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NETWORK PERFORMANCE ANALYSIS
FOR THE
GEMINI GTA-8 MISSION

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GODDARD SPACE FLIGHT CENTER
GREENBELT, MD.

NETWORK PERFORMANCE ANALYSIS

FOR THE

GEMINI GTA-8 MISSION

July 13, 1966

Approved by [signature]
for H. William Wood, Head
Manned Flight Operations Branch

Prepared by

MANNED FLIGHT OPERATIONS DIVISION

GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND

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SUMMARY

The Atlas-Agena target vehicle and the Gemini Titan Eight spacecraft were successfully launched into orbit March 16, 1966. This mission was the first combined exercise of a Gemini spacecraft and an Agena target vehicle. The spacecraft returned to earth on the seventh revolution as a result of problems that were encountered soon after the docking maneuver was completed. Following spacecraft splashdown, extensive maneuvers were successfully conducted with the target vehicle. The mission was terminated when the target vehicle batteries expired on March 23, 1966.

Atlas-Agena Target Vehicle
Launched: 1400 GMT, March 16, 1966
Battery Depletion: During 122nd revolution, March 23, 1966

Gemini-Titan Eight Spacecraft
Launched: 15:40:59 GMT, March 16, 1966
Splashdown: 0223 GMT, March 17, 1966

The mission provided the first opportunity to exercise the full capability of the Manned Space Flight Network (MSFN) by allowing simultaneous tracking of and data acquisition from a spacecraft and a target vehicle close together and also locked together, i.e., docked. Agena flight operations control was transferred from the Mission Control Center, Houston, Texas, to the Corpus Christi, Texas, tracking station on the 47th revolution after the other MSFN stations were released from the mission. During the entire mission period the world-wide facilities of the MSFN provided all of the tracking and data acquisition support necessary to successfully complete a Gemini/Agena rendezvous mission.

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1. INTRODUCTION

This report summarizes the performance of the Manned Space Flight Network (MSFN) during the eighth Gemini mission, GTA-8. The purpose is to review the Network performance and to obtain an overall perspective of the capability and reliance that can be placed on the ground instrumentation.

The report is prepared for those who are familiar with the operation of the MSFN and, therefore, covers the significant problems encountered without emphasis on those systems that functioned normally.

The second section of this report lists the participating agencies and outlines their responsibilities. The third section describes the MSFN participation and the total support it provided during the mission. The fourth section describes the premission activities that transpired to bring the MSFN up to the state of readiness necessary to support the mission. The fifth, sixth, and seventh sections summarize and analyze the performance of Network systems. The last section reviews the reduction, annotation, reproduction, and shipment of data acquired by the Network.

2. PARTICIPATING AGENCIES

2.1 MANNED SPACECRAFT CENTER (MSC)

The MSC has the overall responsibility for conducting and managing all NASA manned space flights. The MSC, through the Program Support Requirements Document, stated the following primary mission objectives for GTA-8:

a. Rendezvous and dock with the Agena Target Vehicle

b. Evaluate the docked vehicle maneuvering capability of the Agena propulsion system

c. Evaluate extra-vehicular life support and maneuvering equipment.

The activities of the MSFN are directed from MSC during all manned space flight mission periods. In this capacity, the Mission Control Center (MCC-H) at MSC provided technical direction of the mission-oriented instrumentation, computation, and communications necessary for GTA-8 support.

2.2 GODDARD SPACE FLIGHT CENTER (GSFC)

GSFC is responsible for organizing, engineering, and as necessary, modifying the Manned Space Flight Network (MSFN), in conjunction with the Department of Defense (DOD) and the Weapons Research Establishment (WRE) so that it will function as an effective integrated entity in meeting mission requirements. During both mission and nonmission periods, GSFC is responsible for the maintenance and technical operation of all NASA MSFN facilities.

The Manned Flight Operations Division (MFOD) is the responsible GSFC organization for Network activities. Its responsibilities include:

a. Engineering and implementing modifications to equipment at Network stations

b. Developing, providing, and up-dating technical operational procedures peculiar to station operation

c. Developing overall Network support and technical operations plans based on project data requirements

d. Ensuring overall Network technical readiness to support missions

e. Monitoring and analyzing the performance of the Network during mission operations to ensure expeditious repair or modification before succeeding missions

f. Providing technical representatives to serve on the Network Support Team in an advisory capacity.

The Weapons Research Establishment (WRE) cooperates with NASA in installing, operating, and maintaining that portion of the MSFN which is located in Australia. This includes the tracking stations at Woomera and Carnarvon and a central communications center in Adelaide.

2.3 DEPARTMENT OF DEFENSE (DOD)

The DOD is responsible for the overall maintenance and operational control of those DOD assets and facilities required to support manned space flight missions. These include Network stations of the Eastern Test Range (ETR), Western Test Range (WTR), White Sands Missile Range (WSMR), Pacific Missile Range (PMR), and the Electronics Test Environment and Air Proving Ground Center (APGC).

The DOD forces supported the MSFN as specified in the Program Support Requirements Document for the GTA-8 mission. They also provided technical representatives to serve on the Network Support Team in an advisory capacity to the network controllers.

2.4 KENNEDY SPACE CENTER (KSC)

KSC, as a NASA Agency, has the overall responsibility for assuring mission prelaunch and launch operations support including interface between NASA and ETR for joint support planning and coordination.

KSC was responsible for the following actions for GTA-8:

(1) Assure that assembly and checkout activities associated with the Gemini spacecraft, the Gemini launch vehicle, and the Gemini/Atlas/Agena target vehicle were controlled and integrated in such a manner as to assure successful initiation of the terminal countdown.

(2) Provide direct operational control, for the mission director, of the three elements during the terminal countdown listed in the preceding subparagraph(1).

(3) Provide ground range instrumentation support, operational facilities, and services for prelaunch checkout and launch countdown as required in the Program Support Requirements Document.

3. MANNED SPACE FLIGHT NETWORK PARTICIPATION

3.1 GENERAL

The combined MSFN includes facilities operated by NASA, DOD, and WRE. It is composed of tracking and data systems around the world that interface with MCC-H, and includes a computing and communications center at GSFC.

3.2 MSFN MISSION FUNCTIONS

The major functions of the MSFN during the GTA-8 mission were to provide (1) C-band and S-band radar tracking; (2) continuous telemetry reception during the powered flight phase, real-time telemetry and dump telemetry reception during the orbital phase, and real-time telemetry during the retrofire sequence just prior to communications blackout; (3) spacecraft voice and ground communications remoting to MCC-H; (4) digital command support during the powered flight phase and orbital phase and tone command support during the powered flight phase for range safety; and (5) real-time computing support for range safety, orbital determination, data acquisition prediction, and reentry prediction.

Complete Network coverage on the Gemini spacecraft was provided from launch through splashdown on the 7th revolution. Complete Network coverage on the ATV was provided from launch until the 47th revolution. By that time all Network stations had been released from mission support with the exception of TEX. TEX continued to track the ATV, during station in-view times, until the batteries of the ATV expired during the 122nd revolution.

The MSFN stations that participated in the mission and the support that each station provided is listed in table 1. Figure 1 indicates the extent of Network station participation during the entire mission. Note that the figure shows only the 47 revolutions during which the entire Network participated. In actuality, mission support extended through the 122nd revolution, but only TEX supported after the 47th revolution.

Table 1. Participating MSFN Stations and Support Provided

Stations \ Systems	Acq Aid	A/G Remoting	ALDS	C-Band Radar	DCS	DRED	DRUL	FC, A/G	FC Manned	GLDS	GLV TLM	HS RDR Data	HS TLM Data	Spandar	ODOP/UDOP	RF Comd	RSDP Sum	S-Band Radar	TLM DT	TLM EXP Display	TLM RCV ANT	TLM R&R	TLM RT Display	TTY	Voice (SCAMA)
MCC-H		X			(X)			X				X					X		X				X	X	X
MCC-K	X				X	X				X	X	X	X						X		X	X		X	X
A/C		X																				X			
ANT	X	X		X			X						X			X			X		X	X	O		
ASC		X		X																	X	X			
BDA	X	X		X			X					X	X			X		X	X			X	O	X	X
CAL	X	X		X														X						X	X
CNV *				X			X				X					X						X	X		
CRO	X			X	X			X	X							X	X	X	X			X	X	X	X
CSQ	X				X			X	X							X	X		X			X	X	X	X
CTN	X	X																				X		X	X
CYI	X			X	X			X	X							X	X	X	X			X	X	X	X
EGL	X			X																				X	X
GBI	X	X		X			X				X		X			X		X	X		X	X	O		
GTK	X	X		X			X				X		X			X		X	X			X	O		
GYM	X							X	X								X	X	X			X	X	X	X
HAW	X			X	X			X	X							X	X	X	X			X	X	X	X
KNO	X	X																				X		X	X
MLA				X																					
PAT				X																					
PRE				X																					
RKV	X				X			X	X							X	X		X			X	X	X	X
RTK	X	X		X																		X			
TAN	X	X																				X		X	X
TEX	X	X			X		X					X	X			X		X	X			X	(*)	X	X
WHS	X			X																				X	X
WLP														X										X	X X
WOM	X			X																				X	X

(X) Master DCS

* Wind profile measurements in support of recovery operations

O Remoting

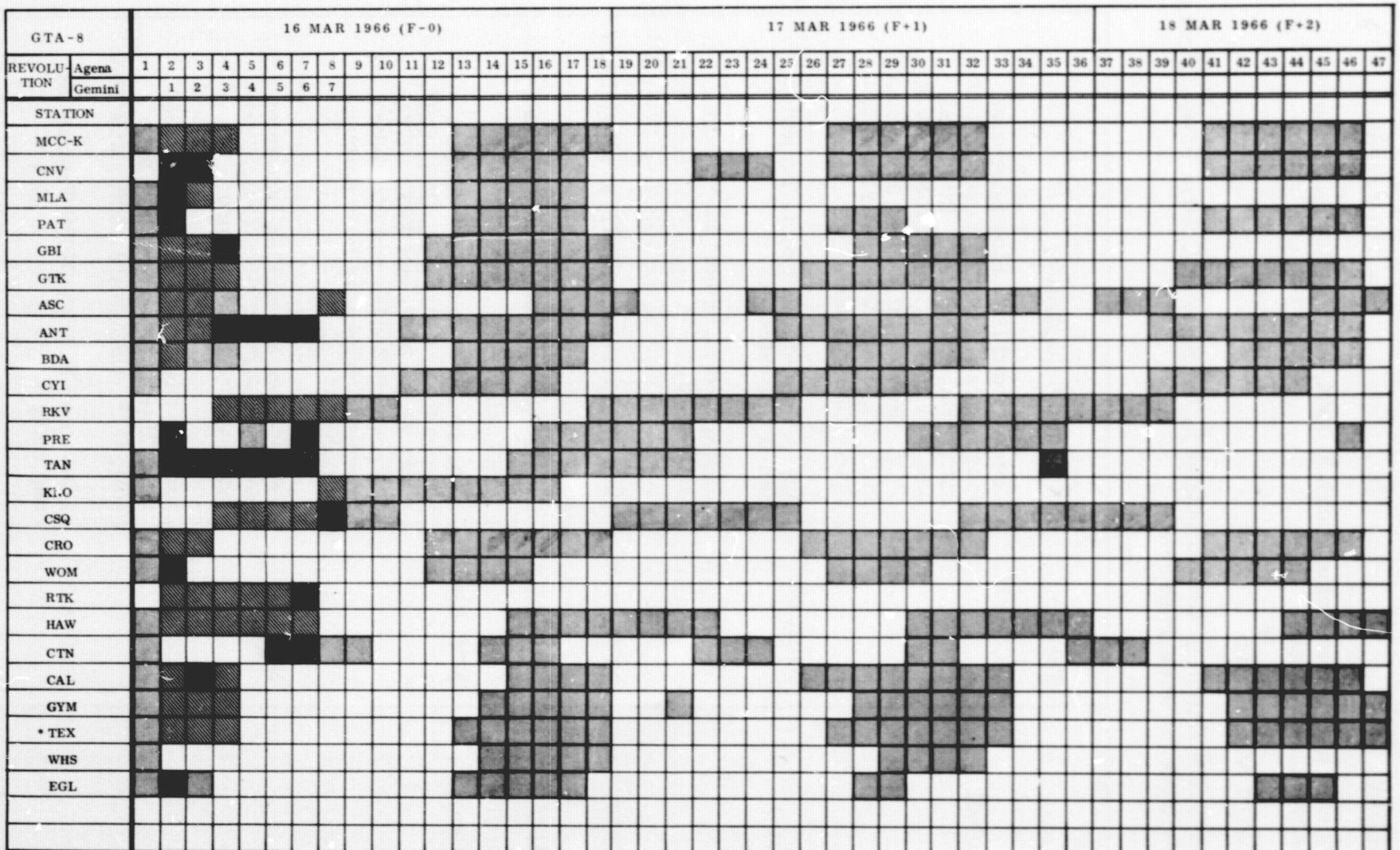
(*) Real time and Remoting

Ship Positions:

CSQ 125° E 20° N

RKV 39° W 19° S

RTK 175° W 25° N



* Tex Supported The Following Agena Revolutions After S/C Splash: 56-61, 71-76, 86-90, 101-106, 116-120, 122

LEGEND:

- Station Tracked Gemini Spacecraft Only
- Station Tracked Agena Target Vehicle Only
- Station Tracked Agena Target Vehicle and also Gemini Spacecraft

Figure 1. Overall MSFN Coverage for the GTA-8 Mission

4. NETWORK SUPPORT PREPARATIONS

4.1 MISSION SCHEDULE

The MSFN was placed on mission status March 3, 1966, and the MCC-H assumed control of the Network on that date.

4.1.1 PRELAUNCH ACTIVITIES

The following prelaunch activities were scheduled by the Network Control Group (NCG) to prepare the Network for mission support.

Days before Launch	Test No.	Activity
F-12 (March 3, 1966)	NCG-107	Computer and Data Flow Integrated Subsystems (CADFISS) Test for ANT, ASC, BDA, CAL, CRO, EGL, GBI, Gemini Systems Control (GSC), GTK, GYM, HAW, MCC, MLA, MSC, PAT PRE, TEX, and WHS. (CYI was excused from this test.)
	NCG-459	Agena/Gemini Theoretical Trajectory Run at GSC MCC-K.
	NCG-634L	Maintenance at Remote Sites and EI Installation.
F-11 (March 4, 1966)	NCG-634K	Detail Systems Test (DST) at all stations
F-10 (March 5, 1966)	NCG-634J	Detail Systems Test at all stations
F-9 (March 6, 1966)	NCG-339	Network FM Biomedical Interface Test at BDA, CRO, CYI, CSQ, GSC, HAW, MSC, RKV, and TEX. (GYM was not included but ran Biomedical Interface Test during their portion of NCG-350.)
	NCG-350	Network Low Speed TLM Data Interface Test at CRO, CYI, CSQ, GYM, HAW, GSC, MSC, and RKV.
	NCG-383	Network High-speed and Wide-band Data Interface Test at ANT, BDA, GBI, GTK, GSC, MCC, MSC, and TEX.
	NCG-413	Low-speed PCM CADFISS Test at GSC and TEX.
F-9 (March 6, 1966)	NCG-458A	DSC Loading Test at CRO, CYI, CSQ, CSC, HAW, and RKV.

Days before Launch	Test No.	Activity
	NCC-458	DCS Data Flow Test at CRO, CYI, CSQ, GSC, HAW, MSC, and RKV.
	NCG-634I	Maintenance and Local Option at all stations.
F-8 (March 7, 1966)	NCG-243	Communication Test at RVK and GSC
	NCG-634H	Network Simulation for all stations except WOM.
F-7 (March 8, 1966)	NCG-243	Communication Test at RKV and GSC
	NCG-634G	DST completed at all stations
F-6 (March 9, 1966)	NCG-243	Communication Test at RKV and GSC
	NCG-634F	Long Count SLD at all stations
F-5 (March 10, 1966)	NCG-243	Communication Test at RKV and GSC
	NCG-634E	Maintenance and Local Option at all stations.
F-4 (March 11, 1966)	NCG-107	CADFISS Test at GSC, CAL, and WHS
	NCG-634D	Network Simulation for CRO, CSQ, CYI, GSC, GYM, HAW, MSC, MCC, RKV, and TEX. (BDA released due to no PCM Simulation tape on station.)
F-3 (March 12, 1966)	NCG-634C	Maintenance and Local Option at all stations.
F-9 (March 6, 1966)	NCG-458A	DSC Loading Test at CRO, CYI, CSQ, GSC, HAW, and RKV.
	NCG-458	DCS Data Flow Test at CRO, CYI, CSQ, GSC, HAW, MSC, and RKV.
	NCG-634I	Maintenance and Local Option at all stations.
F-8 (March 7, 1966)	NCG-146	IAC Test at CRO
	NCG-243	Communication Test at RVK and GSC
	NCG-634H	Network Simulation for all stations except WOM.

