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BYE-110557-81
As of 31 March 1981


MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Quarterly Program Report

Attached is the Program A Quarterly Program Report for the period 31 January 1981 through 31 March 1981.

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

1 Atch
Quarterly Program
Report, as of 31 Mar 81



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QUARTERLY PROGRAM REPORT

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SECTION F

# 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 an increase in noise level and loss of high frequency response from both of its remaining recorders. The average combined tasking level of the three 989 vehicles has been reduced to approximately 400 minutes per day. This primarily reflects a reduction in the URSALA III tasking due to the recorder problems noted above. On 6 March 1981 the LORRI pallet mission was terminated when the host vehicle re-entered. FARRAH-I began preliminary payload compatibility tests with the remainder of the spacecraft system. FARRAH-II continued in its subsystem fabrication and assembly phase.

## 2. Specific Status

### a. On-Orbit Spacecraft

(1) Mission 7343/URSALA III. URSALA III, in its 56th month of operation, continues to support operational ELINT and general search requirements across the 2-12 GHZ spectrum although at a reduced daily tasking level of 100 minutes per day. Two of the three recorders remain operational; however, both recorders began to exhibit increased jitter, loss of high frequency response and increased noise levels. Tape recorder one, which began to fail in mid-February, has degraded to the point that less than 15 percent of the station tapes are processable. Approximately 60 percent of the readouts from tape recorder three are processable. On 5 March, URSALA III support of rapid reporting requirements was suspended. An altitude control maneuver is planned 31 March through 2 April to increase

recorder temperatures by 20 degrees in an effort to reduce recorder noise. The Type 23 recorders, which have a mean design life of approximately 5400 cycles, have 10,219 and 7,783 cycles, respectively. URSALA III's pulse receiver sensitivity loss, reported last period, continued on an intermittent basis with levels varying from minus 10 db to minus 18 db from prelaunch conditions.

(2) Mission 7345/RAQUEL 1A. RAQUEL 1A was launched on 16 March 1978 and is in its 36th 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 further limited to 7. This should extend the remaining recorder life to the March 1982 time frame. RAQUEL 1A is currently supporting a daily tasking level of 160 minutes per day.

(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 24th month of operation and is being tasked at approximately 140 minutes per day. No new anomalies have occurred during this period.

