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NASA - GSFC

OPERATIONS PLAN 7–61

MERCURY NETWORK TEST VEHICLE MNTV-1

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PREPARED BY
OPERATIONS CONTROL BRANCH
OPERATIONS DIVISION
TRACKING AND DATA SYSTEMS DIRECTORATE

1) NASA [spellout], Greenbelt, Md.

2) GODDARD SPACE FLIGHT CENTER

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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NASA - GSFC
MERCURY NETWORK TEST VEHICLE (MNTV-1)
OPPLAN 7-61

The purpose of this Operations Plan is to provide planning information for activities concerned and to serve as a guide during the conduct of the operation. Errata and/or additional appendices will be issued as necessary.

Prepared By:
OPERATIONS CONTROL BRANCH
OPERATIONS DIVISION
TRACKING AND DATA SYSTEMS
NASA - GODDARD

RELEASED BY: H. E. CARPENTER, JR. HEAD, Operations Control Branch

(NASA TMX -50,220)

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1.0 MISSION.

To exercise the Mercury Network and to assess to the greatest extent practical the network capability to support an orbital mission.

The payload is a rectangular box measuring approximately 12.5 inches x 12.5 inches x 17 inches and contains:

1 1500 W-H battery

1 C-Band beacon

1 S-Band beacon

2 Solid-state vector TM transmitters operating on two Mercury frequencies.

2 Minitrack beacons operating on two Minitrack frequencies of 108.060 and 136.560 Mc respectively. The power output from each of these transmitters is 20 mw.

2 Command receivers

4.3.2 Telemetry System.

The payload will include an ADF instrumentation package to measure linear accelerations, 3-axis vibrations, fourth stage motor pressure, and roll rate during the fourth stage burning. The payload TM transmitters will be modulated by the instrumentation until orbital insertion at which time the SCO's will be turned off. Thereafter the TM transmitters will be unmodulated. The Minitrack Network will not be responsible for telemetry acquisition.

4.3.3 Command System.

The command receivers will accept commands to:

(1) Turn on "S" and "C" band beacons and both TM transmitters.

(2) Turn off S-band beacon

(3) Turn off C-band beacon

(4) Turn off High TM

(5) Turn off Low TM

The command receivers and Minitrack beacons will remain on all the time.

4.3.4 Antenna System.

The S-band beacon uses two Mercury S-band antennas and the C-band beacon uses two Mercury C-band antennas. The TM transmitters

4.0 MISSION IMPLEMENTATION.

4.1 VEHICLE.

The Mercury Network Test Vehicle will be placed into orbit by a four-stage solid propellant booster. The various stages are arranged in a tandem configuration with transition sections between them for tying the structure together and to provide space for instrumentation and control systems. The four solid propellant stages are as follows:

FIRST STAGE: An Aerojet-General "Algol" motor (modified version of an earlier Polaris motor).

SECOND STAGE: Thiokol's XM-33-E5 "Castor" motor (improved version of the Sergeant rocket motor).

THIRD STAGE: An Allegany Ballistics Laboratory X-254 "Antares" motor (scaled-up version of the X-248 rocket motor).

FOURTH STAGE: An Allegany Ballistics Laboratory X-248 "Altair" motor.

4.2 ORBIT.

4.2.1 Trajectory.

The launch vehicle will be launched from Pad 18B at the Atlantic Missile Range, Cape Canaveral, Florida with a downrange heading of approximately 72.2 degrees.

4.2.2 Orbital Characteristics.

Some of the predicted orbital parameters calculated from the above trajectory area:

APOGEE	426 Statute Miles
PERIGEE	240 Statute Miles
ECCENTRICITY	0. 021705
INCLINATION	32. 3 Degrees
PERIOD	95.36 Minutes

4.3 PAYLOAD.

4.3.1 General Description.

2.0 RESPONSIBILITIES.

2.1 NASA - LANGLEY SPACE TASK GROUP (STG).

The Space Task Group of NASA - LANGLEY will be responsible, on a project basis, for obtaining the launch vehicle and payload package, and placing a payload package in orbit.

2.2 NASA - GSFC.

The Goddard Space Flight Center Tracking and Data Systems has been assigned orbital computation, tracking, and telemetry data acquisition responsibility for the Mercury Network Test Vehicle (MNTV-1).

2.2.1 GSFC Direct Data Division.

The Direct Data Division is responsible for the operation of the Mercury Tracking Network and for compiling a report concerning the success or failure of the entire MNTV-1 operation.