Days before Launch	Test No.	Activity
F-7 (March 8, 1966)	NCG-146	IAC Test at CRO
	NCG-243	Communication Test at RKV and GSC
	NCG-421	AIMP TLM Transmission Test at GSC MCC-K and the ship Swordknot
	NCG-634G	DST completed at all stations
F-6 (March 9, 1966)	NCG-146	IAC Test at CRO
	NCG-243	Communication Test at RKV and GSC
	NCG-634F	Long Count SLD at all stations
F-5 (March 10, 1966)	NCG-146	IAC Test at CRO
	NCG-243	Communication Test at RKV and GSC
	NCG-634E	Maintenance and Local Option at all stations.
F-4 (March 11, 1966)	NCG-146	IAC Test at CRO
	NCG-107	CADFISS Test at GSC, CAL, and WHS
	NCG-634D	Network Simulation for CRO, CSQ, CYI, GSC, GYM, HAW, MSC, MCC, RKV, and TEX. (BDA released due to no PCM Simulation tape on station.)
	NCG-421	AIMP TLM Transmission Test at GSC MCC, and the ship Swordknot
F-3 (March 12, 1966)	NCG-146	IAC Test at CRO
	NCG-634C	Maintenance and Local Option at all stations.
F-2 (March 13, 1966)	NCG-146	IAC Test at CRO
	NCG-406	Autocat Voice Relay Test at GSC, HAW, and MSC.
	NCG-634B	Network TLM Data Flow Test at BDA, CRO, CSQ, CYI, GSC, GYM, HAW, MSC, RKV, and TEX.
F-1 (March 14, 1966)	NCG-146	IAC Test at CRO
	NCG-107	PCM CADFISS Test at CRO, and GSC

Days before Launch	Test No.	Activity
	NCG-634A	TLM Data Flow Test at CRO, GSC, and MSC Mission Rules Review FIDO Runs at MCC and MSC Mission postponed 24 hours and rescheduled for 16 March 1966.
F-1 (March 15, 1966)	NCG-146	IAC Test at CRO
	NCG-107	PCM CADFISS at CRO, CYI, CSQ, GSC, GYM, HAW, and RKV.
	NCG-408	Air/Ground DST-202C Checkout at BDA, CRO, CSQ, CTN, CYI, CAL, GSC, GYM, HAW, KNO, MCC, MSC, RKV, RTK, TAN, and TEX.
	NCG-634A	FIDO Runs and Mid-Count at MCC and MSC.
	NCG-634	GTA-8 launch rescheduled for March 16 due to problems with the launch vehicle and spacecraft.
F-0 (March 16, 1966)	NCG-634	GTA-8 launched; all stations provided support.

4.1.2 SIMULATIONS

There were two Network simulations conducted during the GTA-8 mission. The first was conducted March 8, 1966 (F-8 days). All Network stations participated except Woomera. The second simulation was conducted March 11, 1966 (F-4 days). All Network stations participated except Bermuda (Bermuda had not received the pertinent simulation tapes).

4.1.3 POSTLAUNCH NETWORK SUPPORT SCHEDULING SUMMARY

During this mission, the Network Support Team (NST) encountered problems in scheduling the Network for support of the next day's passes. Many of the station release messages that had been transmitted had to be changed to reflect changed CADFISS and Acquisition of Signal (AOS) times. This was a result of the Agena burns performed throughout the mission. CADFISS and AOS times had to be provided for the stations at times several hours after the original release message had been transmitted. This resulted in considerable inconvenience to personnel at the stations.

The primary causes for these problems follow:

a. Lack of a Standard Operating Procedure (SOP). Better scheduling SOP's will be developed; coordination between the Network Control (NC) Section and the NST will be necessary to accomplish this objective.

b. Changing of Orbital Parameters. The changing of orbital parameters is a problem which is inherent in this type of a mission.

4.2 NETWORK TESTING

4.2.1 GENERAL

There were three phases of Network testing during this mission. The first phase consisted of data flow tests from remote sites to MCC-H, high speed radar from BDA to MCC-H Operational Readiness and Checkout Testing (ORACT) and associated interface tests between MCC-H, MCC-K, and GSFC. The second phase consisted of BST's and DST's conducted at the remote sites. The third phase consisted of CADFISS tests between the remote sites and the GSFC computers. CADFISS testing was conducted during the prelaunch and orbital phases of the mission.

The first phase of Network testing commenced 41 days prior to launch and was conducted by the Flight Control Organization. The MSFN participated in these tests as a part of the overall ground support for this mission. The results of these tests were compiled and published by MSC and, therefore, are not discussed in this document.

The second phase of Network testing (DST/BST's) was conducted during the time the Network was on mission status. DST's were performed from 11 days prior to launch until completion, and BST's were performed during the Network terminal countdown on the day of launch. All DST/BST's were completed satisfactorily with the following exceptions:

Station	Exceptions
CAL	DST-206. The M&O reported that errors were found in the instructions and submitted a list of discrepancies to engineering.
GYM	DST-216A. The M&O reported that errors were contained in the instructions.
HAW	BST-203A. The M&O reported that the DCS loading tape was incomplete and did not comply with BST specifications.
RKV	BST-203A. This station expressed a need for a checkout procedure as part of the BST to assure proper operation of the telemetry Message Acceptance Pulse (MAP) switch.
CYI	The M&O reported that many errors in the DST/BST instructions were detected and corrected in real time at the station.

As a result of the comments submitted by the stations, DST/BST-216A and 206 are now being revised. The corrective recommendation submitted on BST-203A is under consideration.

The third phase of Network testing consisted of CADFISS testing conducted with the GSFC computers and the remote sites. These tests began nine days prior to launch and continued through the launch and orbital phases of the mission. They were conducted to assure the readiness of Network data systems to perform their functions within prespecified tolerances. Paragraph 4.2.2 is an account of the CADFISS testing conducted during the mission.

4.2.2 CADFISS TESTING

<table>
<tr><th>Days before Launch</th><th>Remarks</th></tr>
<tr><td>F-9</td><td>The 71-line DCS loading test was conducted with the CSQ, RKV, CYI, CRO and HAW stations. All stations completed the test successfully with the exception of RKV. The RKV test time expired and the test was not completed.

A special Pulse Code Modulation (PCM) test was conducted between GSFC and TEX to verify the Telemetry On-line Monitoring, Compression, and Transmission (TOMCAT) program corrections. Discrepancies between the expected values and those received were noted and relayed to the NST Remote Site Data Processor (RSDP) cognizant engineer.</td></tr>
<tr><td>F-6</td><td>CADFISS testing was conducted as part of the Network simulation. All tests were successfull with the following exceptions:

<table>
<tr><th>Station</th><th>Exception</th></tr>
<tr><td>BDA</td><td>Azimuth and elevation failures occurred in the Verlort radar high speed slew. The status message indicated this radar was not completely operational due to no valid data identification.</td></tr>
<tr><td>B/GE</td><td>The Launch Trajectory Data System (LTDS) test failed on the alternate line. A later status message indicated that the alternate line had failed but gave no time that the line was expected to be back in operation.</td></tr>
<tr><td>RTK</td><td>The results of the pointing tests were unsatisfactory. The radar dial settings agreed with the CADFISS expected values, but the computer output did not. The problem was traced to a bad computer load from magnetic tape. The computer was reloaded, but time did not permit a rerun of the test.</td></tr>
<tr><td>ANT</td><td>ANT passed the boresight test with four elevation failures, but failed the slew test with 34 range errors. Subsequent investigation revealed a bad module in the slew control panel. The module was replaced and a rerun of the test was successful.</td></tr>
</table></td></tr>
</table>

Days before Launch	Remarks
	Station — Exception
F-6	PCM — All Agena PCM stations experienced the same three errors; this indicated a TOMCAT error. CSQ — CSQ experienced the same three errors as did the other PCM stations, but used the wrong procedures. A rerun of the test was successful. CRO — The radar did not operate properly during the slew. The station estimated that this difficulty could be corrected in one hour, but time did not allow a rerun of the test.
F-5	A special CADFISS test was conducted at the request of CYI and WOM radar personnel. All tests were successful and error free.
F-4	A special CADFISS test was conducted with CAL and WHS to verify the simultaneous transmission of radar teletype (TTY) data to GSFC and the RTCF. Due to a procedural problem at WHS, GSFC received no more than 13 lines of data while the RTCF received all of the data. The procedural problem was corrected and a rerun of the test was successful and error free.
F-2	A special CADFISS PCM test was conducted with CRO at the request of the Network Controller to confirm previous corrections to the TOMCAT Program. The summary errors encountered were turned over to the NST RSDP representative for inclusion in an Instrumentation Support Instruction (ISI) message.
F-1	A special CADFISS PCM test was conducted with CYI, CRO, HAW, GYM, CSQ, and RKV to verify TOMCAT corrections. All tests were successful and error free.
F-0	CADFISS tests were conducted during the terminal countdown. All tests were successful with the following exceptions: Station — Exception BDA — The high-speed slew test failed due to high winds; the test was not rerun. GYM — PCM station 1 failed. The station reported a posible tape problem. The test was not rerun; however, the system was completely operational prior to launch. CAL — CAL failed the range target test. The station reported a digital TTY problem. The test was not rerun; however, the system was completely operational prior to launch.

Days after Launch	Remarks	
	Station	Exception
F-0	RTK	All test results were garbled. The station reported a TTY transmitter problem. The test was not rerun; however, all systems were completely operational prior to launch.
	RKV	The DCS test was not conducted due to failure of the transmit line. However, the system was completely operational prior to launch.
F+1	All CADFISS tests were successful on F+1 day with the following exceptions:	
	Station	Exception
	CRO	Failed the Verlort slew test due to communication hits on the line.
	GYM	Failed the Verlort slew test. The data appeared to be mixed. A rerun of the test was successful.
	CAL	Failed the FPS-16 counterclockwise slew test. All failures appeared in one block of data. The station reported gusts of wind up to 45 mph as the probable cause of failure. The test was not rerun.
	RKV	Failed the PCM test. The station was not in Network isolation. A rerun of the test was successful.
	BDA	Failed the high speed Verlort slew test. Bits were being dropped from the time field and there were elevation failures. A rerun was not scheduled because station personnel needed time to investigate the problem.
F+2	All CADFISS tests were successful on F+2 day with the following exceptions:	
	Station	Exception
	CYI	Failed the PCM test. The buffer was locked in the static mode. A rerun of the test was successful. Failed the Digital Command System (DCS) test. One command did not have a figures shift. A rerun of the test was successful. The station also failed the boresight test with 15 elevation failures but a rerun of the test was successful. Due to the station preparing for a pass, information relative to the corrective action taken was not available.

Days after Launch	Remarks	
	Station	Exception
F+2	CRO	Failed the PCM test. All formats displayed identical time. A rerun of the test was successful.
	WOM	Failed range part of the boresight and clockwise slew tests. The high-order bit was always set (on track bit). Forty-seven of eighty points were rejected due to the on-track bit being set while tracking in the third range interval.
	HAW	Failed the Verlort radar boresight test with nine azimuth failures. After replacing a bad relay in the azimuth smoothing unit, a rerun of the test was successful.
	CSQ	Failed the DCS test due to line garbles. Failed a rerun of the test due to sending the wrong routing indicator. The load was manually validated and the test terminated.
F+3	All CADFISS tests were successful on F+3 day with the following exceptions:	
	Station	Exception
	ASC	Failed the slew test due to communication hits on the line. A rerun of the test was successful.
	WOM	Failed the range target test due to a bad skin track local oscillator. Since WOM does not skin track, this problem had no effect upon station support and the test was termed a success.
	CAL	Failed both slew tests due to 45 mph gusts. A rerun of the test was not conducted because of the prevalence of high winds.

4.3 NETWORK STATUS

4.3.1 PRELAUNCH

Station	Status
MCC-K	All systems were reported operational during this period.
CNV	The TPQ-18 radar was reported not completely operational (RED) March 10 due to elevation encoder problems. It was reported completely operational (GREEN) on March 11.
PAT	The TPQ-18 radar reported RED March 11 due to hydraulic pump problems. It was reported GREEN March 13.

Station	Status
GBI	The TLM TAA-2 antenna was reported RED on March 4 because of a defective brake. It was reported GREEN March 13. The TPQ-18 radar was reported RED March 10 due to the AN/UYK computer affecting the low density data receive and transmit. It was reported GREEN March 11.
GTK	All systems were reported operational during this period.
ANT	The air/ground communications were reported RED March 15 due to transmitter exciter selecting relay. They were reported GREEN later the same day. The TLM TAA-3 antenna was reported RED March 4 due to a loose elevation gear box and damaged spares. The equipment was reported GREEN March 8.
PRE	All systems were reported operational during this period.
BDA	The RF command system was reported RED March 4 due to failure of resistive elements in dummy loads for the FRW-2 transmitter. It was reported GREEN March 15. The radar was reported RED March 11 and the station was unable to load computer program into AN/UYK computer. The radar was reported completely operational March 13.
CYI	The MPS-26 Radar was reported RED March 4 due to a defective azimuth encoder strobe trigger module. A replacement module was lost en route and a tracer was initiated from GSFC. The module was found in New York and shipped to CYI. The system was reported GREEN March 11. The Verlort radar reported RED due to a faulty Sanborn recorder timing pen coil and stylus holder. The equipment was reported GREEN March 11. The Verlort radar was reported RED March 11 due to a defective dehumidifier motor. The equipment was reported GREEN later the same day.
KNO	Air/ground communications were reported RED March 4 due to a faulty UHF receiver. The equipment was reported GREEN March 8. Plant facilities reported RED due to a defective utility transformer on March 4. It was reported GREEN on March 14.
TAN	Air/ground communications were reported RED due to a bad low-pass filter Model 700 on March 10. It was reported GREEN on March 11. Voice and teletype communications reported RED to repair main frame and cabling which was damaged by lightning on March 13. It was reported GREEN on March 14. Air/ground communications were reported RED March 14 due to a faulty low-bandpass filter Model QF-53-2. The station estimated that the communications would be GREEN March 16.

Station	Status
CRO	Air/ground communications were reported RED March 4 due to a faulty HF antenna select relay. The system was reported GREEN March 14. The FPQ-6 radar was reported RED due to a faulty TV monitor line transmitter March 4. This problem continued throughout the mission; however, the station could support without it. The FPQ-6 was reported RED March 11 due to a faulty TX pulse width control. It was reported GREEN on the same day. The RF Command system was reported RED March 13 due to a faulty FRW-2 transmitter HF Oscillator and power amplifier tuning mechanism. It was reported GREEN March 14. The FPQ-6 was reported RED March 14 due to a faulty computer 24-volt power supply. It was reported GREEN on March 15.
WOM	No items were reported RED during this period.
CTN	The acquisition aid system was reported RED March 4 due to a faulty transmit antenna elevation amplidyne. It was reported GREEN March 11. The telemetry system was reported RED due to a faulty Sanborn recorder motor. It was reported GREEN on March 6. Plant facilities reported RED March 4 due to a defective diesel generator governor. This item remained RED throughout the mission. The station supported the mission using a standby generator. The timing system was reported RED March 9 to perform maintenance on the 60-cycle generator. It was reported GREEN March 11.
HAW	No items were reported RED during this period.
CAL	No items were reported RED during this period.
GYM	Air/ground communications were reported RED March 4 due to HF antenna high Voltage Standing Wave Ratio's (VSWR's). They were reported GREEN March 5.
WHS	No items were reported RED during this period.
TEX	The RSDP was reported RED March 11 due to a faulty nylon gear in the 1259 teletypewriter set. It was reported GREEN March 13. The Verlort radar was reported RED March 11 due to a faulty master timing oscillator capacitor. It was reported GREEN March 13 The telemetry system was reported RED March 11 due to a faulty FR-114 recorder clutch assembly and capstan drive belt. It was reported GREEN the same day.
EGL	The radar data control unit reported RED March 7 due to an intermittent start sequence. It was reported GREEN March 8.

Station	Status
RKV	The HF point-to-point (P/P) system was reported RED March 4 due to faulty insulator and terminal boards. The station estimated that replacement parts would be received April 15; however, the station was able to support the mission.
	The intercommunications system was reported RED due to the power supply being unable to meet the DST specifications. This item was carried RED throughout the mission, but the station was able to support the mission.
CSQ	Communications were reported RED March 4 due to a faulty marine cable. It was reported GREEN March 12.
	The telemetry system PCM simulator was reported RED March 4 due to a faulty circuit breaker. It was reported GREEN March 11.
	The HF P/P communications were reported RED March 11 due to a faulty power supply. It was reported GREEN March 13.
	A VR-3600 recorder was reported RED March 11 due to a faulty tape transport lifter assembly. It was reported GREEN March 14.

4.3.2 TERMINAL COUNT

Station	Status
MCC-K	All subsystems GREEN
CNV	All subsystems GREEN
ETR	The ETR subcable at Jupiter, Florida, was reported RED because of a filter which was being shorted by the filter cover. The cover was removed as a quick-fix for the mission period and the filter was repaired after mission termination. The subcable was reported GREEN at 0635 GMT.
GBI	The telemetry Time Division Multiplex (TDM) was reported RED at 0705 GMT, March 16. The station could not support the Bio-medical checks. The system was reported GREEN at 0759 GMT, March 16.
GTK	All subsystems GREEN
ANT/GTK	The ETR subcable was again reported RED due to a defective equalizer at the ANT terminal. The equalizer was bypassed and the cable equalized at GTK for the mission period. The cable was reported GREEN at T-363 minutes. Permanent repairs were effected after mission termination.
ASC	All subsystems GREEN
PRE	All subsystems GREEN

Station	Status
BDA	The FPS-16 radar data was reported RED due to Radar Data Control Unit (RDCU) problems at 1050 GMT, March 16. It was reported GREEN at 1055 GMT, March 16.
CYI	The TTY channel "A" was reported inoperative on the "send" side at 1400 GMT, March 16. It was reported operational at 1425 GMT, March 16.
KNO	All subsystems GREEN
TAN	Air/ground (A/G) communications were reported RED at 0119 GMT, March 16, due to a faulty low bandpass filter. The station could support the mission and the communications were reported GREEN at 1130 GMT, March 16. The A/G standby transmitter was reported RED at 1254 GMT, March 16, due to a bad tube in the high voltage power supply. It was reported GREEN at 1427 GMT, March 16.
CRO	The radar to digital TTY data converter was reported RED at 1210 GMT, March 16. It was reported GREEN at 1236 GMT, March 16. The TTY channel "A" was reported inoperative at 1350 GMT, March 16. It was reported operational at 1330 GMT, March 16. The FPQ-6 radar was reported RED at 1323 GMT, March 16, due to a timing problem. It was reported GREEN at 1441 GMT, March 16.
WOM	All subsystems GREEN
CTN	The acquisition aid system was reported RED at 1254 GMT, March 16 due to a faulty azimuth drive motor. It was reported GREEN at 1700 GMT, March 16.
HAW	All subsystems GREEN
CAL	Radio Frequency Interference (RFI) was reported on the acquisition aid system at 1453 GMT, March 16. The system was reported GREEN at 1853 GMT, March 16.
GYM	All subsystems GREEN
WHS	All subsystems GREEN
TEX	All subsystems GREEN
EGL	All subsystems GREEN
RKV	All subsystems GREEN
CSQ	All subsystems GREEN
RTK	Voice communications were reported RED at 1250 GMT, March 16. These communications were reported GREEN at 1347 GMT, March 16.