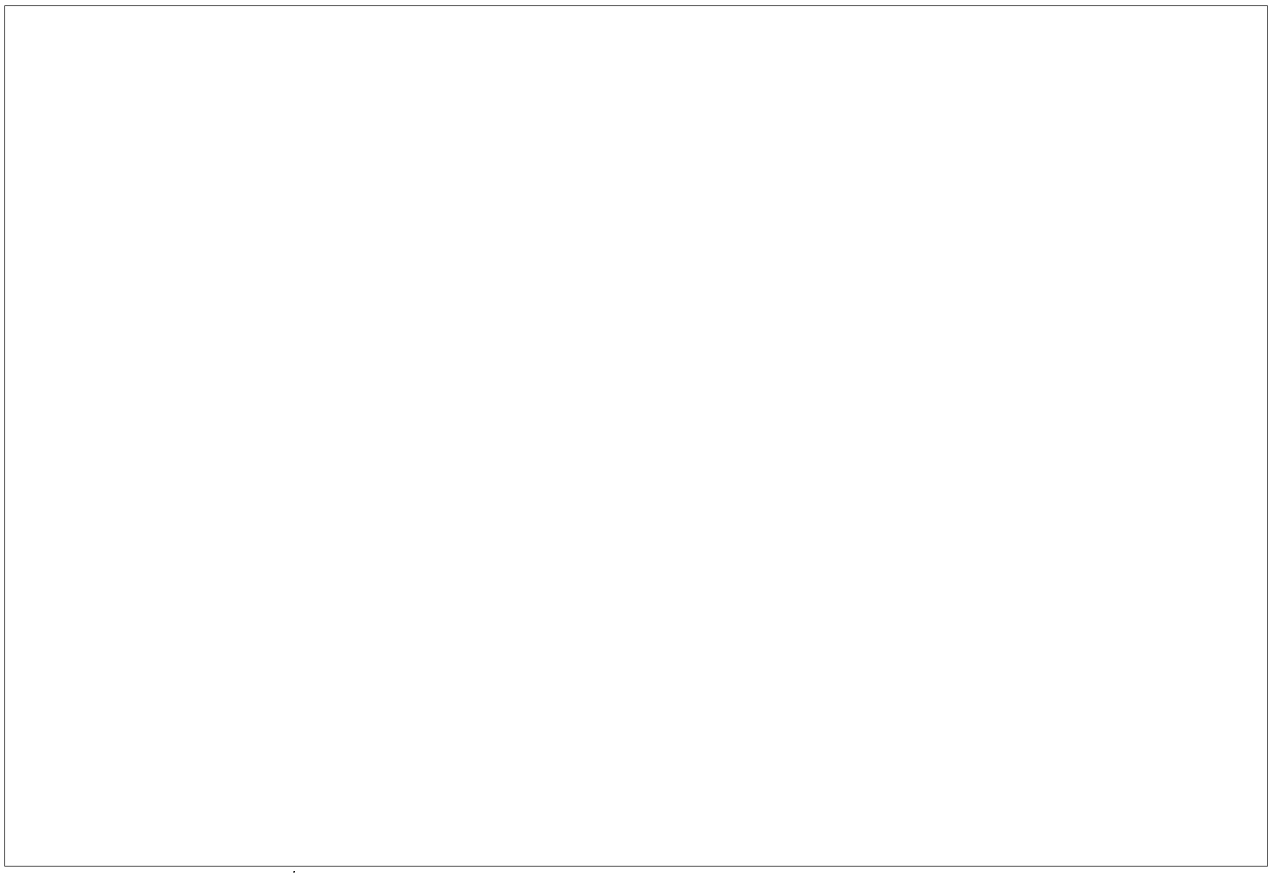
(4) Mission 7241/LORRI. The LORRI pallet, which was designed for a six month mission, completed eight months and 21 days of flawless operation prior to the termination of operations at 2230Z on 6 March 1981 upon host de-orbit. LORRI supported general and directed search operations within the 26-42 GHZ spectrum for both pulse and CW signals for approximately 275 minutes/day.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I. During the current reporting period, all spacecraft subsystem integration testing was completed. The interface testing between the spaecraft and the payload was nearly completed. All the tests used to verify spacecraft/payload compatibility have been run successfully. Two minor problems with the payload required that the technical intelligence receiver and pulse frequency measurement subsystem be removed and returned to the vendor for repair. Spacecraft level testing will be suspended until the return of those subsystems midway through the next

reporting period. Spacecraft/payload compatibility testing will be completed at that time, followed by the remaining vehicle level environmental testing. The spacecraft is progressing satisfactorily toward the scheduled launch in early 1982.

(2) Mission 73XX/FARRAH II. Fabrication and assembly of spacecraft subsystems, antennas and the payload continued during the reporting period. The payload subsystem module assembly and test is approximately 55 percent complete. At present the DF pulse receiver subsystem is in final assembly while the OMNI pulse receiver is completing final subsystem tests. Because of delays in completing trouble shooting activities and retest of the FARRAH I payload and its impact on releasing the specialized test equipment, the FARRAH II payload system level integration and testing are being rescheduled to commence in January 1982.



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BYE-110575-81
As of 30 June 1981
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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 March 1981 through 30 June 1981.

