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\* 64-80054 \*

PROJECT MERCURY :

Code 5H

~~TECHNICAL INFORMATION SUMMARY~~

OF

GP-y

MERCURY-ATLAS MISSION NO. 5/9

(Capsule No. 9)

(u)

TO - ~~CONFIDENTIAL~~  
By authority of L. Shirley  
CLASSIFICATION CHANGE  
UNCLASSIFIED  
E.O. 11652  
Date 3-7-74

(NASA TMX - - - -)

(NASA-TM-X-51302) PROJECT MERCURY:  
TECHNICAL INFORMATION SUMMARY OF  
MERCURY-ATLAS MISSION 5/9 (CAPSULE NO. 9)  
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Space Task Group

Langley Air Force Base, Virginia

October 17, 1961

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## TEST OBJECTIVES AND SYSTEMS PRIORITIES

Test objectives for MA-5/9. - The MA-5/9 mission will be the fifth flight of a specification Mercury capsule to be powered by an Atlas booster. The capsule will have a medium-sized primate aboard for this mission. The capsule, after insertion, will complete three orbits before reentering the earth's atmosphere and landing in a predesignated area approximately 689 nautical miles southeast of Cape Canaveral, Florida.

### First-order test objectives. -

#### Capsule -

(1) Demonstrate the performance of the Environmental Control System by utilizing a primate during the three-orbit mission.

(2) Demonstrate satisfactory performance of the capsule systems throughout a Mercury orbital mission.

(3) Determine by detailed measurements the heating rate and the thermal effects throughout the Mercury capsule for all phases of an orbital mission.

(4) Exercise the satellite clock.

Booster - Determine the ability of the Atlas booster to release the Mercury capsule at the prescribed orbital insertion conditions.

Network - Demonstrate satisfactory performance of the Mercury Network in supporting an orbital mission.

Flight control - Demonstrate the ability of the Flight Controllers to satisfactorily monitor and control an orbital mission.

Recovery - Demonstrate the adequacy of the recovery plans for an orbital mission. Particular emphasis is required for the capsule occupant.

### Second-order test objectives. -

#### Booster -

(1) Evaluate the performance of the Abort Sensing and Implementation System.

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(2) Determine the magnitude of the sustainer/vernier residual thrust after cutoff.

(3) Obtain data on the repeatability of the performance of all Atlas missile and ground systems.

Network - Evaluate Mercury Network countdown and operational procedures.

Third-order test objectives.-

Booster - Evaluate the Atlas booster with regard to engine start and potential causes for combustion instability.

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88 1/2 min

AP  
106  
90

128.2

TABLE I.- NORMAL FLIGHT PLAN AND MAJOR TRAJECTORY PARAMETERS

Event	Time (hr:min:sec)	Altitude (ft)	Aero- dynamic velocity (ft/sec)	Surface range from launch (n.m.)	Dynamic pressure (lb/ft <sup>2</sup> )	Latitude (deg:min:sec)	Longitude (deg:min:sec)
Lift-off	00:00:00	112	—	—	—	28°29'28" N.	80°32'51" W.
Maximum dynamic pressure (exit)	00:00:00	33,880	1,504	*2 E.	872	28°30'11" N.	80°30'27" W.
Booster engine cutoff	00:02:11	207,358	9,155	45 E.	20	28°43'11" N.	79°43'38" W.
Booster engine separation	00:02:14	218,195	9,228	49 E.	13	28°44'18" N.	79°39'36" W.
Tower jettison	00:02:34	293,581	9,894	78 E.	—	28°52'39" N.	79°08'33" W.
Sustainer engine cutoff	00:05:04	528,497	24,379	436 E.	—	30°25'41" N.	72°31'25" W.
Capsule separation	00:05:05	528,513	24,379	440 E.	—	30°26'34" N.	72°27'00" W.
Maximum altitude	00:50:06	810,710	24,049	10,669 E.	—	31°07'18" S.	99°53'58" E.
Retrorocket firing initiated	04:32:26	528,854	24,397	2,544 W.	—	32°04'08" N.	129°40'21" W.
Retrograde package jettisoned	04:33:26	518,163	24,055	2,311 W.	—	32°27'16" N.	125°07'46" W.
Reentry begins	04:42:49	286,379	24,300	159 W.	3	27°13'23" N.	83°10'07" W.
Maximum heating	04:45:19	192,092	20,446	482 E.	168	23°37'03" N.	73°26'42" W.
Maximum dynamic pressure and longitudinal accel- eration	04:46:23	127,299	9,744	646 E.	441	22°25'49" N.	70°42'48" W.
Drogue chute deployed	04:46:25	125,049	9,261	649 E.	440	22°24'28" N.	70°39'48" W.
Main chute deployed	04:48:49	21,000	395	689 E.	95	22°06'38" N.	70°00'33" W.
Impact	04:49:26	10,000	267	689 E.	61	22°06'38" N.	70°00'33" W.
	04:54:15	—	30	689 E.	1	22°06'38" N.	70°00'33" W.