Station	Status
MLA	The radar was reported RED due to hydraulic problems at 1226 GMT, March 16. It was reported GREEN at 1440 GMT, March 16.
PAT	The radar was reported RED at 0635 GMT, March 16 due to faulty parametric amplifiers. It was reported GREEN at 1100 GMT, March 17.

At liftoff all subsystems were GREEN except for the acquisition aid RFI problem at CAL, the parametric amplifier problems at PAT, and the faulty acquisition aid drive motor at CTN.

4.3.3 POSTLAUNCH

Station	Status
MCC-K	No items were reported RED during the entire postlaunch period.
CNV	No items were reported RED during the entire postlaunch period.
MLA	No items were reported RED during the entire postlaunch period.
PAT	The radar was reported RED at 1635 GMT, March 16, due to parametric amplifier problems. It was reported GREEN at 1100 GMT, March 16.
GBI	No items were reported RED during the entire postlaunch period.
GTK	The telemetry system was reported RED at 1420 GMT, March 17, due to a malfunctioning relay in the VR-3600 recorder. It was reported GREEN at 1440 GMT, March 17.
ANT	The RSDP was reported RED at 1712 GMT, March 16. It was reported GREEN at 1907 GMT, March 16.
ASC	The TPQ-18 radar was reported RED at 0337 GMT, March 17, due to hydraulic problems. It was reported GREEN at 1159 GMT, March 17.
PRE	No items were reported RED during the entire postlaunch period.
BDA	The data processing system was reported RED at 1448 GMT, March 17 due to a problem with the Verlort 4008 data transmitter. The equipment was reported GREEN at 0920 GMT, March 18.
CYI	No items were reported RED during the entire postlaunch period.

Station	Status
CRO	The RF command system was reported RED at 1741 GMT, March 16 due to a transmitter problem. It was reported GREEN at 1853 GMT, March 16.
	The FPQ-6 radar was reported RED at 0810 GMT, March 17, due to faulty antenna drive cables. The radar was reported GREEN at 0859 GMT, March 17.
	The FPQ-6 was reported RED at 1420 GMT, March 19 due to a transmitter fault. The radar was reported GREEN at 1745 GMT, March 19.
	The telemetry system was reported RED due to a fault in the PCM 2 lock status on the strip recorder at 1106 GMT, March 19. The system was reported GREEN at 1213 GMT, March 19.
WOM	The radar was reported RED at 0939 GMT, March 18, due to an intermittent range fault. It was reported GREEN at 1014 GMT, March 18.
CTN	The acquisition aid system was reported RED at 1612 GMT, March 16 due to an azimuth drive motor. It was reported GREEN at 1700 GMT, March 16.
HAW	The FPS-16 radar was reported RED at 1900 GMT, March 16, due to 1218 computer problems. It was reported GREEN at 0804 GMT, March 17.
	The Verlort radar was reported RED at 2055 GMT, March 16, due to a transmitter problem. It was reported GREEN at 0804 GMT, March 17.
HAW	RFI was reported on C-band transponder at 1526 GMT, March 17, and RFI on 248.6 TLM link at 2208 GMT, March 17.
	The FPS-16 radar was reported RED at 1645 GMT, March 17, due to computer problems. It was reported GREEN at 1837 GMT, March 17.
	The RF command system was reported RED at 1837 GMT, March 17, due to a faulty FRW-2 transmitter. It was reported GREEN at 1924 GMT, March 17.
	The Verlort radar was reported RED at 1426 GMT, March 18, due to an elevation smoothing problem. It was reported GREEN at 1505 GMT, March 18.
KNO	No items were reported RED during the entire postlaunch period.
TAN	No items were reported RED during the entire postlaunch period.

Station	Status
CAL	No items were reported RED during the entire postlaunch period.
GYM	The radar was reported RED at 2126 GMT, March 17, due to a faulty AZ and EL 36 speed indicator. It was reported GREEN at 0155 GMT, March 18.
WHS	No items were reported RED during the entire postlaunch period.
TEX	No items were reported RED during the entire postlaunch period.
EGL	No items were reported RED during the entire postlaunch period.
RKV	No items were reported RED during the entire postlaunch period.
CSQ	No items were reported RED during the entire postlaunch period.
RTK	The USQ20B computer was reported RED at 1828 GMT, March 16. It was reported GREEN at 2159 GMT, March 16. All communications to RTK were lost at 1945 GMT, March 16. Communications were restored at 2015 GMT, March 16.

4.4 ENGINEERING INSTRUCTIONS (EI's)

A RED EI pertains to a modification of equipment of such a nature that without its completion the flight control capabilities could be limited, but not to the extent of endangering the success of the mission.

Upon entering mission status 12 days prior to launch (3 March), a total of eleven RED EI's had been issued. Of these, six were complete at all applicable stations. EI 1636 which pertained to the installation intercom loops from pad 14 to MCC-K for ATDA support, was held in abeyance pending an ATDA or Agena launch. EI 1495 was an AS-201 EI which pertained to the installation of Voltage Controlled Oscillator (VCO's) at BDA. These VCO's, borrowed from HAW and TEX, were to be removed upon AS-201 termination, returned to and reinstalled at HAW and TEX.

By seven days prior to launch all RED EI's, except 1636, which was not necessary for the mission were complete at all stations.

Five days prior to launch ISI-56 was issued which reclassified the five remaining outstanding HIGHLY DESIRABLE EI's to a "GREEN" status. A total of 14 HIGHLY DESIRABLE EI's had been issued for the mission.

A list of RED EI's issued for the GTA-8 mission follows:

EI No.	Title
1452	Simulator Identification Ward Up/Down Count
1483	Data Routing and Error Detecting (DRED) - Auxiliary Sustainer Cutoff (ASCO) Detect
1495	AS-201 VCO Support
1526	1218 TTY Output Busy Indicator Interface
1527	1218 TTY Output Busy Indicator
1572	Milgo 165A D/TTY Extended Range Modification
1578	Relocation of Brush Mark 200 Recorder
1596	2K-Bit Most Significant Bit (MSB) Capability
1600	M&O to Flight Controller (FC) Master Reset Redesign
1607	Conversion of TTY Tone System
1636	Pad 14 ATDA Intercom Loops

4.5 DOCUMENTATION AND REQUIREMENTS

4.5.1 OPERATIONS DOCUMENTATION

4.5.1.1 Network Operations Directive, OD 63-1. The basic OD 63-1 was revised February 11, 1966, and the GTA-8 Supplements to OD 63-1 were also published on February 11, 1966. Both of these publications were based on the GTA-8 PSRD and 13 revisions thereto.

4.5.1.2 Premission Documentation Changes (PDC). Twenty PDC's were issued as a result of changes or new requirements. All of these PDC's updated either the basic OD 63-1 or the GTA-8 Supplements to the OD 63-1.

PDC No.	Document Updated	Date Issued (1966)
1	Supplement 6.2 (Telemetry)	Feb. 23
2	Supplement 6.6 (S/C Communications)	Feb. 23
3	Supplement 6.7 (Displays)	Feb. 23
4	Supplement 6.7 (Displays)	Feb. 23
5	Supplement 6.4 (Command)	Feb. 23
6	Supplement 6.8 (PCM Validation Tape Scripts)	Mar. 2
7	Supplement 6.7 (Displays)	Mar. 2
8	Supplement 6.4 (Command)	Mar. 2
9	Supplement 6.2 (Telemetry)	Mar. 2
10	Supplement 6.7 (Displays)	Mar. 2
11	Supplement 6.2 (Telemetry)	Mar. 2
12	Supplement 6.5 (Radar)	Mar. 2
13	Supplement 6.4 (Command)	Mar. 2
14	Supplement 6.8 (PCM Validation Tape Scripts)	Mar. 2
15	Supplement 6.3 (RSDP)	Mar. 3
16	Basic OD 63-1	Mar. 3
17	Supplement 3 (Data Handling)	Mar. 3
18	Unassigned	
19	Supplement 6.3 (RSDP)	Mar. 3
20	Supplement 6.2 (Telemetry)	Mar. 3
21	Supplement 3 (Data Handling)	Mar. 3

4.5.1.3 Instrumentation Support Instructions (ISI). A total of 120 ISI's were transmitted to the Network stations. Six were generated by the Network Controller, 11 by O&P, and 103 by the NST. Table 2 is a tabulation of the ISI's generated by the Network Support Team.

4.5.1.4 Queries. A total of 135 queries were received from the Network stations. All queries were answered. Table 3 shows the number of queries generated by each station and the number of queries answered by each system. Twenty-five ISI's were issued as a result of these queries.

Table 2. Instrumentation Support Instructions Originated by the Network Support Team

Subject	No. of ISI's
Telemetry & Displays	34
Remote Site Data Processor	18
Radar	7
Correction to Engineering Instruction 1636	1
Spacecraft Communications	4
Command and Radar Handover Nets for F-8 Count	1
Command	3
Postlaunch Instrumentation Messages (PLIM's)	2
End of GTA-8 Mission	1
Simulation Flight Count	1
Revision to NASCOP	3
Data Handling	2
EI Status	1
F-4 Short Count, Network Sim	1
TV	2
SAVS Requirement	1
H-Minus Count	4
SCAMA	1
Corrections and Addition to and Deletion of ISI's	15
Terminal Count	2
TOTAL	120

Table 3. Tabulation of Query Messages Received from Stations

Station	No. of Queries	Systems								
		Radar	Acq Aid	TLM	RSDP	CMD	A/G	Computers	TTY	Misc
BDA	15	1	1	8		3		1		1
CAL	8	4	2	1						1
CRO	16			6	1	1			1	7
CSQ	4			1		1				2
CTN	3		1							2
CYI	25	2		9	1	2			1	10
EGL	2									2
GYM	11	1		6	3		1			
HAW	30			4	3			1		22
KNO	4			1			1			2
MCC-K	3				3					
RKV	6			3						3
RTK	1			1						
TAN	3			3						
TEX	3			2		1				
WOM	1							1		
TOTAL	135	8	4	45	11	8	2	3	2	52

NOTE

The queries listed under miscellaneous pertained to a variety of subjects not directly affecting any one system in particular, i.e., flight control documentation, data handling and shipping instructions, engineering instructions, network countdown, etc. These queries were answered by flight control personnel, or cognizant network support group members.

4.5.2 REQUIREMENTS

4.5.2.1 Program Support Requirements Document (PSRD). The PSRD was published January 11, 1966, and thirteen revisions were published later. A list of the PSRD revision dates follows:

Book	Revision	Date
I	0	January 24, 1966
I	1	January 29, 1966
I	2	January 30, 1966
II	0	January 22, 1966
II	1	January 28, 1966
II	2	January 29, 1966
II	3	January 30, 1966
IIA	0	January 24, 1966
IIA	1	January 29, 1966
III	0	January 24, 1966
III	1	January 28, 1966
III	2	January 29, 1966
IIIA	0	January 29, 1966

4.5.2.2 Flight Support Requests (FSR's). A total of 28 FSR's were issued, and all were implemented.

4.5.2.3 Launch Support Requests (LSR's). A total of 15 LSR's were issued, and all were implemented.

5. SYSTEMS PERFORMANCE SUMMARY

5.1 ACQUISITION AID

5.1.1 REQUIREMENTS SUMMARY

A brief summary of the acquisition aid requirements for the GTA-8 mission follows:

a. All stations were to track the ATV as the prime target prior to the spacecraft (S/C) launch and also following reentry of the S/C.

b. Following S/C launch, stations with dual-vehicle tracking capability (CRO, CSQ, RKV, TEX, CYI, HAW, GYM, BDA, GBI, GTK, MCC-K) were to track both the S/C and ATV if both were in view during a pass over the station.

c. Stations capable of tracking only one target (KNO, CTN, EGL, TEX, WHS, CAL, TAN, ASC) were to track the S/C unless otherwise directed by flight control personnel.

d. All stations were to record azimuth and elevation errors and signal strength from both the S/C and ATV according to their capability.

e. TEX was to track the ATV after S/C splashdown, but all other Network stations were to be released from mission support.

5.1.2 PERFORMANCE SUMMARY

All MSFN acquisition aid systems performed their acquisition/antenna pointing function as required. There were no major system or equipment malfunctions within the Network. There were some minor problems encountered during the mission, and these are discussed under system failures in paragraph 5.1.3.

5.1.3 PERFORMANCE ANALYSIS

The acquisition aids had a very high percentage of coverage, approaching 100% of the predicted "in sight" times of the target vehicles.

Losses of data caused by acquisition aid systems were limited to a 15-second total at two stations (GYM, CSQ) and this was due to equipment or operator difficulties. The number and durations of signal dropouts were typical of those experienced on previous missions. Recording requirements were carried out nominally and the overall acquisition performance was very good throughout the Network.

5.1.4 FAILURES

A chronological report of the problems which developed during mission status follows:

Day	Station	Problem
F-11	GBI	The telemetry TAA-2 antenna was reported RED for a defective brake. The parts were placed on order and arrived 13 March. The system was reported GREEN for the mission on 13 March.
F-0	CTN	The acquisition aid elevation motor coupling broke during the terminal countdown. This condition allowed the motor to run away and caused it to burn out. The motor and its coupling were replaced prior to liftoff.
F-0	CRO	A faulty 3-db coupler was discovered during the terminal countdown and was replaced prior to liftoff.

Day	Station	Problem
F-0	WHS	No auto-track was achieved on the first revolution due to operator error. The operator failed to phase-adjust the antenna on the boresight tower prior to acquisition. However, using pointing data, the FPS-16 radar did track and no radar data was lost.
F-0	CSQ	Approximately 10 seconds of data was lost on the 5th revolution due to a defective fuse holder. This problem was not detected during maintenance.
F+1	GYM	Approximately 5 seconds of data were lost on revolution 16 due to operator error. The operator failed to zero the cable wrap and consequently the PCM station was switched to the backup acquisition aid.

WHS and BDA were plagued by separate RFI problems at various times during mission status. The RFI problems at WHS were caused by power line arcing during high winds. The power company has since solved this problem. BDA had RFI problems on the Agena real-time telemetry link (240 Mc). The frequency of this link is very close to the second harmonic of the 119.9-Mc transmitting frequency used at Kindley AFB. The Area RFI Coordinator has alleviated the situation to a tolerable level by having Air Force personnel lower their transmitting power level during Gemini passes. However, the basic problem still exists and should be further investigated.

Some interference was experienced at CYI from their C-band radar. This did not cause any loss of data and has been corrected by shielding as directed by the GSFC Manned Flight Engineering Branch.

5.1.5 RECOMMENDATIONS AND/OR CONCLUSIONS

With the exception of the RFI problem at BDA, the discrepancies in this area were deemed to be nonrecurrent in nature.

5.2 RADAR

5.2.1 REQUIREMENTS SUMMARY

There were two C-band beacons aboard the S/C and one C-band beacon and one S-band beacon aboard the Agena Target Vehicle (ATV). A brief summary of the radar requirements for the GTA-8 mission follows:

a. During the launch phase metric tracking data on the ATV was to be provided by CNV, PAT, MLA, GBI, GTK, BDA, and ANT.

b. During the launch phase metric tracking data on the Gemini Launch Vehicle (GLV) was to be provided by PAT, MLA, GBI, ANT, GTK, and BDA.

c. Stations providing S-band support during the orbital phase were to be BDA, CYI, CRO, HAW, CAL, GYM, and TEX.

d. Stations providing C-band support during the orbital phase were to be MLA, PAT, GBI, GTK, BDA, ANT, ASC, CYI, PRE, CRO, HAW, CAL, WHS, EGL, RTK, and WOM.

e. NORAD SPADATS was to skin track the ATV beyond the mission period after the ATV became electronically inactive.

f. All radar data was to be recorded on magnetic tape; functions and events were also to be recorded.

5.2.2 PERFORMANCE SUMMARY

All MSFN radar systems performed their tracking functions as required. There were no major system or equipment malfunctions resulting in a serious loss of data. A more detailed summary of the performance of MSFN radars is contained in paragraph 5.2.2.1 and 5.2.2.2.

5.2.2.1 Agena Target Vehicle (ATV)

a. C-band radars at MLA, PAT, GBI, BDA, GTK, ANT, and CYI tracked the ATV from launch until ATV Loss of Signal (LOS). Immediately following ATV LOS, these stations reconfigured to the Gemini S/C beacon delay to support the Gemini launch. C-band radars at CRO, WOM, HAW, CAL, and WHS had good C-band beacon track on the ATV. In accordance with mission plans, the Gemini S/C beacon was to be turned off after LOS at PRE and the Gemini adapter beacon was to be turned on upon CRO Acquisition of Signal (AOS). CRO, WOM, HAW, CAL, and WHS reconfigured to the Gemini S/C beacon delay after ATV LOS on the basis of the Gemini Capsule Radiation Frequency (CRF) message.

b. S-band radars at BDA, CYI, CRO, HAW, CAL, GYM, and TEX provided S-band beacon tracking support on the ATV as required during revolution 1.