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

1 Atch
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SECTION F

QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager: Colonel Paul F. Foley

1. Summary

Three 989 satellites were operational during this reporting period. There were no new satellite anomalies; however, URSALA III continues to experience an increase in noise level and loss of high frequency response from both of its remaining recorders. The average combined tasking level of the three 989 vehicles has been reduced to approximately 355 minutes per day. This is due to the recorder problems noted above and the further limitation of RAQUEL IA tasking to 7 tape recorder cycles per day. This limitation was imposed to ensure the remaining tape recorder life will last until the launch of FARRAH I. Continuation of FARRAH I payload capability tests with the remainder of the spacecraft was delayed until the last part of June while problems with the TI receiver and omni pulse frequency measurement unit were being resolved. FARRAH II payload and spacecraft subsystems assembly and test are proceeding.

2. Specific Status

(1) On-Orbit Spacecraft

(1) Mission 7343/URSALA III. URSALA III, in its 59th month of operation, continues to support operational ELINT and general search requirements across the 2-12 GHZ spectrum although at a reduced daily tasking level of 80 minutes per day. The increase in noise and jitter from tape recorders one and three, reported in March 1981, continues. Tape recorder three, the last remaining recorder capable of storing PCM data is currently being read out only at Hula, Guam, and Cook where high frequency enchancers have been installed. Even with these devices the reception of quality data continues to degrade and it is anticipated that the recovery of useable PCM data will not extend beyond August 1981. Tape recorder one is being

used exclusively for the recording of omni video collects. The Type 23 recorders which have a mean design life of approximately 5400 cycles have 10336 and 8189 cycles, respectively. The use of URSALA III, which has unencrypted links in the transpond mode to stations outside the CONUS, is under investigation.

(2) Mission 7345/RAQUEL IA. RAQUEL IA, in its 39th month of operation, continues to provide technical intelligence collection 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 has been limited to 7. RAQUEL 1A is currently supporting a daily tasking level of 64 minutes per day and is at its lowest sun condition of 63-65%.

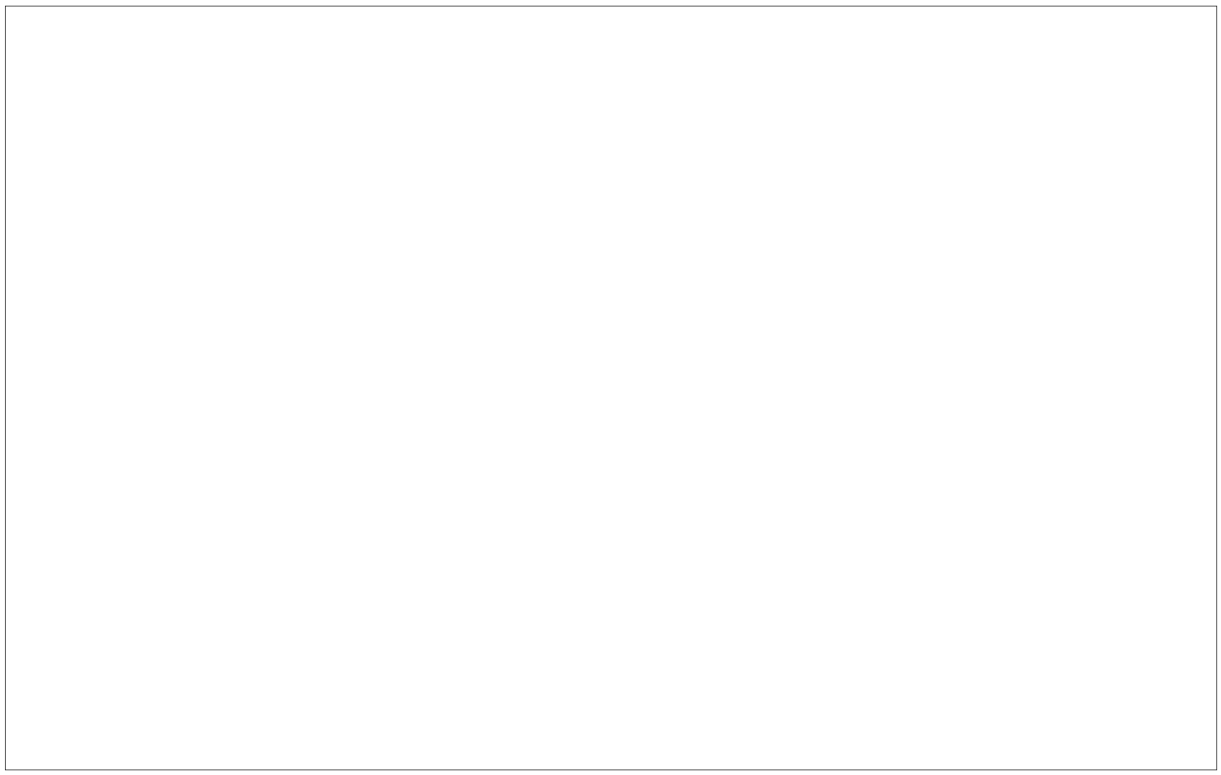
(3) Mission 7344/URSALA IV. The mission of URSALA IV is general search, operational ELINT and technical intelligence for the 2-12 GHZ region. URSALA IV is in its 27th month of operation and is being tasked at about 215 minutes per day under a 77% sun condition. It is expected to reach 100% sun in August 1981. No new anomalies have occurred during the period.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I. During this reporting period, a modification was performed on the spacecraft to incorporate a third battery. This increases the power storage capability from 12 ampere hours to 18 ampere hours allowing for an increase in system tasking by an average of 50%. The change was necessary because of requirement changes over the past three years. When the last Quarterly Report was submitted, the Technical Intelligence Receiver and Pulse Frequency Measurement subsystem had been returned to the vendor for repair. They were returned to the prime contractor and installed in the spacecraft during this report period. The spacecraft is completely assembled at this time and completing spacecraft/payload compatability testing. Baseline and acoustics testing will be completed during the next report period and thermal/vacuum testing will begin. The spacecraft is progressing satisfactorily toward a launch in late January 1982.