2.2.2 GSFC Minitrack Operations Division.

The Minitrack Operations Division has been assigned the responsibility for tracking MNTV-1 using the Minitrack Network from the time of launch until the termination of the experiment,and for providing communications to both the Minitrack and Mercury Network tracking and telemetry stations.

3.0 ORGANIZATION.

The purpose of this section is to describe the organizational structure which was established to assure the successful completion of the MNTV-1 project. It lists the names of the personnel directly concerned with the various areas and briefly describes their responsibilities in their respective areas.

3.1 OVERALL TEST PROGRAM COORDINATOR - Mr. W. J. Boyer

The Overall Test Program Coordinator will be responsible for the following:

3.1.1 Final decision on payload characteristics and system test plan.

3.1.2 Operation of the Mercury Network for this test.

3.1.3 Evaluation of the orbital data from both the Mercury and Minitrack Networks.

3.2 MINITRACK NETWORK PROGRAM COORDINATOR - Mr. J. H. Berbert

It is the responsibility of the Minitrack Network Program Coordinator to coordinate those activities of the MNTV-1 project for which the GSFC Tracking and Data Systems has been assigned Minitrack Network Tracking responsibility.

3.3 PROJECT OPERATIONS COORDINATOR - Mr. J. F. South

It is the responsibility of the GSFC Project Operations Coordinator to gather, assemble, and disseminate information essential to the success of the project; to plan and coordinate the scheduling of the Minitrack Network Tracking Operations, to coordinate the transfer of information between the Minitrack Network facilities and those of the Mercury Network, and to prepare any operational plans, reports, or directives deemed necessary to the successful completion of the project mission.

and command receivers use four spike antennas attached to the payload collar. The Minitrack beacons use single element monopole antenna imprinted on the fourth stage motor case which will remain attached to the payload in orbit.

4.4 TEST OBJECTIVES.

The Mercury Network Test Vehicle is being placed into orbit to test the real-time tracking, data handling, and computing capabilities of the Mercury Network. Launch and orbital parameters will simulate, as near as practical, the Mercury-Atlas Missions.

4.4.1 Primary.

4.4.1.1 Evaluate the Mercury real-time orbital computing capability.

4.4.1.2 Check out the complete Mercury radar digital data system from radar output to computer input.

4.4.1.3 Analyze the capability of the computer orbital programs to operate with real-time orbital computing capability.

4.4.1.4 Determine and evaluate any Mercury radar system errors caused by antenna mis-alignment, survey inaccuracies, etc.

4.4.1.5 Evaluate the Mercury Network procedures covering radar handover and command handover.

4.4.1.6 Evaluate the capability of the Mercury communications system to handle the communications and data traffic.

4.4.2 Secondary.

To provide Flight Controllers' Procedures practice in preparation for MA-4, as applicable.

4.5 TRACKING SYSTEM.

4.5.1 Active Tracking.

4.5.1.1 General Description.

The world-wide Minitrack Network will be responsible for tracking the Mercury Network Test Vehicle (MNTV-1) using the 108.060 and/or 136.50 Mc unmodulated tracking frequencies during the active life-time of the tracking beacons.

4.5.1.2 Launch and Early Orbit Phases.

During the launch and early orbit phases tracking will be required from the stations listed below.

4.5.1.2.1 GSFC Minitrack Stations.

Antofagasta, Chile

Blossom Point, Maryland

Fort Myers, Florida

Goldstone Lake, California

Johannesburg, South Africa

Lima, Peru

Quito, Ecuador

San Diego, California

Woomera, Australia

Santiago, Chile

4.5.1.2.2 U. S. Space Surveillance System.

All stations.

4.5.1.3 Normal Tracking Phase.

The normal tracking phase will begin upon notification from the Space Operations Control Center and will continue for the useful life-time of the satellite, approximately four days. All stations in the world-wide Minitrack (except NEWFLD, WNKFLD, and GFORKS) that have 108 and/or 136 Mc tracking capabilities will be responsible for tracking the Mercury Network Test Vehicle during this phase.

4.5.2 Passive Tracking Phase.

It is not known at this time whether or not optical tracking will be required after the tracking beacons cease to transmit.

4.6 DATA ACQUISITION.

The acquisition and recording of telemetered data from the Mercury Network Test Vehicle shall be the responsibility of the Goddard Space Flight Center Mercury Network. The Goddard Space Flight Center Minitrack Network will not be required to record telemetry.

5.0 SPACE OPERATIONS CONTROL CENTER.

5.1 ORGANIZATION.

The Space Operations Control Center organization includes the functions indicated below:

Operations Director
Operations Manager
Project Operations Coordinator
Technical Advisor to NASA Headquarters
Computer Liaison Officer
Launch Site Liaison Officer
Satellite Controller
Network Controller
Public Information Officer

Personnel will be appointed as required by the Operations Manager and as dictated by the project requirements.