5.2.2.2 Gemini Spacecraft (S/C)

a. C-band radars at MLA, PAT, GBI, BDA, ANT, ASC, and PRE obtained good beacon track from the S/C. During revolution 1, the spacecraft beacon was turned off after LOS at PRE and the adapter beacon was turned on at CRO AOS. CRO, WOM, HAW, CAL, and WHS obtained track and reported a nominal adapter beacon. On revolutions 2, 3, and 4 all scheduled C-band radars obtained good beacon track on the adapter. During revolution 5, when it was learned that the spacecraft was experiencing difficulties, all stations were alerted to standby for an early reentry.

b. On revolution 5 the spacecraft beacon was turned on over HAW. Due to S/C location in relation to MSFN stations, HAW was the only station that could track.

c. On revolution 6 PRE and HAW tracked the spacecraft beacon. The last station to track the Gemini S/C prior to retrofire was ASC on revolution 7. There was no chance for radar tracking after retrofire and prior to splash because splash occurred at 03:23:35 GMT, March 17, 1966.

d. MSFN radars continued to track the ATV after termination of the Gemini phase of the mission. Radar tracking schedules could not be effectively generated in advance after Gemini spacecraft splash because of real-time ATV flight plan changes. The many changes in the ATV ephemeris created new tracking problems and station overlap not experienced on previous missions. The MSFN was released after the TEX S-band radar track on the 47th revolution of the ATV. Table 4 is a summary of data accepted or rejected by Houston computers during the course of the mission.

5.2.3 PERFORMANCE ANALYSIS

5.2.3.1 Launch Day. The radar operation on launch day was excellent. Several outages were reported during the minus count but all systems were GREEN for both Agena and Gemini launches.

Table 4. Radar Data Accepted or Rejected by Houston Computers

Station & Type Radar (C- or S-Band)	Number Revolutions Tracked	Number Revolutions Accepted	Number Revolutions Rejected	*Number Not Processed	Reason for Reject
MLA-C	6	4		2	
PAT-C	13	10	1	2	ATV Skin Track
GBI-C	14	8	2	4	Bias in Range
GTK-C	11	8		3	
BDA-C	15	14		1	
BDA-S	8	5		3	
ANT-C	21	19		2	
CYI-C	16	16			
CYI-S	11	9		2	
ASC-C	17	17			
PRE-C	19	18		1	
CRO-C	20	18	2		(1) Low Elevation (2) Bias in Range
CRO-S	10	9		1	
WOM-C	14	14			
RTK-C	3	1	2		Manual reject
HAW-C	24	24			
HAW-S	8	5	3		Manual reject
CAL-C	15	15			
CAL-S	7	4		3	
GYM-S	8	8			
WHS-C	12	11	1		Manual reject
TEX-S	17	16		1	
EGL-C	11	8	1	2	Rejected 1st 9 points due to range bias, accepted 29 points

*Two reasons exist for not processing data:

1. At dual radar stations, the C-band is transmitted in real time and S-band is transmitted postpass. Before S-band could be processed, another station real-time C-band data was being received and, therefore, no time was available to process the S-band data.
2. After S/C splash and the Agena maneuvers to a 400-mile circular orbit, there was much overlap between stations and not all the data was needed to compute and redefine the orbital parameters.

Radar tracking during the launch phase of both the ATV and S/C was very smooth and no problems were encountered. The BDA Verlort did not acquire valid track on the ATV during the second revolution due to locking on the wrong range interval; the station radar was unable to reacquire prior to LOS.

The ATV S-band beacon was turned off near the end of the second revolution because of an overheating problem. On the third revolution, the S-band beacon was turned on again over HAW. On Gemini revolutions 1 and 2, GBI radar data had a range bias of 820 yards. This was brought to the attention of station personnel after the second revolution. GBI personnel found that a pulse coder malfunction was the cause of the range bias. The coder was realigned and the GBI data was good for the remainder of the mission.

Radar data from RTK was not received for the second revolution because of a communications outage on the RTK. The HAW Verlort radar was RED for revolutions 3 through 10 because of a high voltage coaxial cable problem in the transmitter. This was corrected on the next series of passes of HAW (F + 1 day). The PAT FPQ-6 radar was the only radar that tracked the GLV on launch day. On revolution 1/2, PAT transmitted 24 valid data points to GSFC computers. Additional radars could not be released for GLV tracking because of other tracking requirements.

5.2.3.2 Launch Day Plus 1 (F+1)

When it was determined that difficulties were being experienced with the spacecraft, all stations were alerted for a possible early reentry. PRE was directed to track the spacecraft beacon on revolution 6. The maximum elevation angle was approximately 2.8°. PRE acquired track and eight data points were received and used by the RTCC to update the orbit.

HAW C-band data on revolution 6 was about 25 minutes late in arriving at the RTCC. Indications were that a teletype routing problem between GSFC and MCC-H was the cause for the late arrival.

ASC was the last station to track the spacecraft prior to retrofire. Both the TPQ-18 and FPS-16 radars at ASC tracked on revolution 7. Only the TPQ-18 data was transmitted to MCC-H because the RTCC cannot use the data from the FPS-16 due to its format. The FPS-16 data was transmitted to GSFC.

The ASC TPQ-18 radar experienced hydraulic problems on ATV revolution 9, but it obtained track and transmitted 12 valid data points. ASC was released from the mission after revolution 9 to perform corrective maintenance on the hydraulic system.

All stations capable of skin tracking the GLV were instructed to do so on a non-interference basis. (There was sufficient time separation of the GLV and ATV to allow tracking without interference.) On revolution 13 the CRO FPQ-6 data did not get into the RTCC solution because the CADFISS test bit was present in the data transmission. Indications are that the test bit was not replaced with the correct target identification bit after completion of CADFISS testing. Normal procedures are to remove the CADFISS test bit immediately after completion of CADFISS testing.

The procedure for Verlort beacon sharing on stateside passes was modified on revolution 14. The radar Network experienced an overlap of track between HAW and CAL and also between BDA and TEX because of the extremely high orbit. The CAL, GYM, and TEX Verlorts had overlapping track on nearly all stateside passes. The new procedure specified that radars would operate in full automatic Pulse Repetition Frequency (PRF) mode. This mode of operation eliminated the dead-zone encountered when using the 410 PRF lock-up mode and permits continuous track from AOS to LOS. The disadvantage of this mode is that it creates approximately 5% to 10% beacon countdown. It also increases the chance of beacon stealing when the radars switch PRF's. This method was tried on revolution 14 and worked successfully. Station personnel commented that this mode of operation was definitely superior to the lock-up mode used on launch day. The automatic PRF mode was used successfully for the remainder of the mission.

A basic requirement of both modes of operation is that only two of three mainland Verlort radars (CAL, GYM, TEX) share the beacon simultaneously. The third radar will actively track only when directed by the NST radar controller.

On revolution 17 PRE data was more than an hour late arriving at the RTCC. On revolution 18, PRE data was not received at all. The reason for the late data reception was caused by a communications outage between Cape Kennedy and GSFC. Indications are that a communications routing problem also existed. On revolution 33 a similar problem existed with ASC data; the data was 20 minutes late arriving at the RTCC.

5.2.3.3 F + 2

The CRO FPQ-6 radar data, on revolutions 26 and 27, reportedly had a range bias of approximately 250 yards. Station personnel were advised of the situation, but they could not determine the cause. Data from CRO looked good on revolution 28. The majority of the data points on revolutions 26 and 27 were accepted in spite of the bias.

WOM and CAL were instructed not to send third range interval data to the RTCC unless the valid data bit was off. This was necessary because the RTCC is not configured to accepted third range interval data. The RTCC is considering the possibility of reprogramming to accept third range interval data on future missions.

WHS data was rejected on revolution 32. Station personnel reported the data looked good on site. The most logical cause for the data rejection is that the data received teletype hits during transmission. The data was not played back because the RTCC advised it would arrive too late to be accepted in the program.

The TEX Verlort data was partially rejected on revolution 33. The apparent cause was a timing malfunction that occurred on-station during the pass. TEX data was very good for the remainder of the mission.

5.2.3.4 F + 3

The CYI C-band radar had an elevation bias on revolutions 41, 42, and 43. Station personnel were advised, and they found that on revolution 41 when the radar tracked into the upper limits, the antenna developed a mechanical unbalance. This problem was corrected prior to revolution 44.

During revolutions 43 and 44, EGL experienced power fluctuations which resulted in several bad data points being transmitted. The power fluctuations also caused brief transmitter failures during these passes.

Several stations reported difficulties in tracking the ATV beacons during revolution 45 because of vehicle attitude. The ATV was placed in a nose-up attitude over PRE on revolution 45 and remained in this attitude until the end of the revolution.

The C-band radar beacon-sharing operation was smooth and uneventful throughout the mission.

The MSFN radars continued to track the ATV after termination of the active mission period. The ATV beacons were expected to operate until ATV battery depletion about

March 24. The ETR radar controller assumed the responsibility for coordinating C-band beacon sharing on all stateside passes. S-band phasing control was assumed by the TEX Verlort radar personnel.

5.2.4 SYSTEM FAILURES

All C- and S-band radars scheduled to support the mission were reported GREEN at the time of launch. The radar systems at MLA, GBI, TEK, ANT, PRE, CYI, CAL, WHS, TEX, EGL, and RTK remained GREEN during the entire mission.

The radar systems at PAT, CRO, and GYM each reported their system RED at one time during the mission; however, no loss of data occurred. The HAW RSDP was reported RED on two separate occasions. No loss of real-time tracking data occurred, but radar data was not recorded on magnetic tape during these periods.

The following is an account of the systems which were reported RED during the mission and which did not acquire data while the systems were in a RED status:

Revolution Number	Station	Status
3	HAW	The Verlort radar was reported RED at 2055GMT, March 16, due to a transmitter high voltage cable problem. Data was lost on revolutions 3, 4, 5, and 6. The radar was reported GREEN for the next period it was scheduled to track.
8	ASC	The TPQ-18 radar was reported RED at 0337GMT, March 17, due to a hydraulic problem. This condition caused some loss of data during the 8th revolution as they did not track during all of the pass. The hydraulic problem required additional corrective maintenance and ASC was released from the mission after Agena revolution 9. The spacecraft had reentered and sufficient tracking capability of the Agena was still available.
14	BDA	The Verlort radar data transmitter reported RED at 1448GMT, March 17. The Verlort radar's tracking data was lost, but the FPS-16 (C-band) was available and did track during this period. The Verlort radar was reported GREEN for the next series of passes.
27	WOM	The FPS-16 was reported RED at 0939GMT, March 18, due to failure of the range unit. Data was lost during the 27th revolution, but the radar was reported GREEN for the next scheduled series of passes.
44	CRO	The FPQ-6 radar transmitter reported RED for revolution 44 and up to the Point of Closest Approach (PCA) on revolution 45. Data was lost during these two revolutions, but tracking was resumed after PCA on revolution 45.

5.2.5 RECOMMENDATIONS AND/OR CONCLUSIONS

a. It appears that the new station coordinates for HAW have resolved the bias problem present in past missions.

b. The CYI MPS-26 radar data for the GTA-8 mission was better than it has been on previous missions. The replacement of the synchros and drive motor has made a substantial difference.

c. Considerable interest was expressed both prior to and during the mission regarding the capability of MSFN radars to skin-track the ATV. Missile Precision Instrumentation Radars (MIPIR's) at MLA, PAT, and GBI did skin track the ATV during the active phase of the mission. The indications are that only the FPQ-6/TPQ-18 type radars will be able to consistently acquire and track the ATV in skin mode. The FPS-16 radars at WHS and EGL may be able to track the ATV on certain favorable passes.

5.3 TELEMETRY

5.3.1 REQUIREMENTS SUMMARY

A brief summary of the telemetry requirements for the GTA-8 mission follows:

a. All telemetry stations were required to receive transmissions from both the S/C and ATV.

b. Flight Controller-manned stations (CRO, CSQ, CYI, GYM, RKV) and real-time remoting stations (MCC-K, GTK, TEX, ANT, BDA, GBI) were required to receive telemetry dump transmissions from either the S/C or ATV.

c. TAN, KNO, CAL, CTN and RKV were required to receive and record only.

d. Real-time remoting stations were to provide MCC-H with real-time display of the S/C and ATV primary links during in-view times. Postpass remoting of dump transmissions were to be provided as required by MCC-H Flight Controllers.

e. Real-time magnetic tape recordings were required from all telemetry stations acquiring real-time or dump transmissions from both the S/C and ATV.

f. TEX was required to continue tracking the ATV after the remainder of the Network stations were released from mission support.

5.3.2 PERFORMANCE SUMMARY

All MSFN telemetry stations performed their assigned tasks as required, and there were no major system or equipment malfunctions. Those problems that were encountered during the mission period are discussed under paragraph 5.3.4 (System Failures). These failures were expeditiously repaired with no appreciable data loss.

5.3.3 PERFORMANCE ANALYSIS

The MSFN telemetry task was performed very well. In most cases where equipment malfunctions or operator errors caused loss of data in one equipment, a backup was available and already in use.

Two problems occurred which caused a loss of real-time display data. However, in both cases the data were recorded and available for subsequent playback and analysis.

The first of these problems affected the RKV Agena Memory Compare on Revolutions 4 thru 11 and HAW on Revolution 5. (Reference page 35, revolutions 4 and 5.) The second problem affected the ANT real-time display of Agena data at MCC-H during Revolution 11/12. (Reference page 39, paragraph 5.4.4, F-7.)

Fifteen Gemini dump transmissions were received, recorded and held available for Flight Controller playback. One hundred and five Agena dump transmissions were received and processed. With the exception of TEX the MSFN stations were released from support of the mission following Revolution 47 of the ATV. TEX continued to track and supply data until Revolution 122 when mission support was terminated.

5.3.4 SYSTEM FAILURES

A chronological report of the problems that occurred during the mission follows:

Day of Launch and/or Revolution No.	Station	Problem
F-10	MCC-K	Interface checks failed due to a faulty module in the Telemetry Output Buffer-3 (TOB) which was causing a one bit error in every third word. After replacement of the module, the system was reported GREEN, and the problem did not recur.
F-7	TEX	The simultaneous transmission of Agena 2-kilobit per second (kbps) data and biomedical data was not possible. Refer to page 39, paragraph 5.4.4, revolution 7.
F-4	CSQ	The VR-3600 recorder was reported RED because of a defective coil in the tape lifter solenoid. No spares were available on the ship; consequently, a replacement part was included in an air drop with computer program tapes on F-1 day. The recorder was then returned to operational condition.
F-1	TEX	The FR-114 recorder was reported RED due to a defective friction clutch assembly. An attempt was made to repair the assembly, but repair was not possible with the parts on hand. A spare unit was requested from depot supply, and was air shipped to TEX. The friction clutch assembly was returned to an operational condition after approximately 18 hours of down time.

Day of Launch and/or Revolution No.	Station	Problem
F-1	TAN	The FR-114 recorder was reported RED due to a burned out blower motor. The station was able to reconfigure using a FR-600 track recorder. This required the sacrificing of a redundant requirement; namely, the recording of the A/G signal strength on magnetic tape. The replacement part was shipped air freight and arrived after mission termination.
F-O (T-237 min)	CRO	The PCM station No. 2 was reported RED due to a faulty on/off store. Repairs were made and the system was reported GREEN at T-194 minutes.
Rev. 1	TEX, GYM	Both of these stations reported difficulty obtaining PCM lock on the Agena real-time link due to the phase lock characteristics of the 1434 receivers. An ISI was issued directing the substituting a 1415 receiver and this eliminated the problem. Future missions will use 1415 receivers on this link.
Rev. 1	CSQ	The Sanborn recorder No. 2 failed during the pass. No data was lost since this recorder was assigned to Gemini S/C functions.
Rev. 1	CSQ	The FR-114 capstan amplifier failed halfway through the pass, and was repaired prior to the next station pass. The data that was not recorded during this time was not lost because it was also recorded on the VR-3600 recorder.
Revs. 4 & 5	RKV, HAW	The RKV (revolutions 4 thru 11) and HAW (revolution 5) were unable to get memory compares in the RSDP (subframe "B"). The problem was traced to a broken lead in the TOB at RKV, and a missing module in the TOB at HAW. Both problems affected the subframe "B" status bit circuit. The RSDP DST/BST is being rewritten to include thorough checks of the status bit and to interrupt PCM sync during testing for a more realistic check.
Rev. 10	CRO	The VR-3600 recorder was reported RED due to faulty playback. The local precision 60-cycle reference had been switched to external. This was an operator error, and the switch was turned to internal prior to the next pass.

Day of Launch and/or Revolution No.	Station	Problem
14	GYM	An operator error occurred when the operator failed to confirm that the FR-114 recorder was running until near PCA. The data lost was also recorded on the VR-3600 recorder.
22	CTN	The acquisition and receiving antenna multiplexer was developing high losses, therefore the antenna was patched directly to the 240.2-Mc receiver. Since the equipment originally assigned to Gemini S/C had been reconfigured for use at ATV backup, no data was lost.
42	CRO	The PCM No. 2 lock status to the Sanborns was RED for approximately 53 minutes. The trouble was traced to a faulty lock relay in TOB-2. No data was lost since this is only a lock status indicator and does not affect the received signal.

5.3.5 RECOMMENDATIONS AND/OR CONCLUSIONS

a. Agena flight operations control was transferred to TEX when operations were terminated at MCC-H. Therefore, it is recommended that TEX be furnished with complete flight controller documentation and information in the event of a recurrance.

b. The simulation tape for BDA did not arrive on station until March 23. BDA was unable to support Network telemetry simulations for this reason. This problem was a result of faulty planning in the shipment of this tape. Care must be exercised in shipping these tapes to ensure that air, rather than surface, carriers are used.

5.4 REMOTE SITE DATA PROCESSOR (RSDP)

5.4.1 REQUIREMENTS SUMMARY

A brief summary of the RSDP requirements for the GTA-8 mission follows:

a. The TOMCAT-I operational program was to be used to process S/C and ATV real-time data, real-time playback data, and dump data at HAW, CRO, GYM, CYI, RKV, and CSQ.

b. The TOMCAT-II operational program (2 kbps) was to be used to process S/C and ATV real-time data, real-time playback data, dump data, and to process ATV thruster parameters for transmission to MCC-H from BDA and TEX.

c. The TOMCAT-IV operational program (40.8 kbps) was to be used to process S/C and ATV real-time data, real-time playback data, and dump data at GBI, GTK, and ANT for transmission to MCC-K.

d. MCC-K was to transmit high-speed 40.8-kbps data to MCC-H via the Gemini Launch Data System (GLDS). The buffer multiplexer was to receive S/C and ATV real-time data, real-time playback, and dump data from the MCC-K telemetry output buffers. Launch vehicle real-time and real-time playback data was to be received from the Texas Instrument PCM station at MCC-K. In addition, the 40.8-kbps S/C and ATV real-time, real-time playback, and dump data was to be received from the ETR stations via the Telemetry Synchronization and Conversion (TESAC) equipment at MCC-K for transmission to MCC-H.