\*East of launch site

04 33 08

04 32 42

04 32 32  
40

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- 4 -

TABLE II. - NOMINAL WEIGHTS FOR THE MA-5/9 CAPSULE

4,195 pounds	Gross weight at lift-off (includes adapter and escape tower)
2,924 pounds	Capsule weight after separation from Atlas
2,635 pounds	Capsule weight at start of reentry
2,347 pounds	Capsule flotation weight

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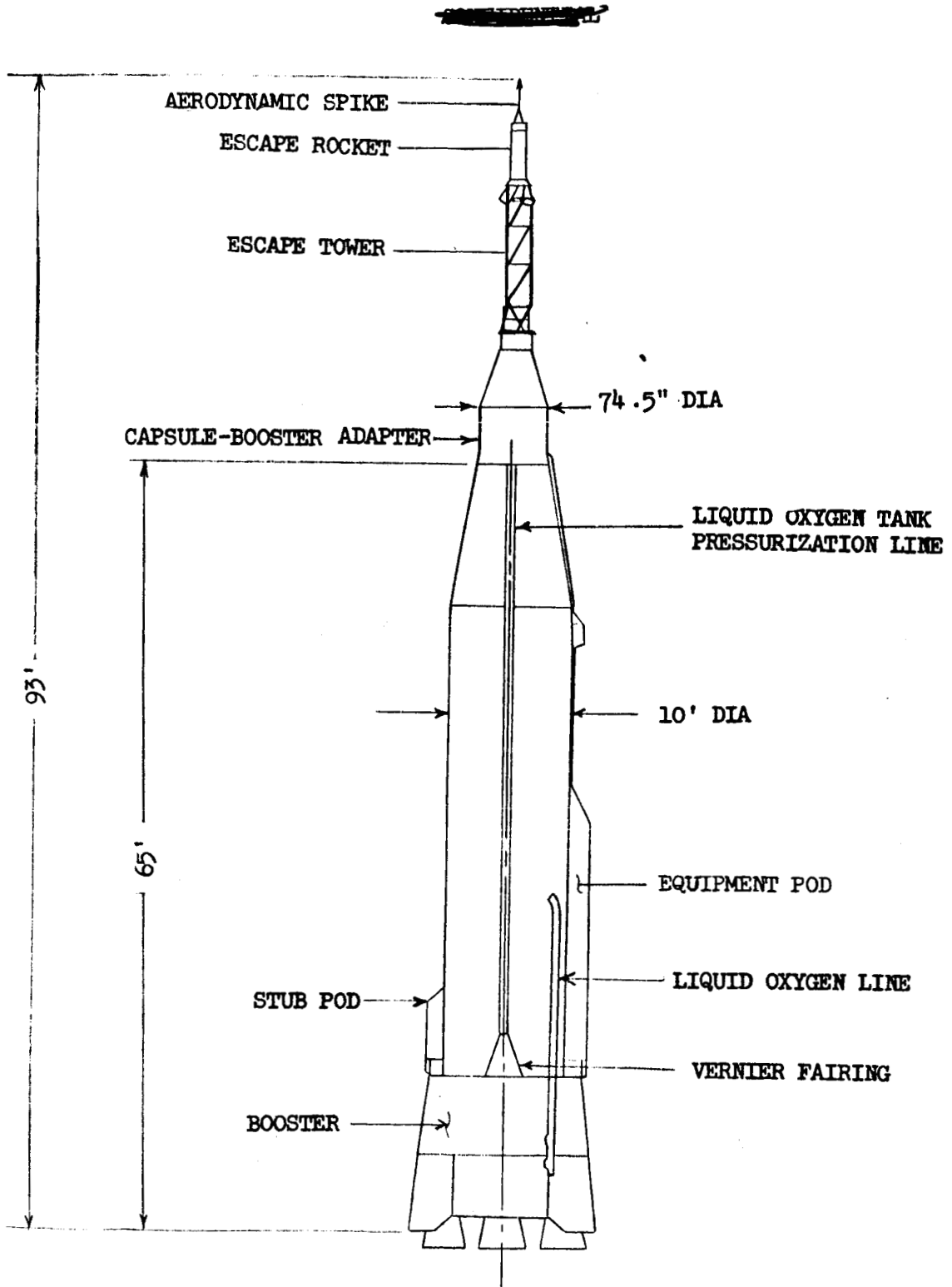
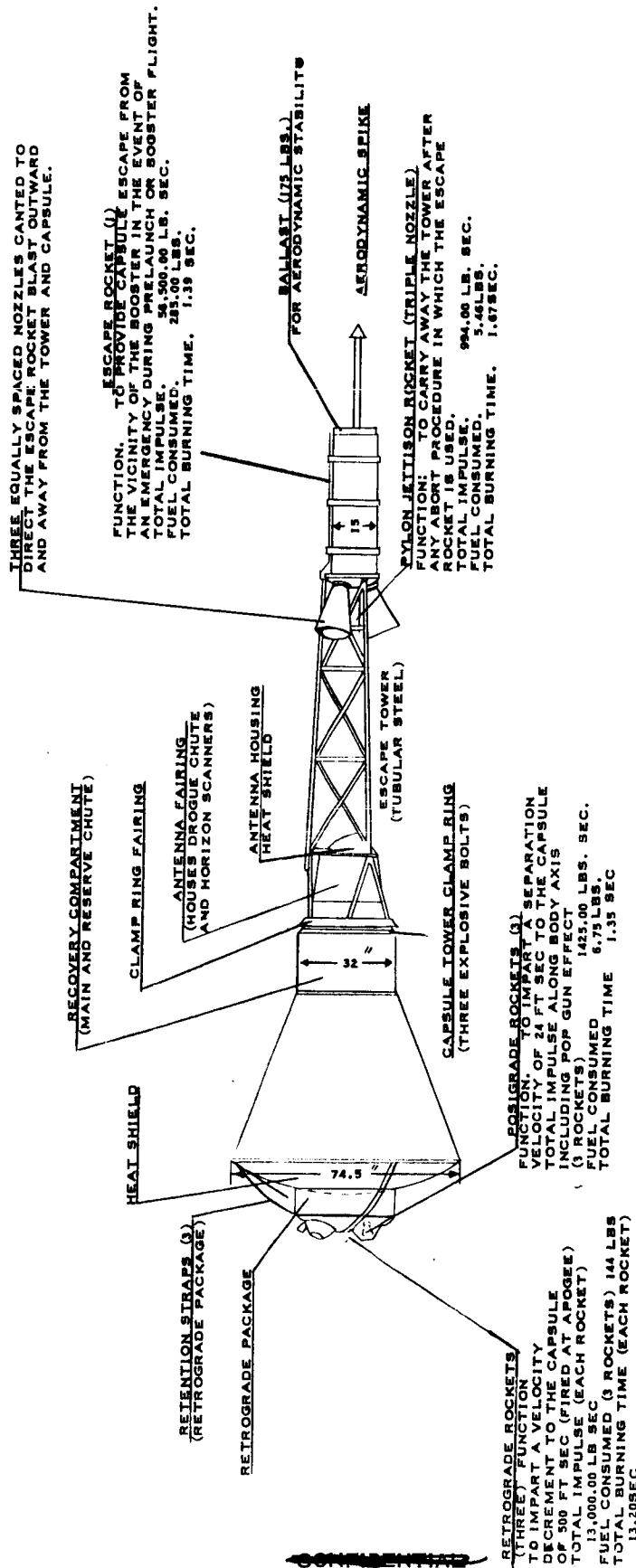