(2) Mission 73XX/FARRAH II. Fabrication, assembly and acceptance testing of various spacecraft subsystems,

antennas, and payload subsystems continued during the reporting period. The A2/B2/A3/B3 and C3/TC2 mainbeam intercept and telemetry and command antenna assemblies completed manufacturing assembly and are presently into test. Numerous spacecraft subsystems have been assembled and are in various stages of acceptance testing. The assembly and test of payload down converter modules is progressing satisfactorily with preliminary band testing initiated in late June 1981. The omni pulse receiver completed acceptance testing on 5 June. The DF pulse, CW and TI receivers, along with the omni inhibit, are in subsystem integration and test with the DF pulse receiver expected to complete acceptance testing by 1 September 1981. During the reporting period, direction was received which extended the availability date of FARRAH II by a year to support a nominal March 1984 launch date. The FARRAH II program has been replanned and rescheduled to make more effective use of available manpower, schedule, and funding resources.



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BYE-110583-81

As of 30 September 1981



MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Quarterly Program Report

Attached is the Program A Quarterly Program Report for the period 31 July 1981 through 30 September 1981.

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

1 Atch
Quarterly Program
Report, as of 30 Sep 81

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SECTION F

QUARTERLY PROGRAM REPORT

P-989 PROGRAM

Program Manager: Colonel Paul F. Foley

## 1. Summary

Three 989 satellites were operational during this reporting period. URSALA III's sole remaining recorder, capable of supporting payload data storage, failed on 30 August 1981. Transpond operations commenced on 31 August 1981 to all remote tracking stations except Oakhanger; however, this collection is constrained to lower priority areas which are visible to the spacecraft while it is within the tracking station's access circle. The average combined tasking level for the period was 399 minutes per day. Both URSALA III and RAQUEL IA are in minimum sun and will remain there until the Spring of 1982. During the period, RAQUEL IA's recorder usage was further limited to 5 cycles per day to ensure the remaining tape recorder life extends until the launch of FARRAH I. FARRAH I system baseline tests were completed during the reporting period and the vehicle is presently undergoing an abbreviated thermal vacuum engineering test. Due to the occurrence of multiple intermittent failures in the payload data handler motherboard, the decision was made to replace the board with a redesigned board. Because of this, the availability of FARRAH I to support mate operations has slipped from 15 December 1981 to 1 April 1982. FARRAH II spacecraft subsystems, antennas, and payload continue to be assembled and tested. The FARRAH III system definition study is in progress.