5.4.2 PERFORMANCE SUMMARY

The MSFN RSDP systems provided excellent support during the mission. Many TOMCAT-I program changes were implemented during the premission period. Most of these changes affected parameter calibration curves. CADFISS tests were used after each major program change and subsequent to the last program change to prove that the reliability of the program had not degraded. All RSDP summary messages were reported 100 percent operational prior to liftoff. The only discrepancies that existed were several engineering unit calibration curves and on-board computer printouts.

The complete capability of the TOMCAT-I programs was exercised for the mission. Several problems were encountered concerning the command comparison, subframe B readout, Agena downrange data, and Agena burn program. All problems were corrected except the Agena burn program. All requirements for summary messages and command processing were fulfilled.

5.4.3 PERFORMANCE ANALYSIS

Several stations were called upon to conduct CADFISS tests with GSFC to verify program changes and real-time checkout of the Agena burn program. This was necessary because GSFC did not have a PCM station to input dynamic data. All stations provided excellent support. HAW, RKV, and CSQ experienced a telemetry output buffer (TOB) hardware problem which affected command comparison and subframe B readout. However, all stations corrected their problems in a minimum amount of time. Operator errors were minimal during this mission.

5.4.4 SYSTEM FAILURES

The following is an analysis of the problems that were encountered during this mission.

Days Prior to Launch and/or Revolution No.	Station	Problem
F-12	HAW	This station began experiencing program faults which were suspected to be a hardware problem. A checkout of the input/output channels provided negative results. The memory diagnostic program was then performed and again results were negative. However, use of the memory maintenance program indicated a memory problem. The problem was corrected by adjusting the memory reference voltage and no further troubles were encountered.
F-7	TEX	TEX reported problems with the transmission of 2 KBPS data. The problem occurs when both PCM inputs are the same format. The TOMCAT-II program must be told which PCM input to process. This same problem occurred on GT-7/6 and was corrected by installing a temporary operator to control which PCM input the TOMCAT-II program should accept. This was accomplished by installing a switch located at the computer console controlling PCM bit 2^{13}. No program change had been made for GTA-8, therefore it was necessary to issue an ISI authorizing the installation of the GT-7/6 modification to correct the problem. An EI will be issued authorizing the switch as a permanent hardware change. No further problems are anticipated.
Rev. 5	HAW, RKV, CSQ	These stations reported problems with the Agena command comparison and subframe B readout capability of the TOMCAT-I program. A software problem was suspected and a software patch to the TOMCAT-I program was written to eliminate the testing of the subframe B status bit. The program change was transmitted to all stations. However, further investigation indicated that the CSQ problem was not similar to the problems at RKV and HAW but was caused by the dropping of 2 bits in the telemetry stream because of noisy data. A checkout of the backup PCM station indicated a faulty module which would have affected the command comparison and subframe B readout if it had been used. The problems at RKV and HAW were traced to TOB hardware problems and were subsequently corrected.
Rev. 12	ETR	Agena data originating from downrange ETR RSDP's was indicating "invalid" at MCC-H. The problem was traced to the Gemini synchronization counter in the 40.8 KBPS buffer. When the TOMCAT IV (downrange) and GLDS (MCC-K) programs were receiving Agena data only, the Gemini synchronization counter would not be counting in the output buffer. This caused the programs to invalidate the Agena data being received and generated Agena fill data in Agena output buffer slots. MCC-H also had to have the Gemini counter stepping to accept data.

Days Prior to Launch and/or Revolution No.	Station	Problem
Rev. 12	ETR	Further investigation revealed that during all pre-mission simulations and data flow tests, Gemini data had always been received ahead of Agena data. This caused the Gemini counter in the output buffer to begin stepping. Consequently, there was no way of knowing that when only Agena data was being received that the data would be invalid. This was considered a program idiosyncrasy and a procedure was established for all downrange stations to have the Gemini simulator input static data to the RSDP when only Agena data was being processed. Program changes were made to the TOMCAT IV, GLDS, and Houston programs prior to the GTA-9 mission which corrected the GTA-8 program problems.

5.4.5 RECOMMENDATIONS AND/OR CONCLUSIONS

As a result of the problems encountered in making changes to the TOMCAT programs during GTA-8 mission, a new procedure was implemented for GTA-9 and subsequent Gemini missions. GSFC will now transmit program changes directly to the remote stations instead of transmitting them to the NST at MCC-H where they were transmitted to the Network as an ISI. The program changes will be contained on a teletype tape which will be converted to a field data tape to update the TOMCAT programs. This procedure will eliminate the time previously spent in originating an ISI, and it will also reduce the amount of time Network station personnel spend on implementing these changes.

5.5 COMMAND

5.5.1 REQUIREMENTS SUMMARY

A brief summary of the command system requirements for the GTA-8 mission follows:

a. The dual 10-kw RF Digital Command System (DCS) at CNV, GBI, GTK, ANT, BDA, CYI, CRO, HAW, CSQ, RKV, and TEX were required to support the GTA-8 mission. The DCS memories at the remote stations HAW, CSQ, RKV, CRO, and CYI were to be loaded via teletype with special groups of stored program, commands velocity meter commands, and computer word commands from the Real-Time Computer Complex (RTCC) at Houston for eventual transmission to the spacecraft and target vehicle. Real-time commands were to be loaded locally from precut teletype tapes provided by the flight controllers.

b. At the real-time stations TEX, CNV, GBI, GTI, ANT, and BDA, transmission of data to the spacecraft and target vehicle was to be accomplished via the Down Range Up Link (DRUL) and transmitted via data lines to the participating stations for uplink to the spacecraft and target vehicle. Actual transmission of the digital commands was to be accomplished by phase shifting a 2-kc subcarrier synchronized with a 1-kc reference signal. These two signals were to be combined and the composite used to frequency modulate the RF command transmitters, which would uplink the signal to the spacecraft and target vehicle via steerable command antennas.

5.5.2 PERFORMANCE SUMMARY

The DCS and RF command support provided during the mission was continuous without interruption. Thirteen discrepancies were reported during the mission, but because of equipment redundancy and expedient repairs, all stations were able to provide support for all scheduled passes. The most important command problem noted during the orbital phase of the mission was the inconsistent uplink of the automatic velocity meter load. Manual uplink of the velocity meter was accomplished without any problem, however, when attempting the automatic velocity meter load uplink, the uplink would be valid for one transmission, then non-valid on the next attempt. This condition prevailed throughout the mission at all stations.

5.5.3 PERFORMANCE ANALYSIS

The apparent problem in uplinking velocity meter loads was the rate of the DCS velocity meter load transmission. The ATV requires a minimum of one second to load the on-board velocity meter. The DCS velocity meter uplink rate is approximately 1035 milliseconds, or just 35 milliseconds over a second. Due to the nearness of the minimum time interval designed to load the ATV velocity meter, it was determined that operation could only be marginal at best. After S/C splash and for the remaining life of the ATV batteries, a test was conducted at the Corpus Christi (TEX) tracking station. An additional 225 milliseconds was added to the DCS velocity meter load time interval with good results. The velocity meter load was transmitted successfully on all attempts. Post-mission review indicated a necessity to increase the velocity meter load transmission interval at all stations and an Engineering Instruction (EI) is being processed to add approximately 1275 milliseconds to the present 1035 milliseconds for a total of 2.3 seconds. This is more than twice the minimum requirement of the ATV velocity meter. After implementation of this EI, no further problem with the velocity meter load transmission and ATV acceptance is expected.

5.5.4 SYSTEM FAILURES

A chronological account of the problems encountered during the mission follows.

Day	Station	Problem
F-0	CRO	One of the FRW-2's was RED for 86 minutes due to a failure of the insulating teflon ring in the driver stage of the transmitter. Replacement of the teflon ring corrected the problem.
F+1		Valid automatic velocity meter loads were not consistently being loaded in the target vehicle from many of the Command stations. After experiencing difficulty at all stations it was determined that a marginal condition existed between the DCS automatic velocity meter transmission and the ATV velocity meter input register.
F+2	TEX	TEX reported a 240-D power amplifier failure (for 30 minutes) due to excess current. No component failure was involved. The transmitter was retuned, and this corrected the problem.

5.5.5 RECOMMENDATIONS AND/OR CONCLUSIONS

a. It is recommended that the transmission time of the DCS velocimeter be lengthened to be more compatible with the ATV velocimeter input register.

b. Prior to launch, Agena systems personnel indicated a desire to use only the first four bits of the Agena 8-bit MAP word to increase the confidence level of the MAP reception. This was accomplished by an ISI instructing the ground station to use only the first four bits (1111). Since the Gemini MAP word is all ones (11111111), the Gemini MAPS would also look like an AGENA MAP at the input of the DCS. This condition decreased the Gemini/Agena MAP bit structure discrimination capability; however, other Gemini/Agena MAP discriminating features of the DCS could differentiate between a Gemini and an Agena MAP word. If only the first four bits of the Agena MAP word are to be used in future missions, it is recommended that at least one of the first four bits of the Agena MAP word be changed to differ from one of the first four Gemini MAP bits. This would increase the Gemini/Agena MAP discrimination at the DCS and would be utilizing the full MAP discrimination features of the DCS.

5.6 SPACECRAFT COMMUNICATIONS

5.6.1 REQUIREMENTS SUMMARY

A brief summary of the S/C communications requirements for the GTA-8 mission follows:

a. Both HF and UHF links were required for the duration of the mission. The UHF link (horizon-to-horizon) was the prime link, and the HF link was to be used as back-up and for over-the-horizon transmissions.

b. The S/C communications remoting capability provided at each MSFN station was to be fully exercised during the mission. The voice communications circuits were to be remoted to MCC-H upon request. The stations that were to provide remoting were KNO, TAN, CAL, GBI, GTK, ANT, ASC, BDA, TEX, RTK, and the voice relay aircraft.

c. The HF and UHF receiver signal strengths and all voice transmissions to and from the S/C were to be recorded.

5.6.2 PERFORMANCE SUMMARY

All MSFN S/C communications systems performed as required. The UHF transmissions were made without any failure to contact the S/C. The HF backup system was not exercised. There were no major system or equipment failures during the mission. The only equipment failure occurred at TEX when the UHF transmitter failed, and when this occurred, the UHF standby transmitter was placed in service within a few seconds. The minor problems encountered during the mission are discussed in paragraph 5.6.4.

5.6.3 PERFORMANCE ANALYSIS

S/C communications were remoted through MSFN stations a total of 26 times during the mission. The only station that experienced remoting problems was KNO and this was on revolution 7 (reentry). Noise on point-to-point circuits caused 20% of the keying tones to be missed; however, the Comm Tech manually keyed the transmitter as per standard operating procedures and communications were carried out quite well with the S/C.

Except for CTN and CAL all stations not manned by flight controllers were remoted by MCC-H. One flight controller manned station (GYM) was remoted to MCC-H on one pass as requested. Only one operator error occurred during the mission. The GYM Comm Tech missed a voice cue to return to "local". Consequently, when the next station (TEX) was requested to go "remote", two transmitters were in a remote condition. A procedure has been developed which will minimize the possibility of this problem recurring. The procedure is described in paragraph 5.6.5.

5.6.4 SYSTEM FAILURES

A chronological report of the problems which developed during the mission follows:

Day or Revolution	Station	Problem
F-11	CRO	The HF system was reported RED because of a faulty antenna select relay. The parts had been on order prior to the mission and arrived 14 March. The system was reported GREEN on F-1 day.

Day or Revolution	Station	Problem
F-0 (Terminal Count)	CRO	During the tone-remoting tests at T-240, minor voice distortion was caused by a change of levels of audio on the remote sites when they selected the A/G transfer key.
Rev 1	TEX	The UHF master transmitter blew a fuse during the pass and the M&O personnel replaced the fuse as well as the power amplifier tubes believing either or both to be faulty. However, the same situation occurred again on the next revolution. Further investigation revealed that the rectifier tubes were at fault. In both cases the UHF standby transmitter was immediately placed into operation, and no loss in service resulted.
Rev 2	GYM	Due to excessive noise on the HF receiver circuit, the Comm Tech missed a voice cue from MCC-H to return to local operation. This resulted in both GYM and TEX (now in the remote mode) to transmit simultaneously and could have caused the signal to the S/C to be garbled.
Rev 7	KNO	HF point-to-point propagation was very poor during revolution 7. Consequently, 20 percent of the UHF remote keying signals were missed due to excessive noise. Three stations (CRO, CAL, and CSQ) experienced moderate RFI on HF communications links throughout the mission. This was the result of HF signal characteristics which are unavoidable. CTN experienced a different sort of RFI on their HF link. A Chinese language broadcast lasted approximately six hours each evening. Both CRO and CTN identified the RFI as Radio Peking.

5.6.5 RECOMMENDATIONS AND/OR CONCLUSIONS

a. The RFI on HF has been a continuing problem, and is characteristic of this frequency spectrum. There was one occasion when the noise level was severe enough that a Comm Tech missed a voice cue from MCC-H. GYM's suggestion concerning this problem will be used as a standard operating procedure and transmitted to all stations. Specifically, when the noise level on the HF circuit becomes excessive, the communications technician will turn over the HF monitoring duties to his receiver technician or another person not otherwise occupied. This will free him to monitor UHF only and should present no problem in receiving voice cues from MCC-H.

b. The line level difficulties experienced on F-0 day between the remote sites and Houston is under study by MFEB/MFOB.

c. The S/C communications were carried out very well despite the minor problems encountered. All problems are being studied to ensure that they are corrected for future missions.

5.7 TIMING

5.7.1 PERFORMANCE SUMMARY

The timing systems performed their function of supplying timing signals to all station systems without any major equipment or system failures. The only significant failure occurred at GYM where they had to voice annotate one recorder on one pass.

5.7.2 PERFORMANCE ANALYSIS

All MSFN timing systems performed nominally during this mission with the exception of GYM. The problems encountered are described in paragraph 5.7.3.

5.7.3 SYSTEM FAILURE

GYM was the only station that reported system failures. This station reported that a total of twelve timing amplifiers failed on Sanborn recorders. High amplitude pulses were the apparent cause of the failures and may have resulted from the installation of EI-1302, which pertained to the installation of an additional analog recorder. The MFEB has studied the failures and approved GYM Change Recommendation Request (CRR) No. 206-24, and this should reduce these types of failures.

5.7.4 RECOMMENDATIONS AND/OR CONCLUSIONS

The action being taken on the GYM timing problem (CRR No. 206-24) is the only recommendation regarding timing because the system performed very well at all other stations and is a reliable source of timing.

6. COMPUTERS

6.1 PRELAUNCH PHASE

The RTCC computers did not experience any significant problems during the terminal countdown. The GSFC computers generated nominal pointing data for the S/C, Agena, and GLV and transmitted this data to the participating MSFN stations. CADFISS testing was conducted with the Network during the F-6 day SLD as well as the F-0 day terminal countdown. All failures were reported to the Network Controller. All theoretical trajectory runs were supported by the RTCC and GSFC computers.

6.2 LAUNCH PHASE

The RTCC and GSFC computers received high-speed launch data from the impact predictor and B/GE complexes via the launch tracking data system and the launch monitor subsystem, respectively, for both the Agena and GT-8 launches. Data quality was good and both launches were nominal. Liftoff time for the Agena was 15:00:03GMT, 16 March. Liftoff time for the GT-8 spacecraft was 16:41:02GMT, 16 March.

During the final five minutes of the Agena terminal countdown, high-speed test pattern data was being received from BDA. GSFC and BDA station personnel were notified of this condition and the high-speed lines were returned to their normal operating mode approximately one minute prior to Agena liftoff. In the future, the transmission of test pattern data will be confined to the time period indicated in the terminal countdown. Throughout the launch phase, the RTCC and GSFC computers performed without incident.

6.3 ORBITAL PHASE

During revolution 13, some CRO radar data was reported lost to the RTCC due to a test bit being inserted in the radar data. Subsequent investigation revealed that the equipment at CRO had to be placed in the test configuration in order to support a postlaunch CADFISS test. The equipment at CRO was not returned to the operational configuration until sometime during the pass, hence the loss of data. The reason that the equipment had to be placed in the test configuration was that EI-1542 had not been implemented. It is expected that EI-1542 will be implemented at CRO prior to the Gemini next mission.

During the F+2 day operation, an Agena burn resulted in an orbit which produced third range interval data from the WOM and CAL radars which was not accepted by the RTCC computers. Both WOM and CAL transmitted this data with the valid track bit set. These stations have now agreed to clear the valid track bit when tracking in the third range interval. However, the RTCC is investigating the possibility of accepting third range interval data.

6.4 REENTRY PHASE

No data was received during the reentry phase of the mission. However, the nominal impact point for a 7-3 reentry is 25 degrees 15 minutes north latitude and 136 degrees 00 minutes east longitude. Based upon preretrofire data, nominal retrofire data and the nominal retrofire time and sequence, the impact point of the GT-8 spacecraft was computed by the RTCC computers as 25 degrees 13 minutes north latitude and 136 degrees 05 minutes east longitude. The impact point as computed by the GSFC computers based upon the same data was 25 degrees 15 minutes north latitude and 136 degrees 00 minutes east longitude.

The impact point of the GLV as computed by the GSFC computers was 6.24 degrees north latitude and 110.69 degrees west longitude. The time of GLV reentry was computed as 2228GMT, March 17.

6.5 POSTMISSION PHASE

At the termination of active mission support of NCG-634, the GSFC computers began to actively monitor the orbital flight of the Agena vehicle. The GSFC computers received orbital tracking data from Network radars and updated the orbit of the Agena vehicle until the Agena battery expired. As the orbit was updated, pointing data was generated and transmitted to the tracking network once every 24 hours.