5.2 OPERATIONS CONTROL.

The Space Operations Control Center shall maintain control over operations of the Minitrack Network and will coordinate requirements and responsibilities with the Mercury Network and other participating organizations. The operations will consists of two distinct phases:

(1) Launch and early orbit phases.
(2) Normal phase.

5.2.1 Launch and Early Orbit Phases.

5.2.1.1 Countdown Schedule.

This countdown schedule is referenced to the nominal lift-off time and lists only those periods in the countdown which require action by personnel in the Space Operations Control Center.

COUNTDOWN	ACTION
T-1 Week	Set condition BLUE.
	Notify SAO, NORAD, and SPASUR of impending launch.
	Obtain nominal Doppler from the Cape Minitrack Doppler Officer.
T-2 Days	Send nominal predictions to all participating stations.

COUNTDOWN	ACTION
T-1 Day	Set condition GREEN.
	Alert all stations to be prepared to implement Operations Plan 7-61.
T-120 Minutes	Set condition RED.
	Alert all stations that launch is imminent.
	Receive station readiness reports.
T-60 Minutes	Establish phone circuits between Space Operations Control Center and Cape Satellite Doppler and Angular Tracking Station - Cape Liaison Officer.
	Receive station readiness reports.
T-30 Minutes	Establish all remaining phone circuits.
	Communications Controller report readiness of communications net to Operations Manager.
T-15 Minutes	Computer Liaison Officer submit Computing Center Status Report to Operations Manager.
	Receive satellite beacon frequencies from Cape via Cape Doppler phone and forward to all stations.
T-15 to T-0	Receive all pertinent pre-launch information by phone and or TTY and relay to all stations concerned.
LIFT-OFF	Receive LIFT-OFF by phone from Cape Liaison Officer and forward to Communications Center for immediate relay to all stations.

5.2.1.2 Telephone Communications.

Telephone communications for liaison coordination, and/or data collection will be established as outlined below.

5.2.1.2.1 Space Operations Control Center to Cape Satellite Doppler and Angular Tracking Station - Cape Liaison Officer.

SOCC Number "A" to Cape Number "A"

Information will be passed from the Cape over this phone to keep the Operations Manager fully informed of status and progress of Cape operations. This will include countdown, accurate lift-off time, time of occurrence of the various launch sequences (i.e., stage ignition and burnout, etc.,) and any other pertinent information available.

5.2.1.2.2 Space Operations Control Center to Cape Satellite Doppler and Angular Tracking Station - Cape Doppler Officer.

SOCC Number "B" to Cape Number "B"

This circuit will be used to forward Doppler data from the Cape to the Space Operations Control Center on a real-time basis. It will also be used as a "back-up" phone in case the other Cape phone in non-operational.

5.2.1.3 Launch Data.

Launch information in the form of Cape Doppler, trajectory and orbit information, and station acquisition information will be given to the appropriate personnel in the Space Operations Control Center for entry on display boards.

5.2.1.4 Raw Minitrack Data.

Raw Minitrack data will be received in the Communications Center and undergo prescribed logging and filing. It will then be forwarded to the Information Processing Section for checking the data quality and format using the CDC-160 edit program. The CDC-160 magnetic tape output will be forwarded to the Computer Operations Branch for orbital computations.

5.2.1.5 Radar, Optical, Miscellaneous Data.

All tracking data coming into the Communications Center which has not already been described such as radar, optical etc., shall be sent to the Information Processing Section for processing and forwarding to the Computer Operations Branch for orbital computations. A copy of the direction cosine equations will be sent to SAOCAM and SPATRK as soon as available.

5.2.1.6 Operational Control Displays.

Appropriate displays shall be maintained in the Space Operations Control Center during the launch and early orbit phases to keep the GSFC Operations personnel informed of the status of the operation.

5.2.1.6.1 Network Status Board.

This board will show facility status and overall status of the Minitrack Network.

5.2.1.6.2 Cape Doppler Plot.

Doppler data from launch until the signal is lost will be plotted on a wall display board on a real-time basis as received from the Cape. The plot will show frequency versus time as an indication of vehicle performance.

5.2.1.6.3 Status Board.

This board will be kept current at all times and will show orbital elements, vehicle, spacecraft, and hold status.

5.2.1.6.4 Tracking and Data Acquisition Board.

This board will be kept current as close to real-time as possible and will show orbit number, stations, acquisition time, predicted and actual meridian crossing times, zenith angle, and other pertinent remarks deemed appropriate.