Figure 1.-  
Mercury-Atlas launch vehicle configuration.

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### LENGTH OF OVERALL L CAPSULE CONFIGURATION 24.5 FEET



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FIGURE 2.- CAPSULE CONFIGURATION

NOTE: ASTRONAUT IS SHOWN TO INDICATE SCALE AND RELATIVE LOCATIONS OF EQUIPMENT. FOR UNMANNED MISSIONS AND INSTRUMENTATION, SPACE IS OCCUPIED BY SPECIAL INSTRUMENTATION, AND CREW SIMULATOR OR CHIMPANZEE COUCH.

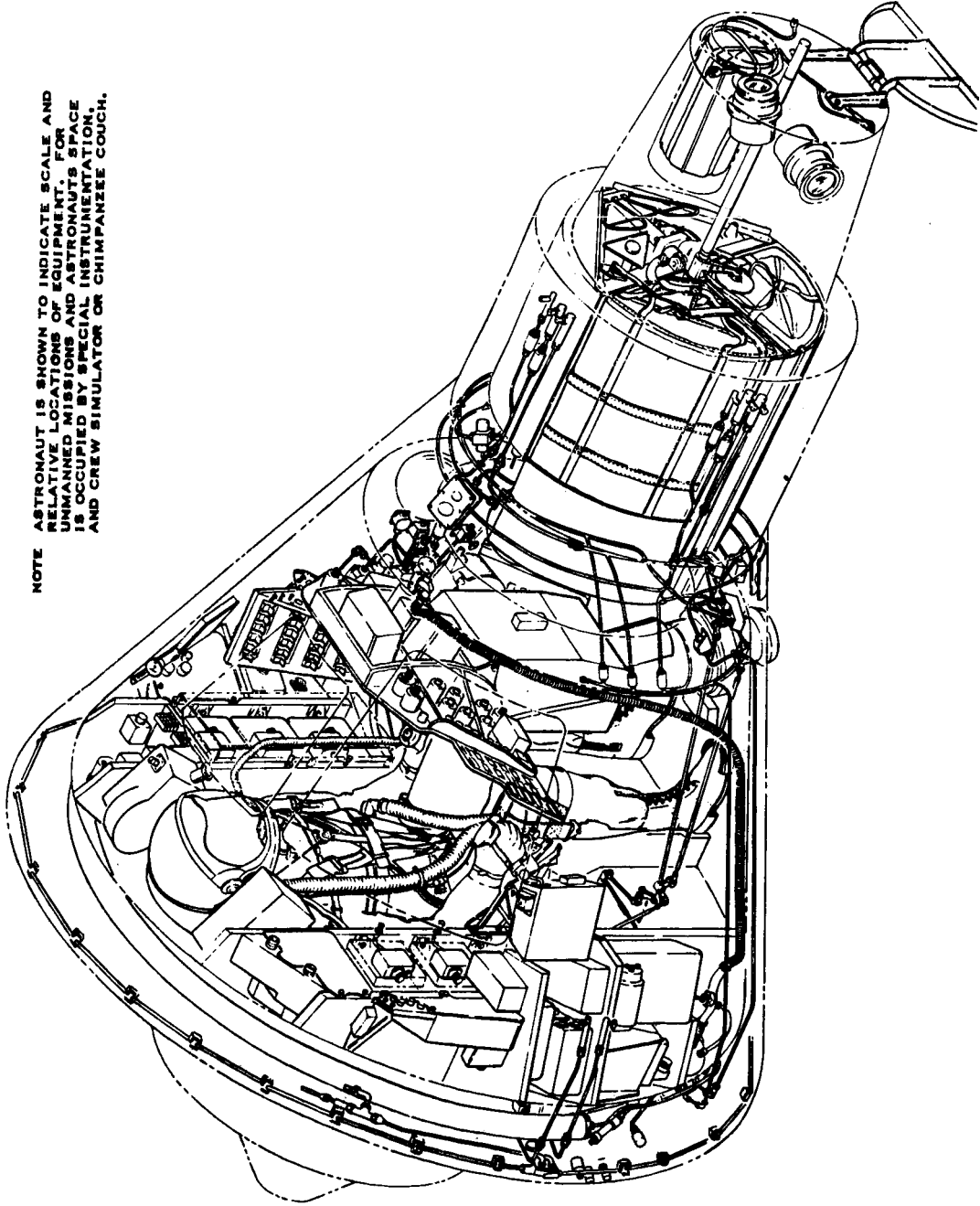
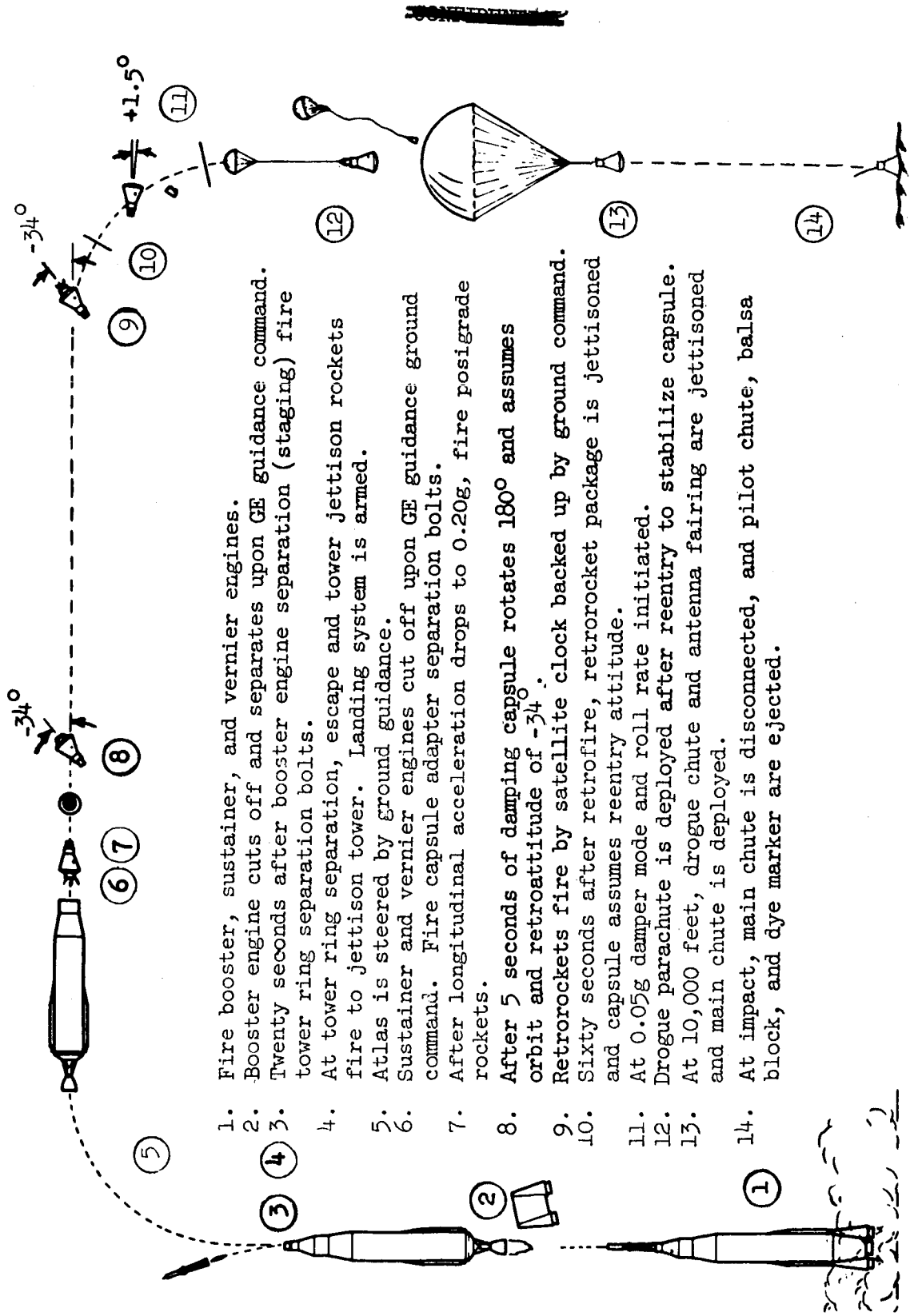