7. NASA COMMUNICATIONS NETWORK

7.1 GENERAL

This section summarizes the performance of the NASA Communications (NASCOM) Network during the GTA-8 mission and is concerned primarily with noting circuit loading rather than all aspects of the NASCOM Network as it supported the mission. Particularly excluded are traffic counts of all Aeromedical traffic, direct data lines, order wires, and "make-good" circuits, that were also a part of the Network.

The configuration of the NASCOM Voice/Data Network for GTA-8 is shown in figure 2. The configuration of the NASCOM Teletype Network for GTA-8 is shown in figure 3.

7.2 SWITCHING, CONFERENCING, AND MONITORING ARRANGEMENT (SCAMA) VOICE CIRCUITS

Voice transmissions on the manned flight conference loop of the NASCOM Network were monitored and logged from 1600 GMT, March 16 thru 0328 GMT, March 17. Monitoring of the SCAMA Voice Network was accomplished by logging voice transmissions on the manned space flight voice conference loop between Houston and the spacecraft via air-to-ground relay-equipped ground stations, and between Houston and mission-oriented ground stations.

All voice transmissions in the above categories total 1,917. Of the total transmissions logged, 85.6 percent were between Houston and the ground stations, and 14.4 percent were between Houston and the spacecraft. Of the 1,642 ground station transmissions, 2.43 percent were requests for retransmission and 2.43 percent were retransmissions. Of the 275 Houston air-to-ground transmissions, 2.54 percent were requests for retransmissions and 2.54 percent were retransmissions.

Table 5 presents totals of SCAMA transmissions logged. Also tabulated are the number of requests for retransmission, the number of retransmissions, and what percentage each is of the total. The figures cover the time period of 1600 GMT, March 16, to 0328 GMT, March 17.

Table 5. Summary of SCAMA Activity

	Total Transmissions	Request for Retransmissions		Retransmissions	
		Number	%	Number	%
Houston/Ground Station	1642	40	2.43	40	2.43
Houston/Spacecraft	275	7	2.54	7	2.54
Total SCAMA	1917	47	2.45	47	2.45

Ground Stations Monitored:		Ships Monitored:
Ascension	Carnarvon	CSQ
Bermuda	Guaymas	RKV
California	Hawaii	RTK
Canary	Kano	
Canton	Tananarive	
Cape Kennedy	Texas	

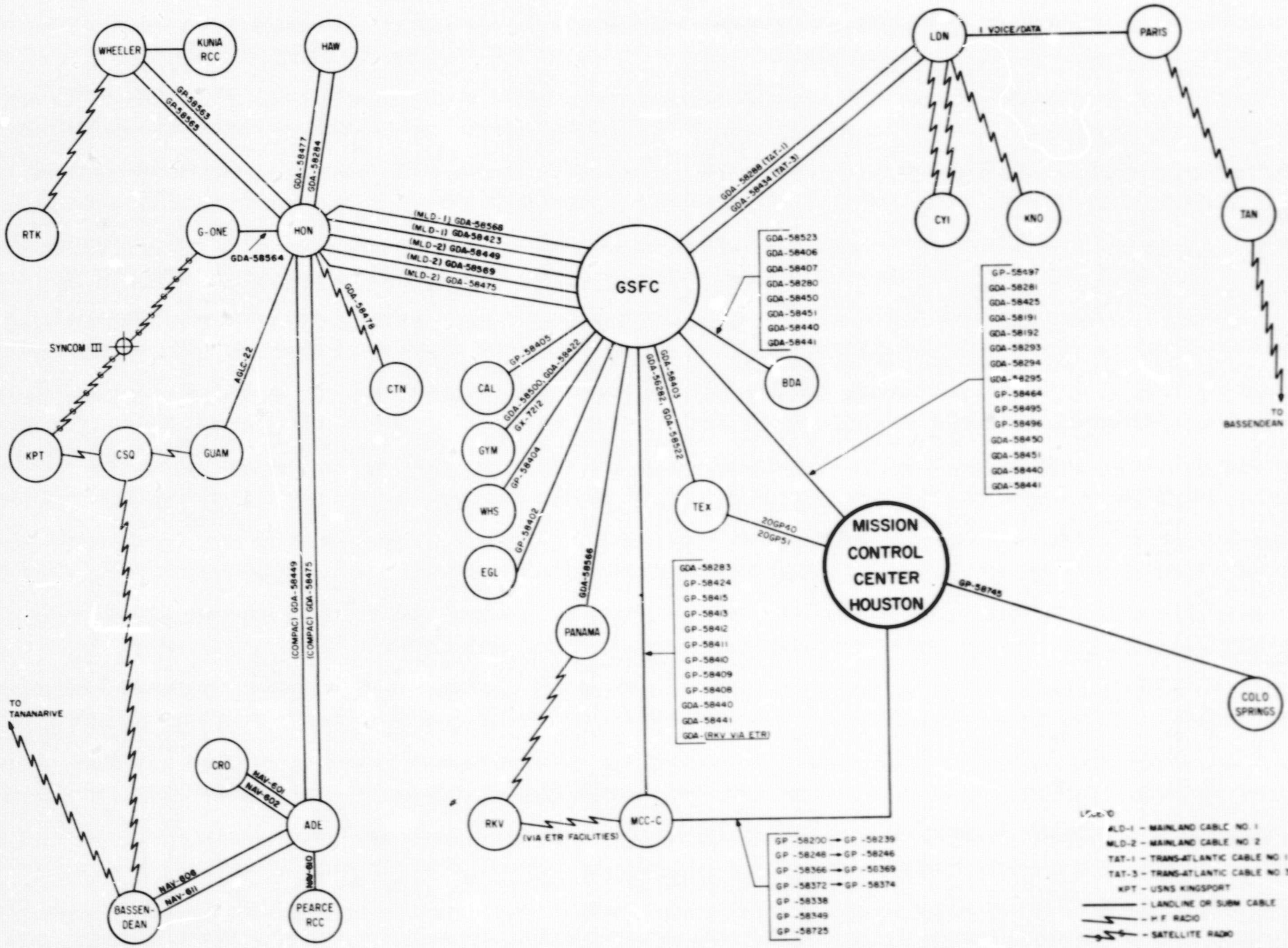


Figure 2. NASCOM Voice/Data Network for the GTA-8 Mission

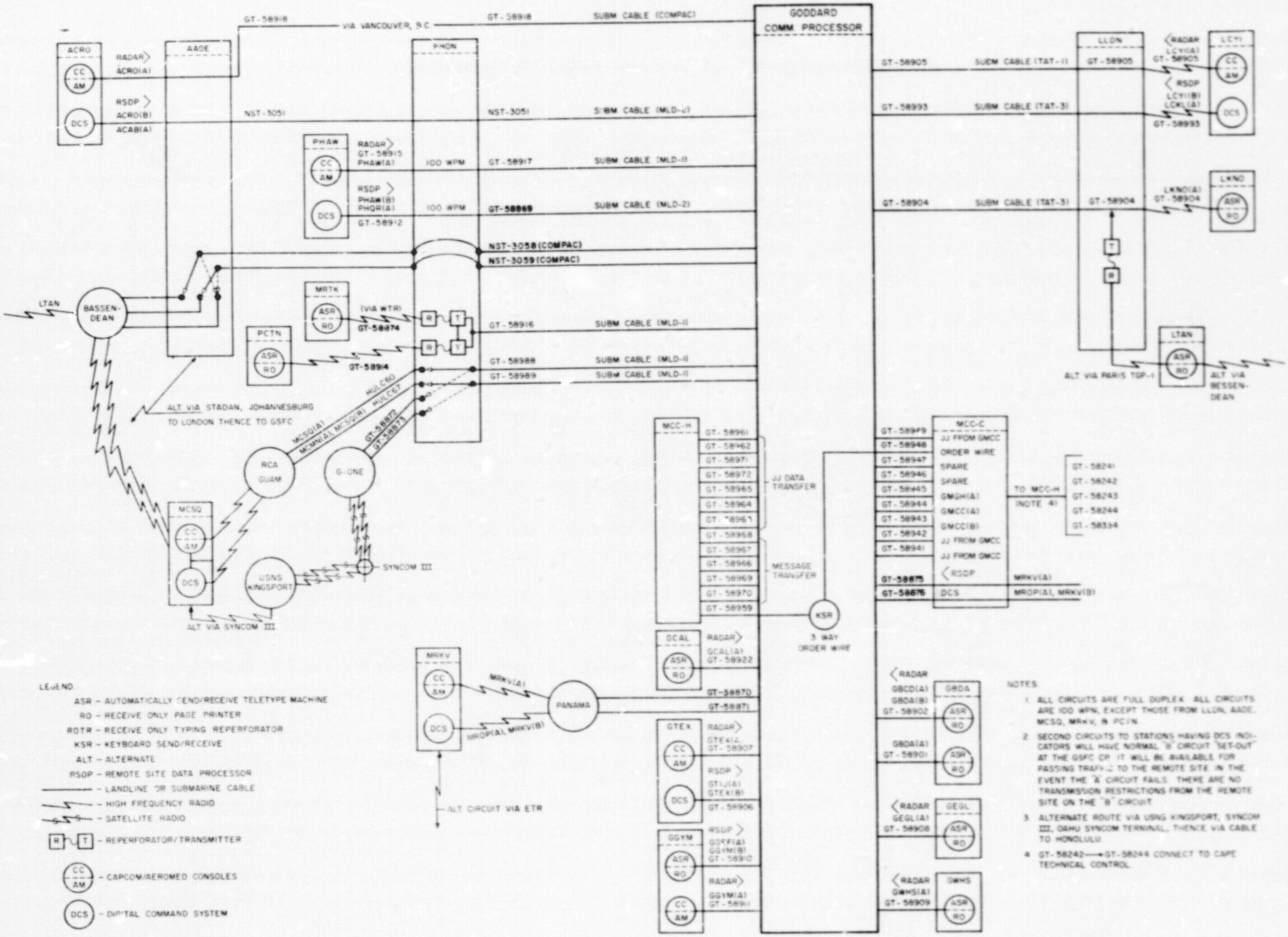


Figure 3. NASCOM TTY Network Configuration for the GTA-8 Mission

7.3 TELETYPE CIRCUITS

The analysis of Teletype (TTY) traffic to the prime stations was made from the liftoff of Agena through splashdown of the GT-8 spacecraft. An analysis reveals that 33 percent of all messages switched during the mission experienced delays greater than one minute through the 490 Communications Processor. Of the 27 circuits analyzed, 13 experienced no delays greater than one minute. Traffic over 13 of the 14 circuits listed below, which had messages delayed greater than one minute, are graphically presented in figures 4 through 10.

ACRO-A	ACAB-A	Carnarvon
LCYI-A	LCKL-A	Canary Island
MCSQ-A	MCMN-A	Coastal Sentry
MRKV-A	MROP-A	Rose Knot
PHAW-A	PHQR-A	Kauai, Hawaii
GGYM-A		Guaymas, Mexico
GTEX-A		Corpus Christi
MRTK-A		Range Tracker
HMTS-A		Houston

The Houston circuit (HMTS-A) was not graphically presented, as all delayed messages noted were of nonmission (PP) precedence.

The graphs (figures 4 thru 10) compare the total number of messages transmitted with the number of messages delayed for each time period surveyed. The third curve of each graph indicates the maximum delay in minutes for the same time frames. The message experiencing the greatest delay per time unit is indicated by annotating the "maximum delay in minutes" curve with message type and precedence classification.

Message data was not printed on journals during the period 2025 to 2125 GMT, March 16. This lack of data is illustrated by breaks in the curves of figures 3 through 9. Available information indicates this break was caused by an overload of message data on journal "cue". However, it is further reported that switching of message traffic was not affected. The same break in journal printout was noted during GT-3. Note that four journal machines were on line for both GT-3 and GTA-8, whereas six were used during GT-4 through GT-7/6, when no breaks in journal printouts were noted.

The six types of messages and five precedence classifications used for the graph notation follow:

Designator	Type of Message
1. AQ	Acquisition messages usually consist of pointing data pertaining to horizon arrival of time of a spacecraft.
2. SUM	A summary message.
3. OPN	Flight Controller to Flight Controller message, usually of NN precedence level.
4. SPE	A special message used when certain information concerning the safety and success of the flight must be transmitted with minimum delay.
5. RET	A retransmission.
6. UNK	Unknown (source material not available).

Designator	Precedence
1. UU	Urgent (none assigned during the periods surveyed).
2. SS	Special (utilized for mission-oriented traffic).
3. NN	Normal (utilized for mission-oriented traffic).
4. PP	Priority (utilized for non-mission traffic).
5. RR	Routine (utilized for non-mission traffic).

Tables 7 and 8 list by hour and by precedence, the total number of messages switched between Houston and the prime stations during the time period surveyed. Table 8 further lists the total number of delayed and non-delayed messages for each receiving station.

7.4 HIGH FREQUENCY PROPAGATION CONDITIONS

High frequency radio propagation conditions were good during the GTA-8 mission period. Voice transmission monitored indicated that conditions were slightly better than normal. No unusual propagation outages were reported.

The effects of Magnetic Storm 103 on March 13 caused depressed conditions on March 14 and 15, but the storm had subsided by the launch date. The high solar activity of March 16 appeared to have no adverse effect upon high frequency communications.

7.5 CONCLUSION

In every respect, the performance of the NASCOM Network was satisfactory in support of the GTA-8 mission. Outages were minimal throughout the operational phase of the mission. Voice communications with all land-based stations and with the three support ships were, for the most part, very good. A small percentage of the voice contacts required requests for retransmission. Most repetitions were due to normal procedures and not to compensate for communication malfunctions.

Analysis of the 27 Teletype circuits monitored, revealed that 13 circuits experienced no message delay. The remaining 14 circuits experienced delays which were attributable to circuit loading rather than equipment fault or loss of facilities.

There is an evident increase in the number of messages delayed through the Communications Processor. The percentages have increased from mission to mission in the following manner:

GT-4	14%
GT-5	17%
GT-7/6	21%
GTA-8	33%

This represents an average increase for each mission over the previous mission of approximately 30%. Should this trend continue we can expect:

GT-9	43%
GT-10	55%
GT-11	72%
GT-12	92%

These percentages, coupled with the fact that the circuits experiencing the delays are the same from mission to mission, imply a need to investigate the cause of the trend.

Table 6. Message Count From Agena Liftoff Through 2359 GMT, March 16, 1966

TIME (GMT)	16/1500 16/1559		16/1600 16/1659		16/1700 16/1759		16/1800 16/1859		16/1900 16/1959		16/2000 16/2025		16/2125 16/2159		16/2200 16/2259		16/2300 16/2359	
REC. STAT.	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN
ACAB-A	10	0	13	0	9	0	15	0	20	0	12	0	6	0	6	0	3	0
ACRO-A	3	3	8	6	20	6	4	6	8	4	2	1	8	2	6	1	8	1
ACRO-B	0	0	0	0	0	0	1	0	0	0	1	0	3	2	0	1	0	2
GBDA-A	1	3	5	4	7	3	2	3	4	1	1	1	4	3	3	1	6	2
GBDA-B	0	0	0	0	3	0	0	2	1	1	1	0	3	1	0	0	0	0
GGYM-A	1	4	7	4	11	6	3	6	7	2	2	0	11	5	5	2	9	0
GGYM-B	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
GTEX-A	2	3	4	4	10	5	5	9	9	1	1	2	5	4	5	0	8	2
GTEX-B	0	0	1	0	3	1	0	2	0	2	1	1	4	4	0	1	0	1
HMSC-A	1	7	0	11	3	8	2	9	1	8	0	6	7	9	4	7	3	10
HMSC-B	1	1	0	3	0	2	0	1	1	4	0	1	0	2	2	0	1	2
HMSC-C	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	2
HMSC-D	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
HMTS-A	0	0	0	0	0	0	0	8	0	3	1	7	0	0	0	3	0	0
LCKL-A	10	0	13	0	8	0	15	0	21	0	13	0	5	0	7	0	3	0
LCYI-A	4	1	4	4	11	6	3	6	4	3	2	3	10	5	3	3	8	1
LCYI-B	0	0	0	0	2	2	0	2	0	1	0	0	4	0	1	0	1	0
MCMN-A	10	0	13	0	8	0	15	0	21	0	13	0	4	0	6	0	4	0
MCSQ-A	2	3	4	4	11	6	3	5	5	3	4	1	11	2	21	3	10	3
MCSQ-B	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
MROP-A	10	0	13	0	11	0	14	0	21	0	13	0	7	0	9	0	6	0
MRKV-A	2	3	4	4	11	7	2	6	7	3	6	1	18	1	8	6	16	2
MRKV-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MRTK-A	0	1	4	4	9	4	2	3	6	2	3	3	7	3	6	1	10	0
PHAW-A	4	3	5	4	14	6	4	8	10	4	2	1	11	4	9	3	11	3
PHAW-B	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
PHQR-A	9	0	12	0	9	0	8	7	26	0	8	0	7	0	7	0	3	0
TOTALS	70	32	110	53	161	63	99	83	172	42	86	28	137	47	110	32	111	32
TOTAL MSG.	102		163		224		182		214		114		184		142		143	

1. Entries are totals of all messages in hourly increments, for each circuit, by precedence classification. The incremental counts of delayed messages are displayed in the graphs of figures 4, 5, 6, 7, 7A, 8, 9, and 10.

2. All PP (non mission) precedence messages were included in the NN category, as only traffic to HMTS (Houston) carried that precedence.