5.2.1.7 Operations Watch.

The Duty Operations Controller will be on duty (in the Space Operations Control Center) during the first 72 hours after launch or until relieved by appropriate authority. He will be responsible for the following:

Maintaining operations control of the tracking and data acquisition stations and monitoring all tracking and data messages received by SPACON pertaining to the satellite.

Maintaining the Station Acquisition Board and the World Map Plot on a real-time basis.

Preparing a daily Project Status Report for submission to the Assistant Director for Tracking and Data Systems at 0800 hours E.D.T. during the three day period after launch. Copies of this report will be forwarded to those personnel on the Weekly Status Report Distribution List.

5.2.2 Normal Phase.

Upon notification by the Space Operations Control Center the Minitrack Stations will enter the normal tracking phase and continue to operate in this mode for the useful life-time of the satellite, nominally four days.

6.0 FIELD STATION OPERATIONS.

6.1 TRACKING.

Section 4 above lists those stations which have tracking responsibility, both during the launch and early orbit phases, and the normal tracking phase. It is the intent of this section to list the responsibilities of the various stations and to describe briefly the operations required.

6.1.1 Launch and Early Orbit Phases.

6.1.1.1 Countdown.

The countdown shown below is abbreviated to show only those times which are of particular interest to the tracking and telemetry acquisition stations.

COUNTDOWN	ACTION
T-1 Week	Communications Test. NOTE: This test will be initiated by SPACON.
	Cape Satellite Doppler and Angular Tracking Station Doppler Officer forward nominal Doppler frequencies to SPACON, Attention: Code 531.4.
T-2 Days	Receive nominal predictions from SPACON.
T-1 Day	Receive message from SPACON which states that station should be prepared to implement Operations Plan 7-61 and that network condition is now GREEN.
T-150 Minutes	Receive network grouping from SPACON. All stations send 4 lines of fox test to SPACON upon request.
T-120 Minutes	Receive notice from SPACON that network condition is RED and that MINIMIZE is imposed.
	Receive message from SPACON which states that launch is imminent.

COUNTDOWN	ACTION
	All stations submit station readiness report to SPACON.
T-60 Minutes	All stations again submit station readiness report to SPACON. Stations are assumed to be operational after this time unless SPACON is notified otherwise.
T-15 to T-0 Minutes	Cape Liaison Officer report frequencies and all pertinent pre-launch information by phones to SPACON.
	All stations receive Cape launch information via SPACON.
LIFT-OFF	Cape Liaison Officer report LIFT-OFF to Space Operations Control Center via phone.
	All stations receive LIFT-OFF time via TTY from SPACON.

6.1.1.2 Cape Launch Doppler Station.

The Cape Launch Doppler Station shall track the launch signals until the signal is lost. Frequency versus time data shall be relayed to the SOCC Cape Doppler Officer on a real-time basis via phone. The Cape Launch Doppler Stations shall also relay to the SOCC via telephone and/or teletype, as feasible, all pertinent data and information (i.e., countdown, accurate time of LIFT-OFF, ignition and burnout of the various stages, general status and progress of the operation, etc.).

6.1.1.3 U. S. Naval Space Surveillance System - Dahlgren, Virginia.

The U. S. Naval Space Surveillance System is requested to use their tracking facilities to track the Mercury Network Test Vehicle during the first 24 hours after launch and to forward the tracking data via TTY to the NASA Goddard Space Flight Center, Greenbelt, Maryland, ATTN: Code 531.4, as soon as possible after being acquired.

6.1.1.4 Minitrack Network.

During the launch and early orbit phases, and until notified to begin normal operating procedures, the Minitrack Network with the exception of WNKFLD, GFORKS, and NEWFLD will track the Mercury Network Test Vehicle using both the 108.060 and 136.560 Mc beacon frequencies.

6.1.1.5 Data Transmission.

During the launch and early orbit phases all of the tracking stations are to report signal acquisition times as soon as possible after acquired. The need for this data is URGENT. The tracking data should be forwarded immediately after it becomes available. Minitrack stations are also required to report the time at which the satellite crosses the station prime vertical and/or meridian.

6.1.2 Normal Phase.

The normal tracking phase will begin upon notification from the Space Operations Control Center and will continue for the active life-time of the satellite's transmitter.

6.1.2.1 Predictions.

Until the Computer Operations Branch issues formal predictions as data becomes available, the Space Operations Control Center will send nominal predictions in the form of estimated time the satellite will cross the station prime vertical or meridian and direction of the satellite with respect to the tracking station.