## 2. Specific Status

### a. On-Orbit Spacecraft

(1) Mission 7343/URSALA III. URSALA III, in its sixty-second month of operation, continues to support limited operational ELINT and general search requirements across the 2-12 GHZ spectrum. Because of the failure of recorder number three, all tasking operations, except a very limited number of omni video collections, are being

completed in the transpond mode. All remote tracking stations, except Oakhanger in the United Kingdom, are being used. URSALA III's unencrypted payload data down links preclude the use of Oakhanger for transpond operations. At present, URSALA III is supporting approximately 140 minutes per day of collection. For the period, no further degradation in payload pulse amplitude senistivity beyond the 10 to 18 dbm range has occurred.

(2) Mission 7345/ RAQUEL IA. RAQUEL IA, in its forty-second month of operation, continues to provide technical intelligence collection 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 has been further limited to five. RAQUEL IA is currently supporting a daily tasking level of approximately 55 minutes.

(3) Mission 7344/URSALA IV. The mission of URSALA IV is general search, operational ELINT, and technical intelligence in the 2-12 GHZ region. URSALA IV is in its thirtieth month of operation and is being tasked at about 280 minutes per day under 100% sun condition. No new anomalies have occurred during the period.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I. During this reporting period, spacecraft/payload compatability and baseline testing was completed. The spacecraft is currently undergoing thermal/vacuum testing. It was determined during environmental testing that a digital motherboard in the payload was unsatisfactory, necessitating its removal and replacement. The payload box containing the motherboard will be moved from the spacecraft and returned to the vendor for rework as soon as the replacement board is ready for installation. Subsequent to the rework and reinstallation of the payload box, spacecraft environmental testing will be repeated, followed by flight readiness testing and mate. During the next report period, the payload rework, subsequent pre-environmental testing, and acoustic/pyro shock test will be completed.

(2) Mission 73XX/FARRAH II. Fabrication, assembly, and acceptance testing of the various spacecraft subsystems, antennas, and payload subsystems continued during the reporting period. The C3/TC3 and A2B2/A3B3 mainbeam

intercept and telemetry/command antenna assemblies completed acceptance testing. The B1/B4 (6-12 GHZ-DF antenna) is presently completing its post environment RF patterns. The A1/A4 qual unit with its redesigned reflector is into final assembly with the testing to commence in October 1981. The C1/C4 (6-18 GHZ DF assembly) is into final assembly after experiencing delays in obtaining acceptable beamforming network components. All spacecraft subsystem electronic boxes being manufactured by the prime contractor have been assembled and are into/or have completed acceptance testing. The telemetry command unit and the stored command sequencer (considered risk items) have successfully completed acceptance testing. The only remaining items to be fabricated, assembled, and tested are those relating to the third battery installation, the spacecraft wire harness, and the solar array panels. The assembly of the Type 28, 10 watt transmitter qualification unit began during the reporting period following numerous delays in obtaining high reliability parts. The assembly alignment, integration and band testing of payload down converter modules is progressing satisfactorily. At present, bands 1-5 (2-10 GHZ) for the sum, delta, guard, and omni plus and minus channels are complete. Alignment and test of bands 6, 7 and 8 (12-18 GHZ) down converter modules is in progress. The DF pulse receiver, CW receiver,TI receiver, and pulse frequency measurement units are into subsystem integration and test. During October 1981, the DF pulse and CW receiver should complete these acceptance tests. The data handler daughter boards have been integrated as a unit and acceptance tested. Final integration with the flight item motherboard will be completed following the finalization of the motherboard/B-box wiring harness. Eleven of the fourteen required payload power converters have been completed.

