retest all the subsystems with new ribbon. The payload is ready to start full-up integrated system level testing in early July 1980. The payload and antennas will be delivered to the spacecraft test facility at the end of September 1980. Final integrated testing will then be completed to support a mate to the host vehicle in February 1981.

(2)Mission 73XX/FARRAH II. FARRAH II long lead materials continue to be received and inspected. Currently, 96 percent of the materials for the spacecraft have been received and approximately 80 percent are on hand for the payload. Detailed planning activities for proceeding with the manufacturing and assembly of the spacecraft and payload has been completed. Initiation of this phase is projected for 1 July 1980. Breadboard testing of the Type 28 transmitter modules was completed during April and May 1980. A prototype design baseline has been established and fabricated and assembly of a prototype transmitter is to be completed by 4 July. The month of July will be used for prototype testing to support the Detailed Design Review in September 1980.

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QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager:

Colonel Paul F. Foley

1. Summary

Three 989 satellites and the LORRI pallet were operational during the reporting period. There were no new satellite anomalies. The URSALA IV Band 2 delta anomaly continued on an intermittent basis; however, the time it was present remained below two percent. For the quarter, the average combined tasking of the three 989 vehicles was approximately 600 minutes per day. During the quarter, two major developmental milestones occurred. First, the FARRAH I payload completed subsystem and system integration and entered into full-up system testing. Second, the FARRAH II development contract was negotiated and signed.

2. Specific Status

a. On-Orbit Spacecraft

(1) <u>Mission 7343/URSALA III</u>. URSALA III, in its 50th month of operation, continues to support operational ELINT and general search requirements across the 2-12 GHZ spectrum at a daily tasking level of 225 minutes per day. The projection of URSALA III power available shows a continued decrease as the vehicle transitions from the 100 percent sun condition. As a result, there will be a gradual reduction in tasking levels until a minimum of approximately 175 minutes per day is reached in January 1981.

(2) <u>Mission 7345/RAQUEL IA</u>. RAQUEL IA was launched on 16 March 1978 and is in its 30th month of operation. Its mission is to provide technical intelligence collection, support directed and general search requirements, and provide operational ELINT coverage in the 4-18 GHZ region. The vehicle has continued to operate satisfactorily. The vehicle is in full sun; however, because only one recorder

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remains operational, the number of tape recorder cycles per day are being constrained. RAQUEL IA is accomplishing 170 minutes of collection per day.

(3) <u>Mission 7344/URSALA IV</u>. The mission of URSALA IV is general search, operational ELINT and technical intelligence for the 2-12 GHZ region. URSALA IV is in its 18th month of operation and is being tasked at approximately 200 minutes per day. It is in a 63 percent sun condition and is projected to reach the lower limit of its available power budget in late December. When this occurs, the estimated level of tasking will be reduced to 170 minutes per day. With the exception of the Band 2 delta anomaly and the failure of tape recorder 3, reported previously, URSALA IV continues to operate flawlessly. The intermittent occurrence of the Band 2 delta anomaly described in the September 1979 Quarterly Report has remained a negligible level.

(4) Mission 7241/LORRI. LORRI, which was launched on 18 June 1980, is in its third month of operation and continues to operate successfully. LORRI supports general and directed search operations within the 26-42 GHZ spectrum for both pulse and CW signals. LORRI is presently being tasked at the rate of 250 minutes/day and is not limited in power availability.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I. During this reporting period, the FARRAH I spacecraft continued with initial integrated system checkout. The preliminary system testing is complete and environmental testing has begun. All subsystems are performing as required. All 14 antennas are ready for systems integration except the four OMNI antennas which are in final calibration. All antennas will support the system test schedule. The payload is currently in final integrated checkout and environmental testing, with delivery to the prime contractor scheduled for early November. The spacecraft is progressing satisfactorily toward a scheduled launch in late Spring 1981.

(2) <u>Mission 73XX/FARRAH II</u>. FARRAH II long lead materials continue to be received and inspected; at present 98 percent of the spacecraft material/piece parts have been received and approximately 90 percent of the payload materials/piece parts are in stock. Fabrication has

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commenced for most spacecraft and payload subsystems. Within the payload, preparations for the FARRAH II Payload Update Design Review, scheduled in October, are in progress. Manufacture and test of the prototype Type 28, 10 watt transmitter was successfully completed in September.