6.1.2.2 Preparations.

All tracking stations should have all equipment checks and preparations (i.e., paper, pens, etc.,) completed at least 10 minutes prior to the predicted transits.

6.2 TELEMETRY.

The Minitrack Network will not be required to record telemetry from the Mercury Network Test Vehicle.

7.0 SPACE COMMUNICATIONS CENTER OPERATIONS.

The GSFC Space Communications Center will be fully activated using the procedures outlined in SPACOMMSOP 1-60 as amended.

7.1 LAUNCH AND EARLY ORBIT PHASES.

During the launch and early or bit phases communication links will be required to all Minitrack Network Tracking Stations which are operational except WNKFLD, GFORKS, and NEWFLD.

7.2 TELECOMMUNICATIONS OPERATIONS.

7.2.1 Communications Status.

For purposes of this instruction the following status conditions will apply for the tracking network.

7.2.1.1 Condition BLUE.

Normal routine status. Any launch operations over 24 hours in the future.

7.2.1.2 Condition GREEN.

Launch operations expected within 24 hours.

7.2.1.3 Condition RED.

Launch operations in progress. Countdown is proceeding on schedule and is within two hours of lift-off. MINIMIZE (Transmit only operational traffic) will be imposed. If unanticipated lengthly delays should occur, the network will be returned to condition GREEN or BLUE depending upon the expected length of the delay.

7.2.2 Status Initiation.

The Space Operations Control Center will initiate the various conditions as the need arises. When the network is in condition RED, MINIMIZE will be in effect and only messages concerning the launch in progress will be transmitted.

7.2.3 Station Grouping.

When condition RED is initiated (approximately T-120) certain tracking stations will be grouped into launch operations networks by combining them through use of the leg combining repeaters located at SPACON. A typical condition RED grouping is as follows:

GROUP I	CAPCAN
	FTMYRS
	BPOINT
	NWLDAL
	SAOCAM
GROUP II	NELCAL - JETCAL
	MUGUHQ

Traffic to AGASTA, LIMAPU, QUITOE, OOMERA, and SNTAGO will be broadcast via the MXD (mastersend) method and the remaining stations will operate from the 111-B switching center as usual. The primary reason for grouping stations is to permit CAPCAN/SPACON to provide them with current launch information such as the count, payload status and frequencies, etc., on a real-time basis and to facilitate rapid exchange of launch information between stations in the group.

7.2.4 Station Readiness.

As soon as the station groups have been established, all stations, both grouped and ungrouped, will report station operational and communication readiness to SPACON for relay to the Space Operations Control Center. Stations reporting NOT READY/NO GO will explain and indicate the time the station is expected to become READY/GO.

If SPACON, for any reason, is unable to make communications contact with a field station via normal methods, every possible effort will be made to determine the reason for the failure. The carriers wire room or test board should be able to advise SPACON of a temporary outage and indicate the approximate duration of the outage. If the carrier can not estimate restoration time, SPACON will contact the field station by the fastest available alternate means and determine that station's status.

The readiness report will be repeated at approximately T-60 when directed by the Space Operations Control Center. No further readiness reports will normally be required as the stations will be assumed to be READY unless they advise otherwise. However, certain critical stations, whose NOT READY status would cause a hold, may be required to report their status more frequently as directed by the Space Operations Control Center.

7.2.5 Traffic Flow.

When condition RED has been set, traffic on the network groupings will be limited to those messages relating to operations in progress and will be primarily to and from SPACON. Station to station traffic will be held to an absolute minimum and its transmission will be governed by SPACON. At approximately T-15, SPACON will turn over net control of Group I to CAPCAN who will manage this group until the launch phase is terminated. Upon termination of the launch phase, SPACON will assume net control and adjust the network groupings to meet the situation.

When field stations are grouped together by the leg combining sets, all lines become the equivalent of half-duplex lines, the network group becomes a multipoint (party line) circuit and only one station may transmit at a time. For this reason, circuit discipline must be rigidly observed by all stations in the group. When field stations are grouped, message numbering is not required and message acknowledgements will not be made unless so directed by SPACON. Precedence indicators will not normally be required because the circuit status (RED) indicates that launch operations are in progress and all messages are handled on an urgent basis.

While in condition RED, messages received by SPACON from stations in network grouping I will be delivered to the delivery desk. Messages from those not grouped will be routed over the SPACON "A" circuit for routing to the delivery desk. In the Space Operations Control Center, RO Teleprinter No. 1 will monitor the Group I network, RO Teleprinter No. 2 will monitor the SPACON "A" circuit. Arrangement will permit simultaneous reception of all operational messages by both the Space Operations Control Center and the message delivery desk in the Communications Center. This may be adjusted to meet unusual situations.