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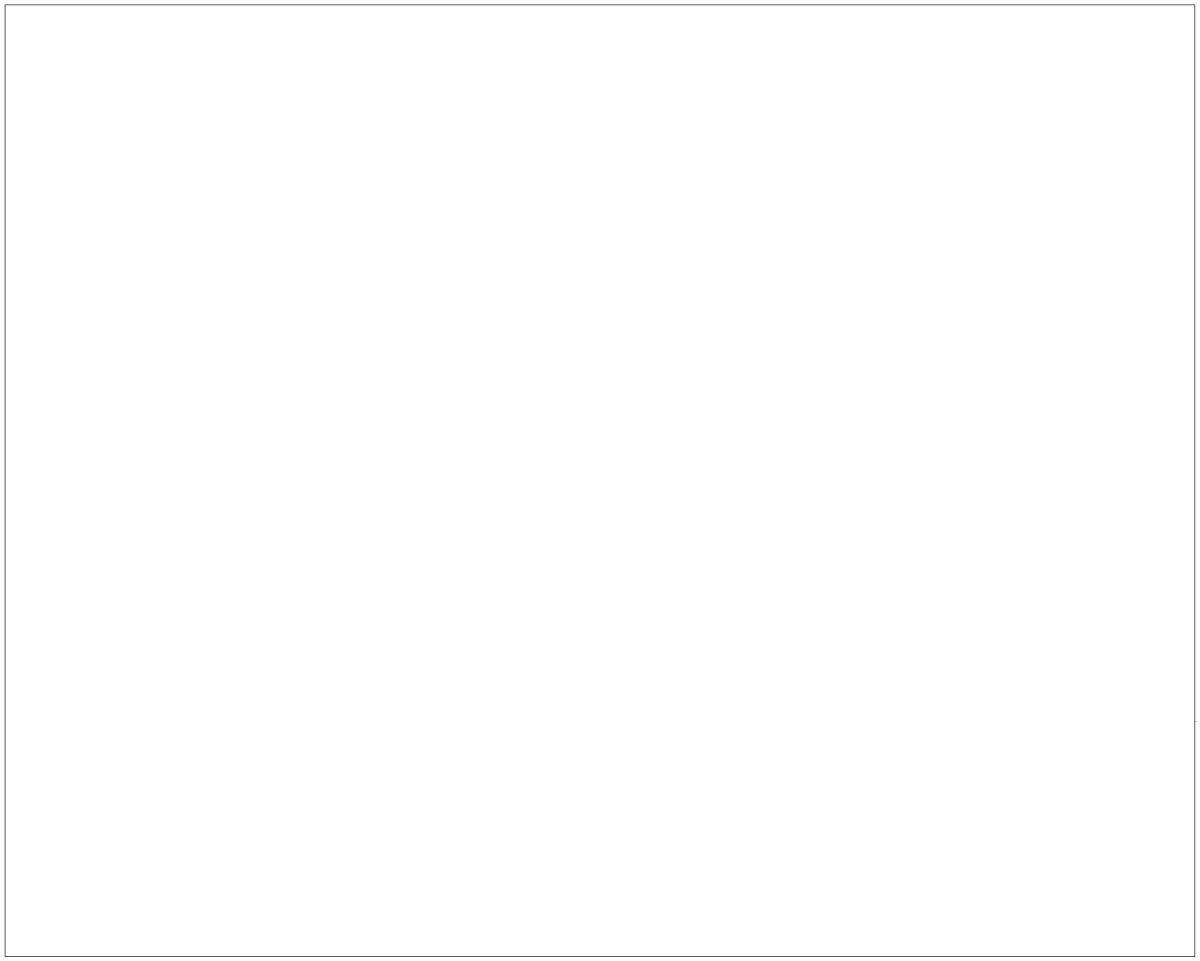

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MEMORANDUM FOR THE DIRECTOR, NATIONAL RECONNAISSANCE OFFICE

SUBJECT: Quarterly Program Report

Attached is the Program A Quarterly Program Report for the period 1 October 1981 through 31 December 1981.