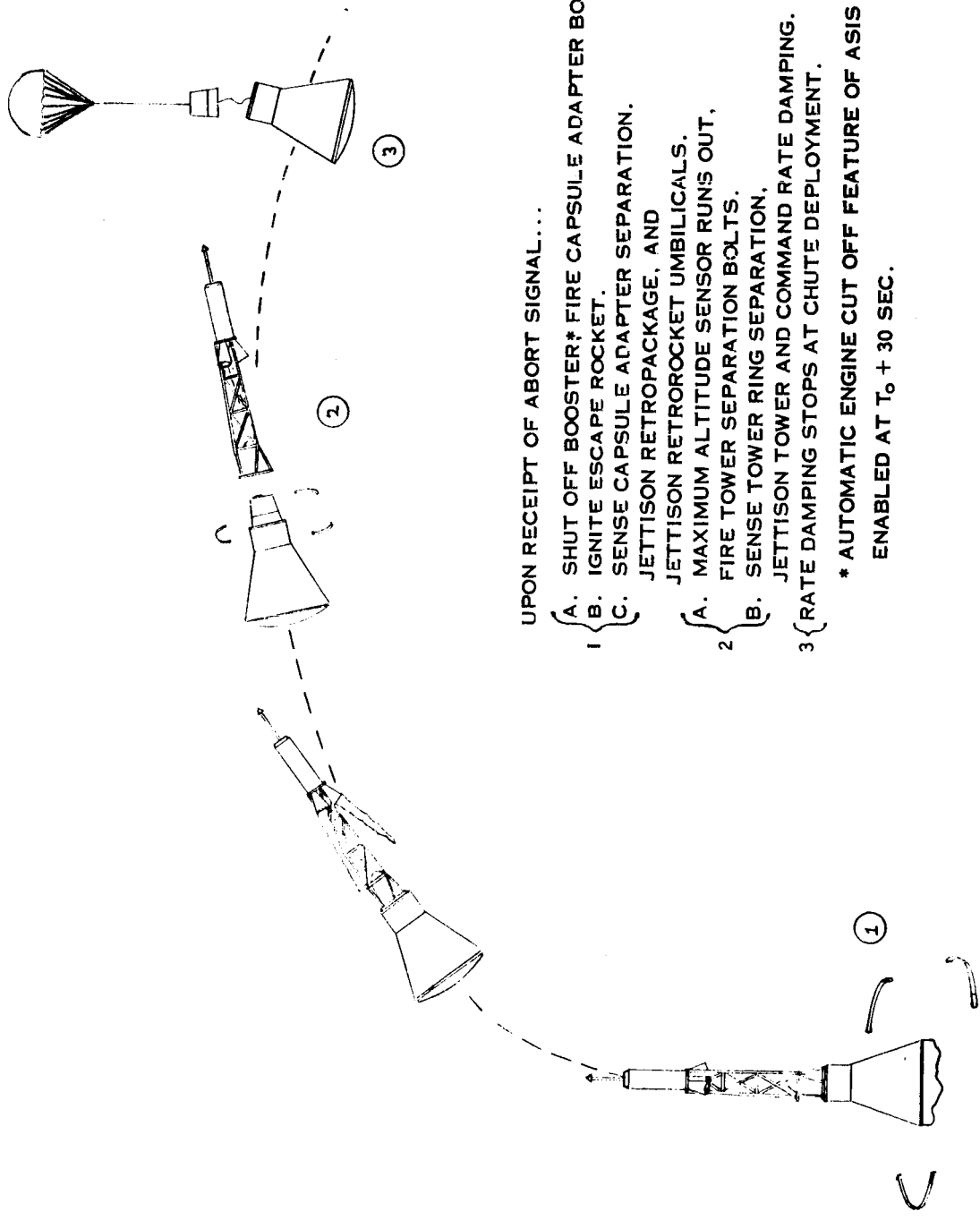
Figure 3.- General interior arrangement of capsule.