7.3 COMMUNICATIONS COUNTDOWN.

This countdown is referenced to the nominal lift-off time and lists only those periods in the countdown which require action by personnel in the Space Communications Center.

ITEM	TIME	NETWORK CONDITION	ACTION
I	T-1 Week	BLUE	SPACON conduct communication exercises.
II	T-1 Week	BLUE	Forward notifications of impending launch to SAO, NORAD, and SPASUR.

ITEM	TIME	NETWORK CONDITION	ACTION
III	T-1 Week	BLUE	Forward request to Cape Minitrack Doppler Officer for nominal Doppler frequencies.
IV	T-2 Days	BLUE	Forward nominal predictions to all participating stations.
V	T-1 Day	GREEN	Forward station alert to all participating stations requesting that they be prepared to implement Special Operations Plan 7-61
VI	T-1 Day	GREEN	SPACON alert chief operator at GSFC telephone switchboard of impending operations.
VII	T-180 Min	GREEN	SPACON alert RCA/SF and RCA/NY that circuits to OOMERA and JOBURG will be required to be operational for the next 4 hours and request them to monitor the circuit.
VIII	T-150 Min	GREEN	SPACON establish network groups I and II, and conduct complete system test by having both grouped and ungrouped stations send 4 lines of fox test. This test must be received perfectly by SPACON otherwise station will not be considered READY. SPACON prove all CDC circuits by sending test.
IV	T-120 Min	RED	Forward condition RED to all stations. Impose MINIMIZE at this time.
X	T-120 Min	RED	Forward alert to all stations stating that launch is imminent.
XI	T-120 Min	RED	SPACON obtain station readiness reports from all tracking and telemetry stations and forward to Space Operations Control Center.

ITEM	TIME	NETWORK CONDITION	ACTION
XII	T-60 Min	RED	SPACON obtain readiness reports from all tracking and telemetry stations and forward to Space Operations Control Center.
XIII	T-30 Min	RED	Terminate transmissions on all circuits except the continuing count from CAPCAN.
XIV	T-15 Min	RED	SPACON transfers control of Group I to CAPCAN and notifies the Space Operations Control Center of network readiness.
XV	LIFT-OFF	RED	Lift-Off. CAPCAN keeps Group I informed of progress, SPACON informs all others.
XVI	T + 1 Min	RED	Control of Group I reverts to SPACON who will adjust or terminate special launch groupings as needed.
XVII	T + *	BLUE	Receive notification to begin normal operations from Space Control Center and forward to all tracking and telemetry stations.

*When Conditions Permit.

7.4 DATA TRANSMISSION.

7.4.1 Launch and Early Orbit Phases.

During the launch and early orbit phases, all tracking data received in the Communications Center will undergo prescribed logging and filing. It will then be forwarded to the Information Processing Section for processing and routing to the appropriate recipient for orbital computations.

SPACON will transmit the tracking data to the Information Processing Section via TTY and as indicated below:

Via CDC 1 - Routine Minitrack data on satellites presently being tracked.