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

1 Atch
Quarterly Program
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# QUARTERLY PROGRAM REPORT

## 989 PROGRAM

Program Manager: Colonel Paul F. Foley

## 1. Summary:

Three 989 satellites were operational during this reporting period. The average combined tasking level for the period was 397 minutes per day. On 29 Sep 81, an abnormally large number of pulses in URSALA IV's read in segments were noted. This increase was determined to be due to a failure in the payload omni inhibit circuitry which compares the amplitude of data from the high gain direction finding antennas with that from the omni antennas and inhibits data which is coming through the sidelobes of the DF antennas. Without this inhibit function erroneous geolocation of emitters results. All bands (2-12 GHz) were affected. All pulse and CW processing and reporting was suspended. On 30 Sep, following a special on-orbit calibration, CW processing and reporting was resumed. During the period of 1-8 Oct, [redacted] developed and tested data processing poke-through logic criteria which permitted the identification and subsequent thinning of suspect pulses. On 9 Oct, processing and reporting of pulse data resumed. By the end of October, processing and reporting volume attained similar levels as that experienced prior to the anomaly. For URSALA III and beginning on 23 Oct 81 for RAQUEL IA, transpond operations were conducted. Collections are constrained to lower priority areas which are visible to the spacecraft while being within the remote tracking station's access circle. All tracking stations, with the exception of Oakhanger, support transpond operations. For FARRAH I, the replacement of the payload data handler motherboard and the subsequent reaccomplishment of vehicle level baseline testing was successfully completed on 15 Dec 81. The spacecraft has been subjected to vehicle level acoustic and pyro shock tests, prepared for thermal vacuum testing, and is awaiting the conduct of post acoustic functional tests. It is anticipated that these tests will be completed the first week of January

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with thermal vacuum testing beginning on or about 14 January 1982. This schedule is in support of the new mate date of 1 April 1981 which was previously reported. FARRAH II spacecraft subsystems and antennas continue to be assembled and tested. Failures of a number of 20 mil and 100 mil silver ribbons in the payload pulse, CW, and test signal generator modules necessitated a suspension of all receiver acceptance testing until a cause for the failures was identified. Results of a Tiger Team investigation identified the most probable causes for the failure to be a combination of inadequate strain relief in the ribbon loops at the time of installation and the questionable metallurgical quality/properties of the ribbon used. Efforts to replace the ribbons in the various receiver and downconverter modules is underway. The net impact of this problem has been assessed to be a delay of 3-4 months in the availability of downconverters for box level integration and a projected delay in payload delivery of one month. Preparation of the necessary program acquisition documentation has been completed for FARRAH III. Release of the request for proposal is anticipated in the mid-January 1982 time frame.

2. Specific Status:

a. On-Orbit Spacecraft

(1) Mission 7343/URSALA III. URSALA III, in its 65th month of operations, continues to support limited operational ELINT and general search requirements across the 2-12 GHz spectrum. Because of the failure of recorder number three, all tasking operations, except a very limited number of omni video collections (2/week) are being completed in the transpond mode. URSALA III's unencrypted payload data down links preclude the use of Oakhanger for transpond operations. At present, URSALA III is supporting approximately 100 minutes per day of collection. For the period, no further degradation in payload pulse amplitude sensitivity beyond the 10 to 18 dbm range has occurred.

(2) Mission 7345/RAQUEL IA. RAQUEL 1A, in its 45th month of operation, continues to provide technical intelligence collection 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 continues to be limited. For the period, the average number of tape recorder readouts per day has been four. On 23 Oct 81 RAQUEL IA began transpond operations to all remote track stations except Oakhanger. At present, 90 minutes per day of tasking are being supported by RAQUEL IA. No new anomalies have occurred.