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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 October 1980 through 31 December 1980.

Ε. JOHN KULP

Major General, USAF Director l Atch Quarterly Program Report, as of 31 Dec 80

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SECTION H

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QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager

Colonel Paul F. Foley

1. Summary

Three 989 satellites and the LORRI pallet were operational during this reporting period. There were no new satellite anomalies; however, URSALA III experienced additional loss in pulse amplitude sensitivity across its entire frequency spectrum. The average combined tasking of the three 989 vehicles was approximately 500 minutes per day. FARRAH I met a number of key development milestones. The payload completed system calibration, environmental testing, and was shipped to the prime contractor for integration into the satellite on 22 December 1980. The omni antenna calibration activities and spacecraft spin deployment and command verification tests were also completed.

2. Specific Status

a. On-Orbit Spacecraft

(1) Mission 7343 /URSALA III - URSALA III, in its 53rd month of operation, continues to support operational ELINT and general search requirements across the 2-12 GHZ spectrum at a daily tasking level of 150 minutes Two of the three recorders remain operational; per day. however, both have far exceeded their expected life span. From 27 October 1980 to the present, URSALA III's pulse receiver sensitivity decreased 12 to 18 db from its pre-launch level of performance. Prior to this time it was operating 6-10 db down from its pre-launch level. This was a reoccurrance of a previous anomaly that first occurred in November 1977 and continued through May 1978. Between May 1978 and 26 October 1980, the condition had improved, but not to pre-launch levels. The loss in pulse amplitude sensitivity varies with time and band. The suspected cause was identified to be a faulty



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capacitor in the automatic gain control circuitry of the receiver. There is no know fix for the problem.

Mission 7345/RAQUEL IA - RAQUEL IA was (2)launched on 16 March 1978 and is in its 33rd month of operation. Its mission is to provide technical intelligence collection, support directed and general search requirements, and provide operational ELINT coverage in the 4-18 GHZ region. This vehicle has continued to operate satisfactorily, but because only one recorder remains operational, the number of tape recorder cycles per day is being limited to 11. RAQUEL IA is currently supporting a daily tasking level of 180 min/day. During the reporting period, a special calibration was scheduled to investigate the responsiveness of band 7 (14-16 GHZ) which had failed in April 1979. Results of the test proved negative and the status of band 7 remains unchanged.

(3) Mission 7344/URSALA IV - The mission of URSALA IV is general search, operational ELINT and technical intelligence for the 2-12 GHZ region. URSALA IV is in its 21st month of operation and is being tasked at approximately 170 min/day. No new anomalies have occurred during this period.

(4) Mission 7241/LORRI - The LORRI pallet is in its sixth month of operation and continues to operate flawlessly. LORRI supports general and directed search operations within the 26-42 GHZ spectrum for both pulse and CW signals. Its original mission life, which is set by its host vehicle, was to be six months. On 25 October, the host vehicle's parking orbit was increased to 170 NM. This will extend the 7241 mission to approximately 7 March 1981. Following the maneuver, the available power for LORRI was increased to support 300 minutes per day of tasking. This tasking level has since decreased to 290 minutes and will continue to decrease gradually as the host's orbit decays.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I - During this reporting period, two major milestones were accomplished in the FARRAH I spacecraft development. The most significant achievement was the completion of payload acceptance testing and calibration and the subsequent delivery of

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the payload to the prime contractor on 22 December 1980. The second major milestone was the completion of calibration of all of the collection antennas. These antennas are now available for installation on the spacecraft. All spacecraft environmental testing which could be accomplished without the payload was completed during this report period. All spacecraft subsystems are complete and integrated. System level testing is in progress. Spacecraft/payload compatibility testing and spacecraft system environmental testing will continue through the next report period. The spacecraft is progressing satisfactorily toward a launch in early Summer 1981.

(2) Mission 73XX/FARRAH II - Ninety-eight percent of FARRAH II's materials/pieceparts have been received and fabrication and assembly of subassemblies are underway for both the spacecraft and the payload. The FARRAH II system update design review was held on 21-22 October 1980. The payload subsystem module assembly is approximately 40 percent complete. Except for solar panel fabrication and assembly, all spacecraft subsystem work is proceeding on schedule.

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