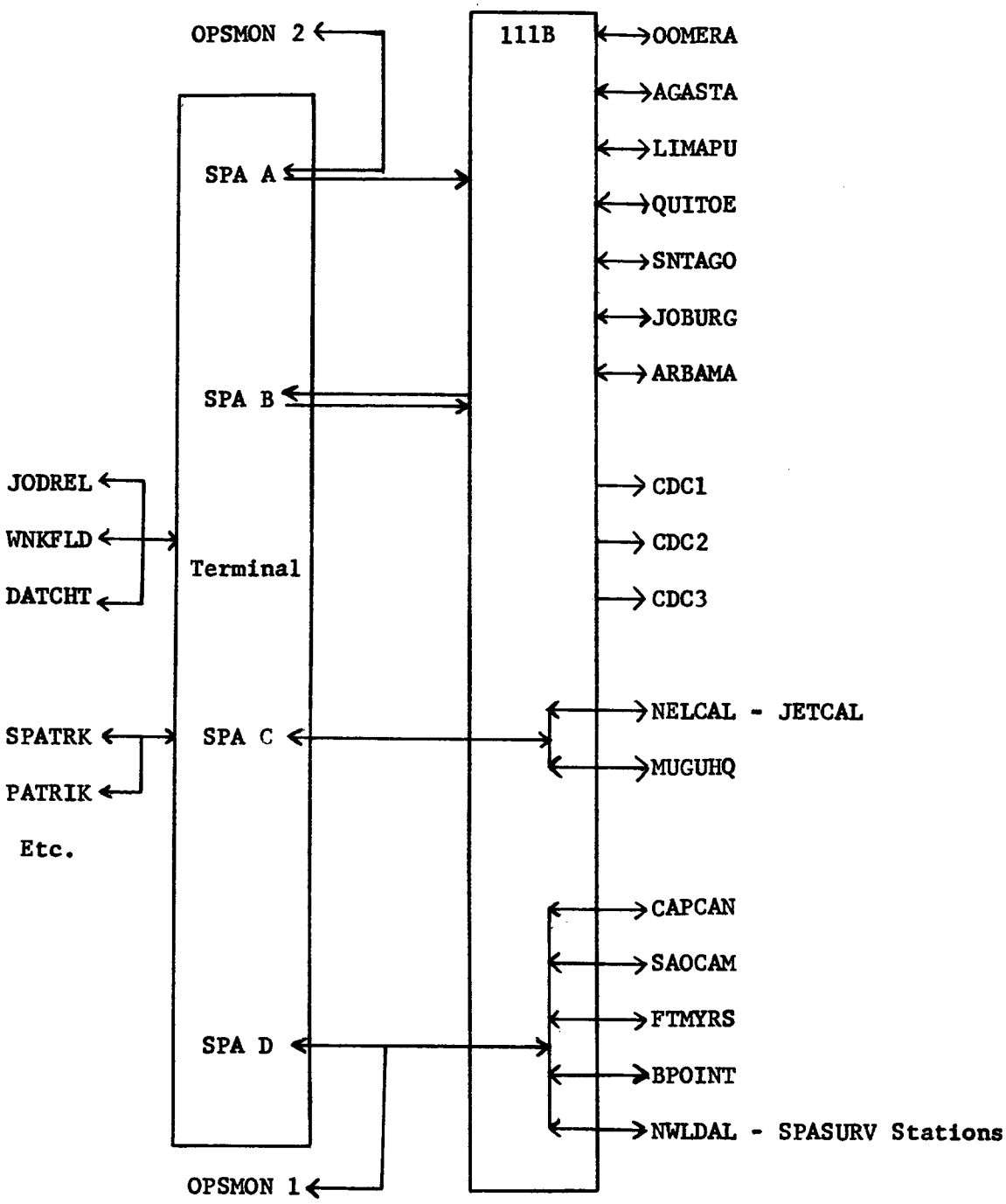
Via CDC 2 - Minitrack data on the new satellite.

Via CDC 3 - All Doppler and Radar data on new satellite with precedence given to Minitrack Doppler.

NOTE: The above may be modified as the situation demands and as mutually agreeable between SPACON and the Information Processing Section.

7.4.2 Normal Phase.

Tracking data will be handled in the standard prescribed manner during the normal operating phase.



SPACON NETWORK
Launch and Early Orbit Phase
Condition RED

8.0 COMPUTING CENTER OPERATIONS.

The Data Systems Division shall be responsible for Minitrack orbital computations and for Minitrack and Mercury Network station predictions. It will also be responsible for preparing post-launch definitive rv vectors and station predictions.

8.1 NOMINAL PRE-LAUNCH PREDICTION REQUIREMENTS.

8.1.1 Input.

Nominal trajectory data from the Goddard Space Flight Center Direct Data Division.

8.1.2 Output.

8.1.2.1 Orbital elements, equator crossing predictions, meridian crossing predictions, and look-angle predictions will be required as indicated below.

8.1.2.1.1 Minitrack Network Stations.

LOCATION	ORBITAL ELEMENTS	EQUATOR CROSSINGS	MERIDIAN CROSSINGS	LOOK ANGLES
Antofagasta, Chile	X	X	X	-
Blossom Point, Maryland	X	X	X	-
Fort Myers, Florida	X	X	X	-
Goldstone Lake, California	X	X	X	-
Woomera, Australia	X	X	X	-
Quito, Ecuador	X	X	X	-
Santiago, Chile	X	X	X	-
Lima, Peru	X	X	X	-
San Diego, California	X	X	X	-
Johannesburg, S. Africa	X	X	X	-