(3) Mission 7344/URSALA IV. The mission of URSALA IV is general search, operational ELINT, and technical intelligence in the 2-12 GHZ region. URSALA IV is in its 33rd month of operation and is supporting 201 minutes of tasking per day. On 10 Nov 81 URSALA IV exited 100% sun; on 29 Nov 81 an ACS maneuver was completed to improve the vehicle's orientation with respect to the sun. The effect of the maneuver is to increase the power available for tasking. As previously stated, on 29 Sep 81, a failure occurred in URSALA IV's payload which rendered the omni inhibit function within the DF pulse receiver inoperative. Through on-orbit testing/calibrations, a summing amplifier which combines omni plus and minus channel data in the inhibit circuitry was isolated as the most probable point of failure. This inhibit circuitry provides the means of thinning unwanted pulses and determining if the signal is being received through the DF antennas mainbeam or through its sidelobes/backlobes. Without this discrimination, sidelobe pulses are assumed to come through the mainbeam and therefore are geolocated erroneously. Ground processing poke-through logic criteria were established and tested which evaluate the sum-over-delta ratios of a given pulse and the movement of the signal across the antennas pattern. Following implementation of these criteria into the Flight Data Processing System, processing and reporting of pulse signals resumed on 9 Oct 81. Similar processing criteria have been implemented into the Near Real Time Processor in order to regain some of the timeliness lost by this anomaly.

b. Vehicles Under Development and Test

(1) Mission 7346/FARRAH I. In the last report, we noted that the data handler multilayer motherboard would have to be replaced in the payload due to unsatisfactory operation. During this report

period, subsequent to one cycle of thermal vacuum testing on the spacecraft, the affected payload box was removed and returned to the vendor. The motherboard was replaced and the box acoustically vibrated. It was connected to the remaining payload boxes, thermal cycled, and acceptance tested. Subsequently, the spacecraft was reassembled and subjected to system level acoustic vibration. Currently the system is undergoing the post acoustic functional test. During the next report period, system level thermal vacuum and flight readiness testing will be completed in preparation for mate in early April and launch in early May 1982.

(2) Mission 73XX/FARRAH II. Fabrication, assembly, and acceptance testing of the various spacecraft subsystems, antennas, and payload subsystems continued during the reporting period. The last main-beam intercept and telemetry/command antenna C2/TC1 completed final assembly and is well into acceptance testing with only it's final patterns remaining to be completed. The A1/A4 qual unit is having final patterns completed after having been through its qualification environments. The end item A1/A4 DF antenna (2-6 GHZ) has completed assembly and is awaiting acceptance testing while the C1/C4 (6-18 GHZ assembly) is having its initial pre-environmental patterns completed. All spacecraft subsystems electronic boxes have been assembled and are into or have completed acceptance testing. The only remaining items to be fabricated, assembled, and tested are those relating to the third battery installation. The solar array panels are into final assembly. During the reporting period, alignment and test of the remaining sum, delta, guard, and omni plus and minus channels were completed; however, on 23 Oct a problem was found on a test signal generator module in which a number of silver interconnect ribbons (20 mil wide by 1 mil thick) failed following approximately 30-60, 105 degrees centigrade thermal cycles. Similar failures occurred in the CW, DF pulse, local oscillator modules/subsystems which were into acceptance level temperature cycling tests. A Tiger Team of contractor/ government personnel was formed to identify the cause and mechanism for the failures. The cause of the problem was identified as thermal stress due to differential motion between microwave substrates which

exceeded the capability provided by the strain relief loops.

In December the decision was made to replace, where practical, all silver ribbons in all subsystems modules with replacement ribbon that has been thoroughly tested for ductility, metallurgical purity, and micro-structure. The new ribbons are to be installed and inspected for sufficient strain relief. In order to minimize the impact on box level integration, the CW and DF pulse receiver, pulse frequency measurement units, and the local oscillator are being worked first. The downconverter availability for box-level integration has slipped three months with a possible one month slip in payload delivery.

Finally, the data handler motherboard, along with the B-box harness completed acceptance level testing and has been integrated into the B-box structure.

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