Table 7. Message Count With Mission Totals From 0000 GMT, March 17, Through Splashdown

TIME (GMT)	17/0000 17/0059		17/0100 17/0159		17/0200 17/0259		17/0300 17/0330		Total Delayed		Total Non Delayed		Grand Total		Total Msg.
REC. STAT.	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	SS	NN	
ACAB-A	14	0	12	0	9	0	0	0	86	0	43	0	129	0	129
ACRO-A	5	1	3	2	3	0	0	0	18	7	60	26	78	33	111
ACRO-B	3	0	1	0	0	0	1	0	0	0	10	5	10	5	15
GBDA-A	8	0	2	2	1	0	0	0	0	0	44	23	44	23	67
GBDA-B	0	0	2	0	0	0	1	0	0	0	11	4	11	4	15
GGYM-A	7	1	3	2	2	0	0	0	7	5	61	27	68	32	100
GGYM-B	3	0	1	0	0	0	1	0	0	0	7	0	7	0	7
GTEX-A	5	1	2	2	2	0	0	0	5	4	53	29	58	33	91
GTEX-B	2	0	1	0	0	0	1	0	0	0	13	12	13	12	25
HMSC-A	13	4	6	5	1	8	1	3	0	0	42	95	42	95	137
HMSC-B	3	2	3	2	1	1	0	0	0	0	12	21	12	21	33
HMSC-C	1	0	0	1	1	1	0	0	0	0	4	5	4	5	9
HMSC-D	0	0	0	0	1	0	0	0	0	0	2	1	2	1	3
HMTS-A	0	0	0	0	0	0	0	0	0	2	1	19	1	2	22
LCKL-A	16	0	8	0	7	0	0	0	92	0	34	0	126	0	126
LCYI-A	6	1	4	2	1	0	0	0	6	6	54	29	60	35	95
LCYI-B	3	0	0	0	0	0	1	0	0	0	12	5	12	5	17
MCMN-A	20	0	12	0	6	0	0	0	87	0	45	0	132	0	132
MCSQ-A	16	1	17	1	10	2	3	0	56	12	63	20	119	31	150
MCSQ-B	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
MROP-A	20	0	12	0	6	0	0	0	91	0	51	0	142	0	142
MRKV-A	16	0	14	3	10	0	0	0	51	12	63	24	114	36	150
MRKV-B	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1
MRT[illegible]-A	11	0	4	3	3	0	1	0	15	5	51	19	66	24	90
PHAW-A	15	1	8	1	10	2	2	0	15	7	90	33	105	40	145
PHAW-B	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2
PHQR-A	19	0	11	0	8	0	0	0	44	7	83	0	127	7	134
TOTALS	206	12	126	26	82	15	12	3	573	67	912	398	1485	464	1950
TOTAL MSG.	218		152		97		15		640		1310		1950		

NOTE: Entries are as in Table 6. This table also lists mission totals. Mission totals are also broken out for the delayed and non-delayed message categories.

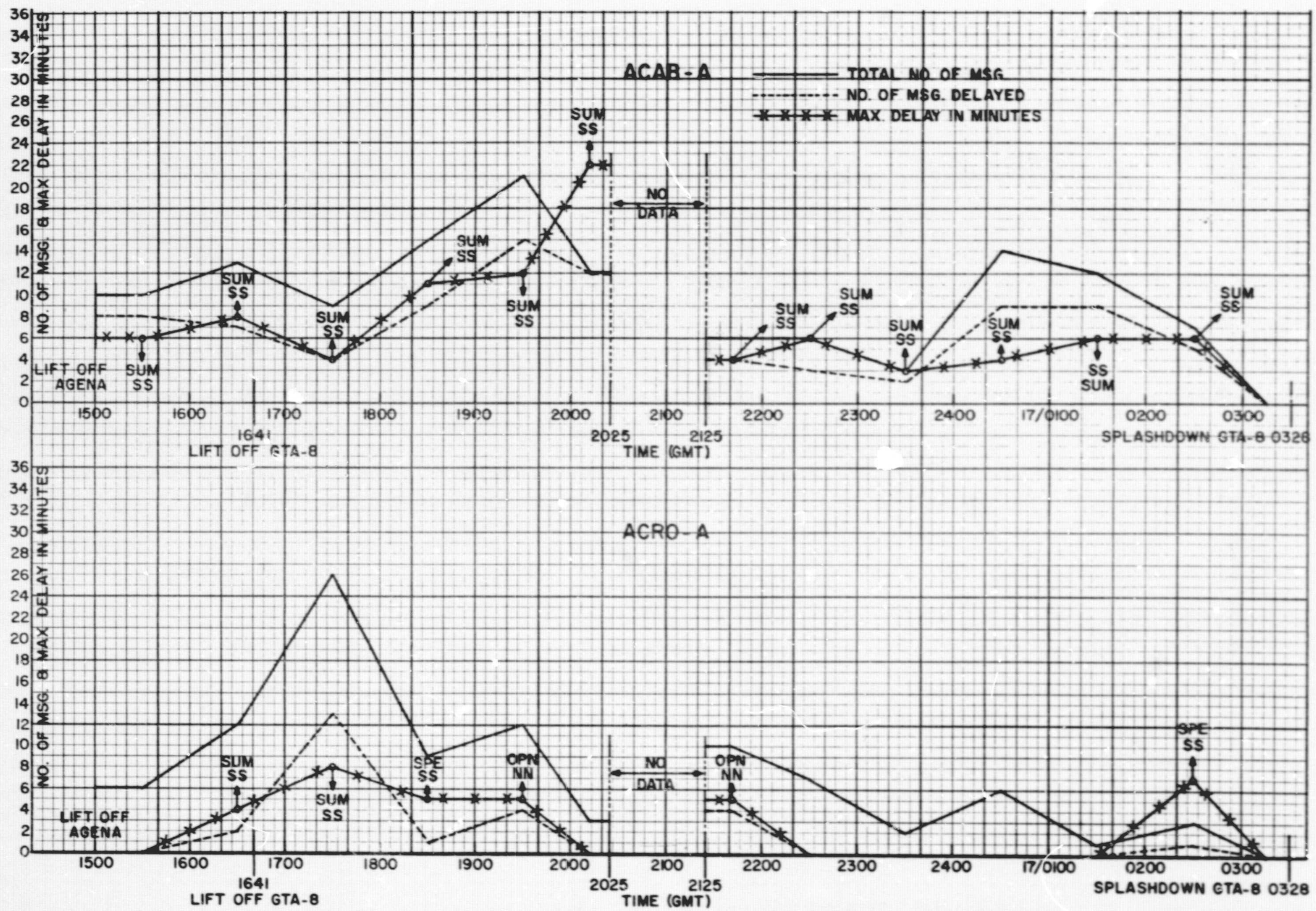


Figure 4. Analysis of Two Teletype Circuits to Carnarvon From T-0 Through Splashdown

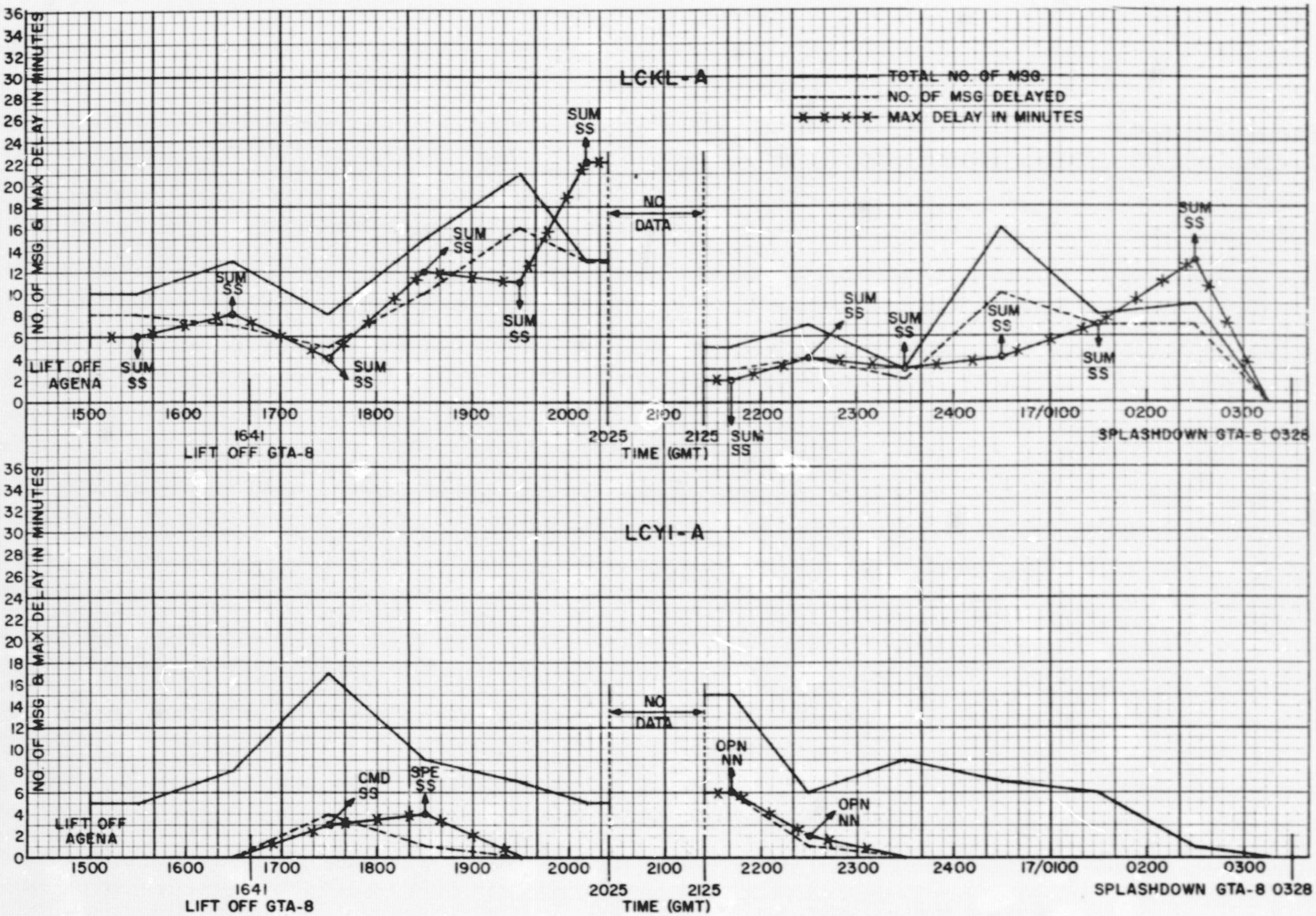


Figure 5. Analysis of Two Teletype Circuits to CYI From T-0 Through Splashdown

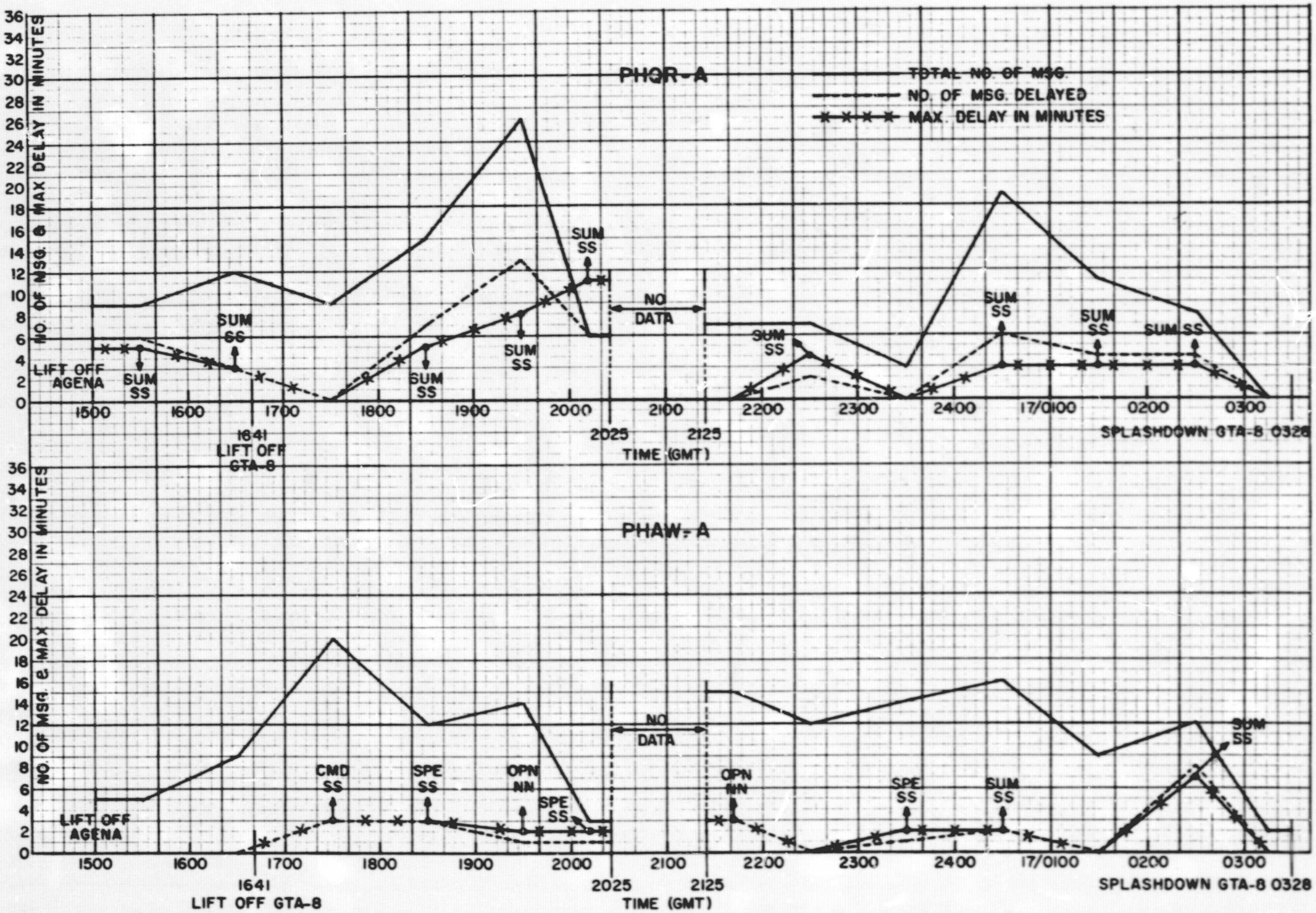


Figure 6. Analysis of Two Teletype Circuits to HAW From T-0 Through Splashdown

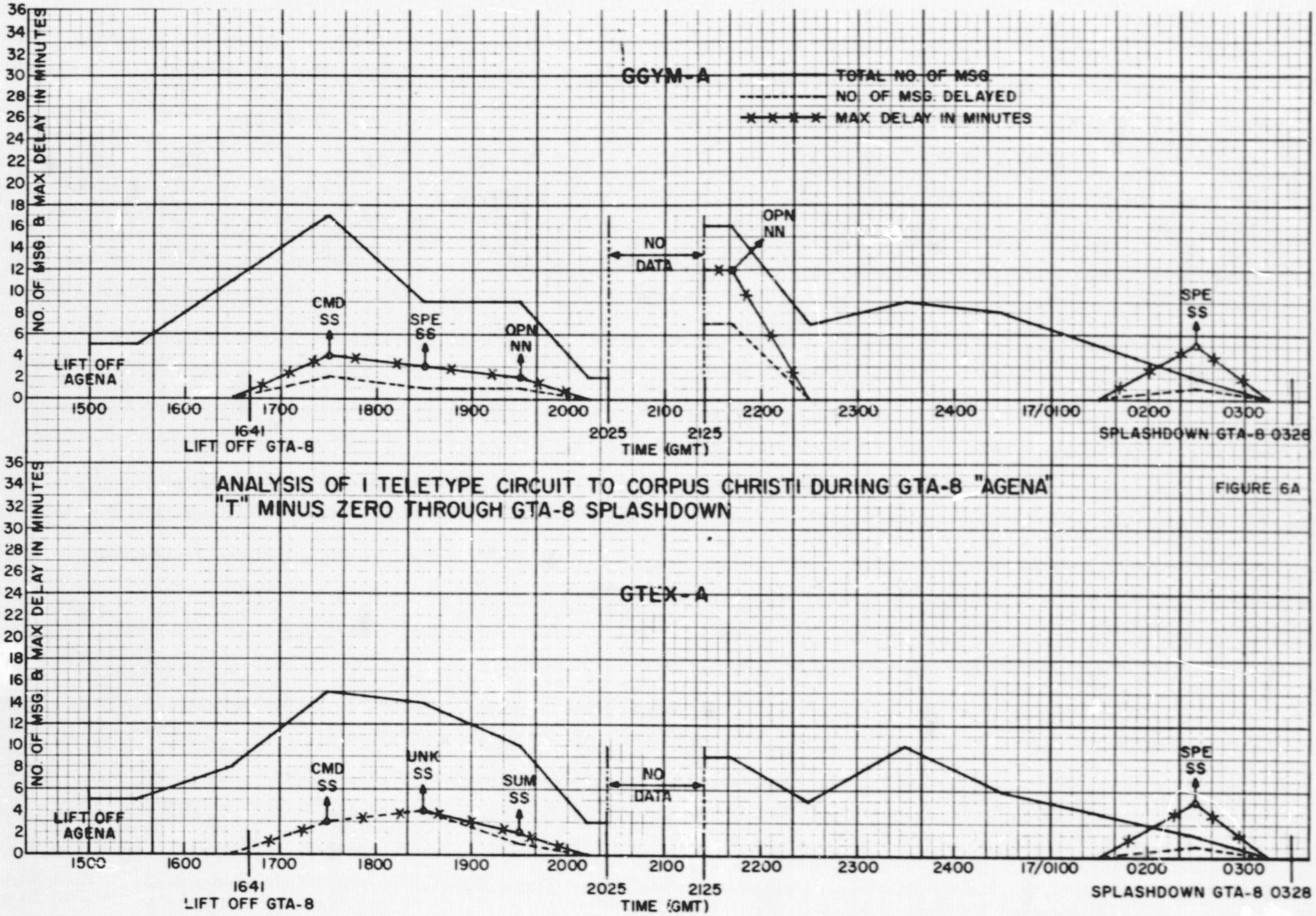


Figure 7. Analysis of One Teletype Circuit to GYM and One to TEX From T-0 Through Splashdown