8.1.2.1.2 Mercury Network Stations.

LOCATION	ORBITAL ELEMENTS	EQUATOR CROSSINGS	MERIDIAN CROSSINGS	LOOK ANGLES
Cape Canaveral, Florida	-	-	-	X
Bermuda (Verlort)	-	-	-	X
Bermuda (FPS-16)	-	-	-	X
Atlantic Ship	-	-	-	X
G. Canary Island	-	-	-	X
Kano, Nigeria	-	-	-	X
Zanzibar	-	-	-	X
Ind. Ocean Ship	-	-	-	X
Muchea, Australia	-	-	-	X
Woomera, Australia	-	-	-	X
Canton Island	-	-	-	X
Kauai Island (Verlort)	-	-	-	X
Kauai Island (FPS-16)	-	-	-	X
Pt. Arguello (Verlort)	-	-	-	X
Pt. Arguello (FPS-16)	-	-	-	X
Guaymas, Mexico	-	-	-	X
White Sands, N. Mex.	-	-	-	X
Corpus Christi, Tex.	-	-	-	X
Eglin AFB, Florida	-	-	-	X
Patrick AFB, Florida	-	-	-	X

8.1.2.1.3 Other Participating Facilities.

LOCATION	ORBITAL ELEMENTS	EQUATOR CROSSINGS	MERIDIAN CROSSINGS	LOOK ANGLES
SAOCAM	X	X	-	-
SPADATS	X	X	-	-
SPASUR	X	X	-	-
SPATRK	X	X	-	-

8.1.2.2 Prediction World Map.

The prediction world map should contain predictions for a four day period and should contain all stations listed in paragraphs 8.1.2.1.1 and 8.1.2.1.2 above. Three copies are required for the Project Operations Coordinator.

8.1.3 All of the above nominal predictions should be computed and available for transmittal to the appropriate locations not less than four days prior to launch and should be recomputed if necessary due to trajectory changes occurring prior to launch.

8.2 POST-LAUNCH REQUIREMENTS.

8.2.1 Input.

8.2.1.1 Mercury Network Radar Data (rv vector)

8.2.1.2 Minitrack Direction Cosine Data

8.2.1.3 Space Surveillance Data

8.2.2 Output.

8.2.2.1 Orbital Elements and Predictions.

The Goddard Space Flight Center Early Orbit Determination Group will be responsible for computing the orbit of the Mercury Network Test Vehicle (MNTV-1), using Minitrack and/or other approved data, as soon as possible after launch, and supplying orbital elements and prediction data to the Minitrack and Mercury Network tracking stations as indicated below.

8.2.2.1.1 Minitrack Network

Orbital elements, equator crossing predictions, and meridian crossing predictions are required for all of the Minitrack stations listed in paragraph 8.1.2.1.1 above.

8.2.2.1.2 Mercury Network

Look-angle predictions will be required for each of the Mercury Network stations listed in paragraph 8.1.2.1.2 above. These predictions will be at 60 second intervals during each pass near the respective station and shall be in the form of time (GMT), range (kiloyards), azimuth (degrees clockwise from north), and elevation (degrees). The predictions will be required at periodic intervals during the nominal four day active lifetime of the Mercury Network Test Vehicle (MNTV-1). These periodic intervals at which the predictions are required are based upon those times at which the MNTV-1 will be in such a position that it passes over the Mercury Network Tracking facilities. The nominal times at which this occurs are as listed below:

First three orbit mission	T+ 1 hr 52 Min to T+ 5 hr 12 Min
Second three orbit mission	T+ 22 hr 05 Min to T+ 27 hr 22 Min
Third three orbit mission	T+ 45 hr 53 Min to T+ 51 hr 08 Min
Fourth three orbit mission	T+ 69 hr 20 Min to T+ 74 hr 58 Min

The first set of look angle predictions will be required as soon as a Minitrack definitive orbit can be obtained (preferably at least four hours before the Mercury Network Test Vehicle is scheduled to pass over the Mercury Network for the second three orbit mission, and shall be for a period of four days as measured from lift-off).

The second set of look angle predictions will be required at least four hours before the beginning of the third three orbit mission and should cover the period from the time the orbit is up-dated to four days after lift-off.

The third set of look angle predictions will be required at least four hours before the beginning of the fourth three orbit mission and should cover the period from the time the orbit is up-dated to four days after lift-off.

8.2.2.2 RV Vectors.

The GSFC Early Orbit Determination Group will also be responsible for supplying the Mercury Computing Group with an rv vector just prior to the second, third, and fourth three orbit missions. The Minitrack Computer Group will, in addition, be responsible for supplying the Direct Data Division with definitive rv vectors as soon as available after the conclusion of the active tracking phase of the project.

8.2.2.3 Minute Vector Magnetic Tape.

A Minute Vector Tape will be required by the Direct Data Division. This tape will be based entirely upon Minitrack observations and should be available as soon as possible after the conclusion of the active tracking phase of the project.