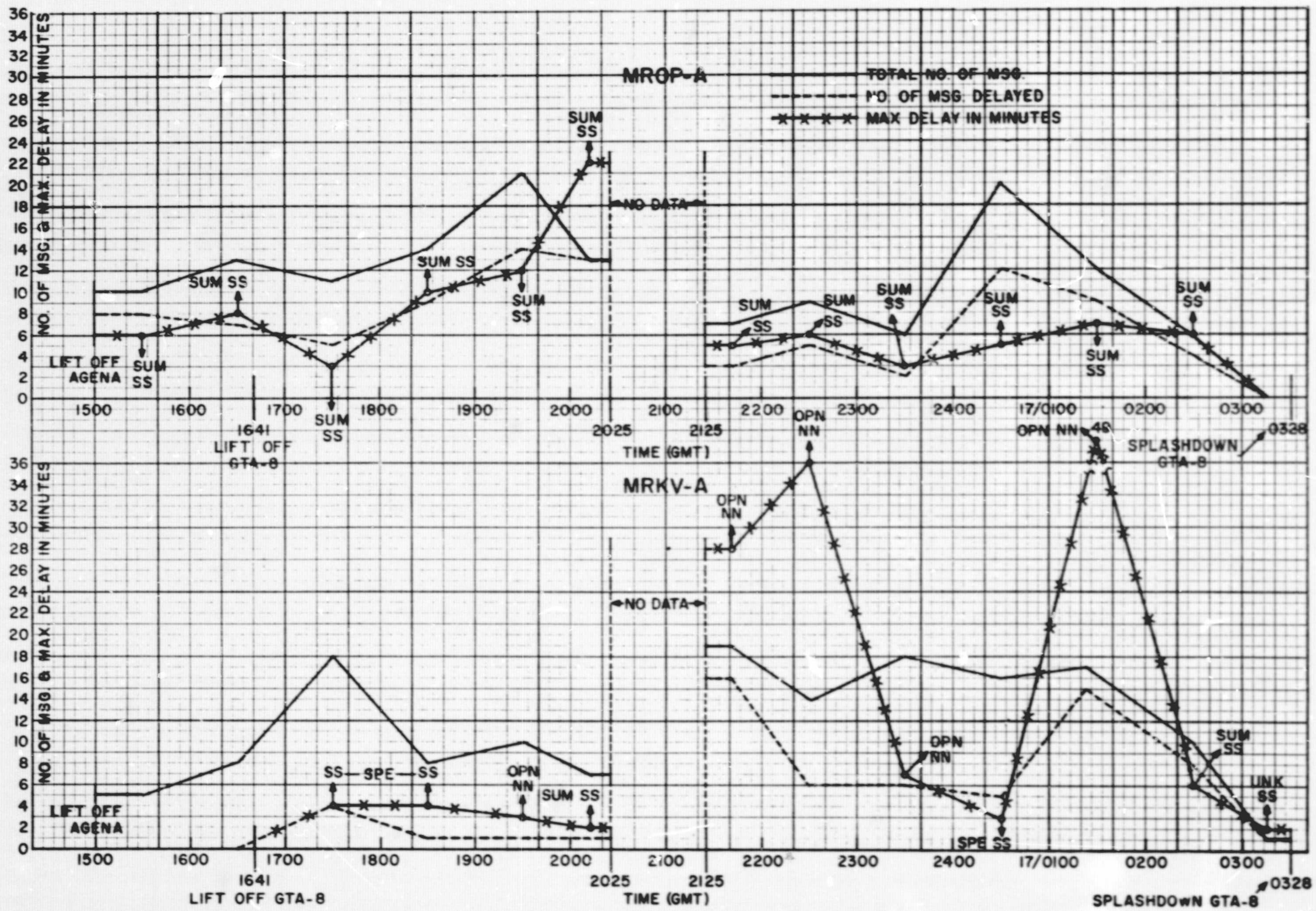


Figure 8. Analysis of Two Teletype Circuits to RKV From T-0 Through Splashdown

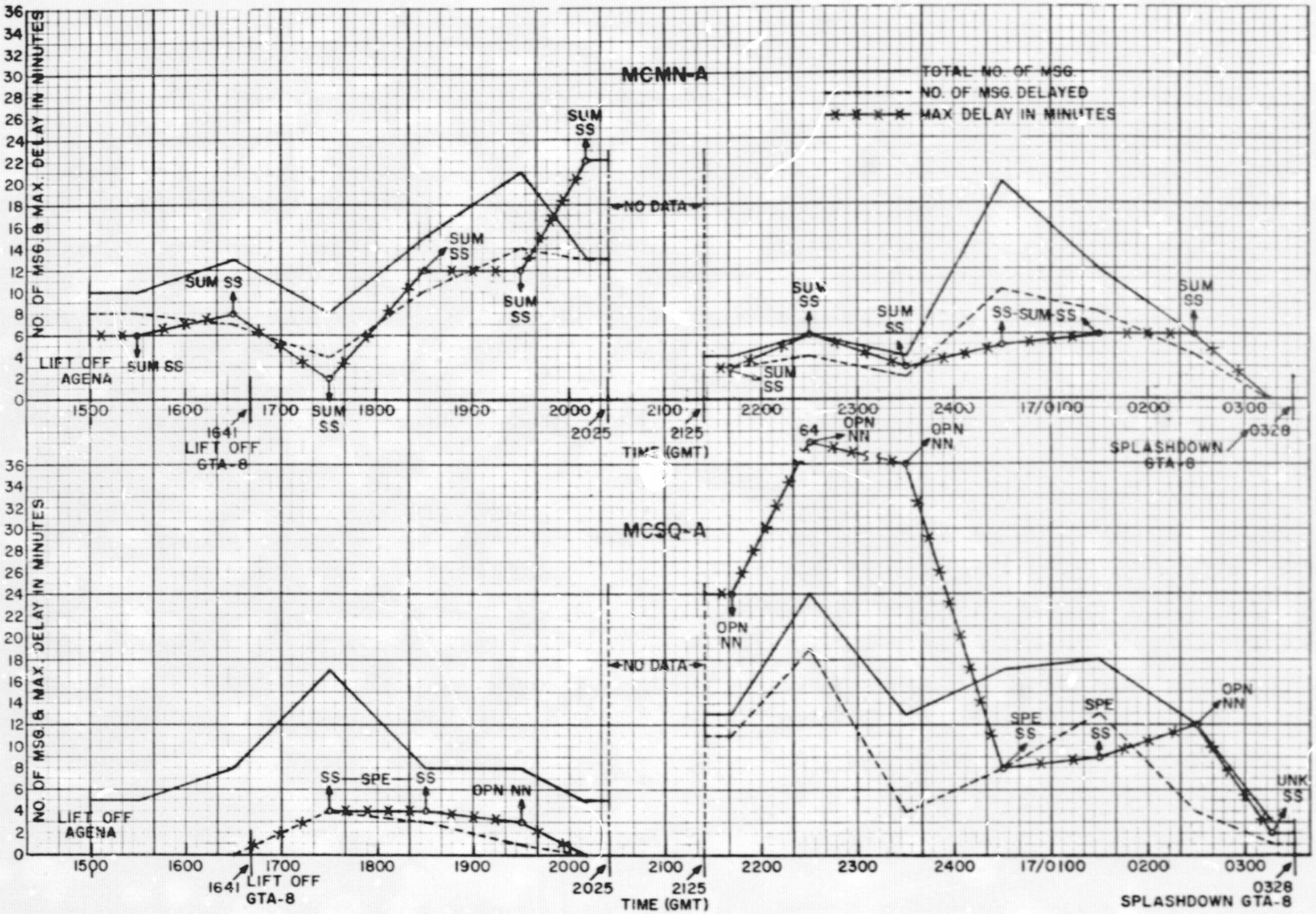


Figure 9. Analysis of Two Teletype Circuits tc CSQ From T-0 Through Splashdown

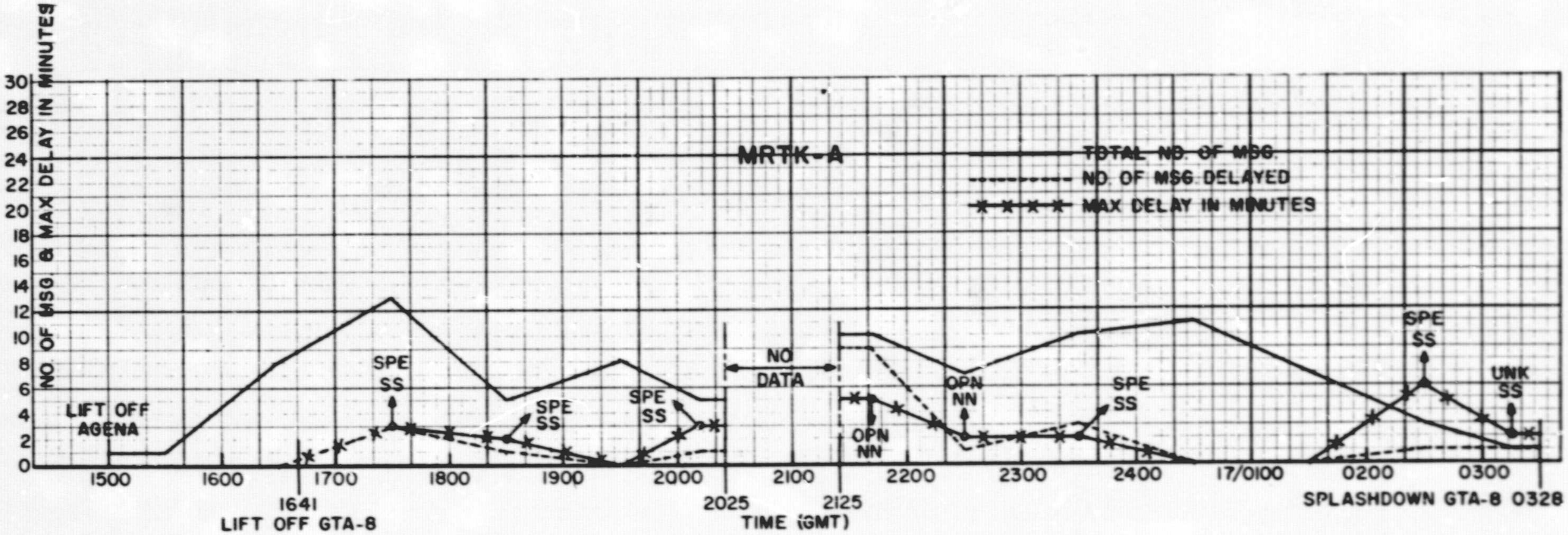


Figure 10. Analysis of Teletype Circuit to RTK From T-0 Through Splashdown

8. DATA HANDLING

8.1 SUMMARY

Data was provided by the MSFN in accordance with PSRD requirements. The supporting stations recorded and shipped data within acceptable time frames and in good condition. The MFOD Data Services Group (DSG) received the following data for reproduction and distribution:

225 Magnetic Tapes (Analog and Digital)
312 Direct Write Signal Strength Recordings
668 Systems Operator's Logs.

From this data, a total of 139 magnetic tapes, 312 direct write signal strength recordings, and 2,672 systems operator's logs were reproduced and distributed.

8.2 ORBITAL DATA (ETR)

No attempt will be made to evaluate the handling of orbital data recorded by the ETR. These data are the responsibility of the MSFN, however the data are handled by the KSC per request from the DSG through the Goddard Network Support Office (GNSO). In addition the KSC was requested to provide the DSG with orbital data status reports. These reports have never been received.

8.3 CLASSIFICATION OF DATA

Due to the early termination of the GTA-8 flight, data from the early orbits of both vehicles were classified. The Gemini Failure Contingency Plan when implemented appeared to cause some confusion at station level. This was further compounded by various persons contacting stations directly without clearing through the GSFC Flight Support Request (FSR) representative and DSG; however, there was no further problem encountered once the data was received by the DSG.

8.4 DATA SHIPMENTS

8.4.1 INCOMING DATA

Data shipments were received without any apparent delays with the following exceptions.

a. Data recorded by Tananrive was shipped air freight via commercial carrier. The carrier notified GSFC Freight Transportation of the shipment arrival, but the shipment stayed at the airport for two weeks before being picked up.

b. Indications are that Woomera did not receive or did not follow the GTA-8 supplements to OD 63-1 since they shipped data air mail instead of air freight.

8.4.2 OUTGOING

No problems were encountered during the shipping of data with the following exception: The GSFC Storage and Transportation Branch failed to comply with agreements made for data shipments to be handled on an expedite basis. For instance, there were no personnel available on Saturdays, as per agreement, to handle paperwork; consequently, shipments could be made only during normal working hours. Also, there were no daily afternoon pickups as there were for previous missions; this resulted in DSG having to bring in a man on overtime to deliver outgoing shipments to the airports.

8.5 STATION DISCREPANCIES

The following discrepancies occurred in the identification and handling of data:

Station	Discrepancy
EGL	Did not properly identify radar plots
WOM	Did not send follow-up teletype messages giving mail registry numbers for two shipments of data.
all	No station consistently indicated the vehicle tracked on the Data Annotation Form. Also, stations did not consistently enter on the Data Annotation Form whether the tape was recorded on an FR-100 or FR-600 recorder.

8.6 DATA REPRODUCTION

All magnetic tapes were reproduced through the facilities located at GSFC. The only exceptions were telemetry tapes recorded on VR-3600 magnetic tape recorders and air/ground communications tape. These tapes were sent directly to MSC.

All direct-write signal strength recordings and systems operator's logs were reproduced through the facilities located at the DSG; however, reproduction of the signal strength recording was delayed for three days because of a machine break down.

8.7 ANALYSIS OF POSTLAUNCH INSTRUMENTATION MESSAGES (PLIM's)

Prior to the GTA-8 mission, the PLIM formats used by the stations supporting the Gemini missions were such that the information was not transmitted in a uniform manner. This method of submitting data made the interpretation somewhat difficult to those not totally familiar with the PLIM data content.

The Data Services Group reorganized the PLIM format so that every station would submit a PLIM in a standard format for every transmission, thus making the PLIM data more readily recognizable to anyone who may have need to use this data. This, of course, could only be accomplished with all stations complying with the directives pertaining to the PLIM.

A few days before GTA-8 launch, all stations were requested to take part in a test which involved transmitting simulation data via the revised PLIM formats. All stations except PRE participated in this test; however, several stations were using the old formats. A few stations indicated that these new PLIM forms were not on site at the station; however, upon conversing with cognizant personnel of the Logistics Group it was determined that the revised PLIM formats were at all stations except GBI and ANT. This would indicate that the forms control at some stations could be improved.

Prior to launch, there were only a few queries in the PLIM area and these queries were answered with no problems. A Premission Documentation Change (PDC) was transmitted to add a signal appraisal to the telemetry format. ISI No. 12 was transmitted to aid the stations in defining blocks 8, 9, and 10 of the S/C Comm (202) PLIM Data Sheet. In reference to a CRO query ISI No. 29 was transmitted to add vehicle identification to block 2 of the M&O PLIM format.

A copy of the GTA-8 mission PLIM critique is attached to aid in a review of station performance in transmission of PLIM's.

The following indicates the PLIM's transmitted complete and incomplete:

RADAR

Station	PLIM's Complete	PLIM's Incomplete
PAT	23	6
MLA	12	3
CNV	1	1
GBI	23	4
GTK	19	1
BDA	24	2
ANT	24	1
ASC	19	1
CYI	27	0
CRO	36	6
WOM	17	1
HAW	36	2
CAL	26	1
GYM	15	4
TEX	23	5
WHS	10	0

SPACECRAFT COMMUNICATIONS

GTK	4	1
MCC-K	1	0
GBI	3	0
BDA	1	0
ANT	3	0
ASC	3	0
TAN	6	2
CRO	4	0
RTK	6	0
HAW	6	0
CAL	3	0
GYM	3	0
TEX	3	0
CNV	2	0
RKV	5	0
CSQ	5	1
CTN	1	0

COMMAND

Station	PLIM's Complete	PLIM's Incomplete
MCC-K	16	1
GBI	4	0
GTK	11	0
ANT	27	2
BDA	8	0
CYI	21	0
CRO	24	0
HAW	31	0
TEX	53	2
RKV	28	15
CSQ	23	0

TELEMETRY

TAN	8	8
MCC-K	23	1
GBI	25	0
GTK	24	0
BDA	19	1
ANT	36	0
ASC	23	1
CYI	17	0
KNO	12	0
CRO	24	0
CTN	11	3
HAW	32	0
CYI	16	0
TEX	50	0
RTK	9	0
RKV	24	0
CSQ		

ACQUISITION AID

MCC-K	21	0
GBI	15	0
GTK	49	0
BDA	36	1
CYI	34	1

Stations	PLIM's Complete	PLIM's Incomplete
KNO	12	0
TAN	15	0
CRO	44	0
WOM	16	0
CTN	13	1
HAW	48	1
CAL	15	1
CYI	37	0
WHS	12	0
TEX	102	11
EGL	13	0
RTK	7	0
CSQ	42	2
RKV	24	7

Data from these PLIM's was extracted manually and entered on IBM Fortran sheets. Once entered on the sheets it was keypunched onto cards. As the DSG did not have access to a keypunch during normal working hours, this work was taken to the EAM Services Group at GSFC and accomplished on a non-priority basis. This created a lengthy delay in obtaining the final listings needed to fulfill the requirements placed upon the Data Services Group by the Network Control Section at the MSC in Houston, Texas. The causes of the delay were explained to MSC, and it was implied that there would be no delay in future missions. The PLIM summary tabulation was included as Appendix I to the Network Controller's Mission Report.

8.8 CONCLUSIONS AND RECOMMENDATIONS

The GSFC storage and transportation branch is not providing the efficient services necessary to fulfill data shipping requirements. It is recommended that personnel responsible in this area be made aware of the inefficiencies that exist in the handling of data shipments and that steps are taken to assure a better service in the handling of future data shipments.

There have been a few instances where data shipments have been delayed because the data handling procedures as outlined in the basic OD 63-1 have not been followed. It is recommended that these procedures be followed to ensure efficient handling of mission data.