1. Fire booster, sustainer, and vernier engines.
2. Booster engine cuts off and separates upon GE guidance command.
3. Twenty seconds after booster engine separation (staging) fire tower ring separation bolts.
4. At tower ring separation, escape and tower jettison rockets fire to jettison tower. Landing system is armed.
5. Atlas is steered by ground guidance.
6. Sustainer and vernier engines cut off upon GE guidance ground command. Fire capsule adapter separation bolts.
7. After longitudinal acceleration drops to 0.20g, fire postgrade rockets.
8. After 5 seconds of damping capsule rotates 180° and assumes orbit and retroattitude of -34°.
9. Retrorockets fire by satellite clock backed up by ground command.
10. Sixty seconds after retrofire, retrorocket package is jettisoned and capsule assumes reentry attitude.
11. At 0.05g damper mode and roll rate initiated.
12. Drogue parachute is deployed after reentry to stabilize capsule.
13. At 10,000 feet, drogue chute and antenna fairing are jettisoned and main chute is deployed.
14. At impact, main chute is disconnected, and pilot chute, balsa block, and dye marker are ejected.

Figure 4.- General Sequence of Events Planned for this mission.



UPON RECEIPT OF ABORT SIGNAL...

- 1 {
    - A. SHUT OFF BOOSTER\* FIRE CAPSULE ADAPTER BOLTS.
    - B. IGNITE ESCAPE ROCKET.
    - C. SENSE CAPSULE ADAPTER SEPARATION.
  - 2 {
    - A. MAXIMUM ALTITUDE SENSOR RUNS OUT.
    - B. FIRE TOWER SEPARATION BOLTS.
  - 3 {
    - A. JETTISON RETROCKET UMBILICALS.
    - B. SENSE TOWER RING SEPARATION.
    - C. JETTISON TOWER AND COMMAND RATE DAMPING.
    - D. RATE DAMPING STOPS AT CHUTE DEPLOYMENT.
- \* AUTOMATIC ENGINE CUT OFF FEATURE OF ASIS IS ENABLED AT  $T_0 + 30$  SEC.

FIGURE 5.- GENERAL SEQUENCE OF EVENTS THAT WOULD OCCUR IF FLIGHT SHOULD BE ABORTED BEFORE CAPSULE ESCAPE TOWER IS JETTISONED.

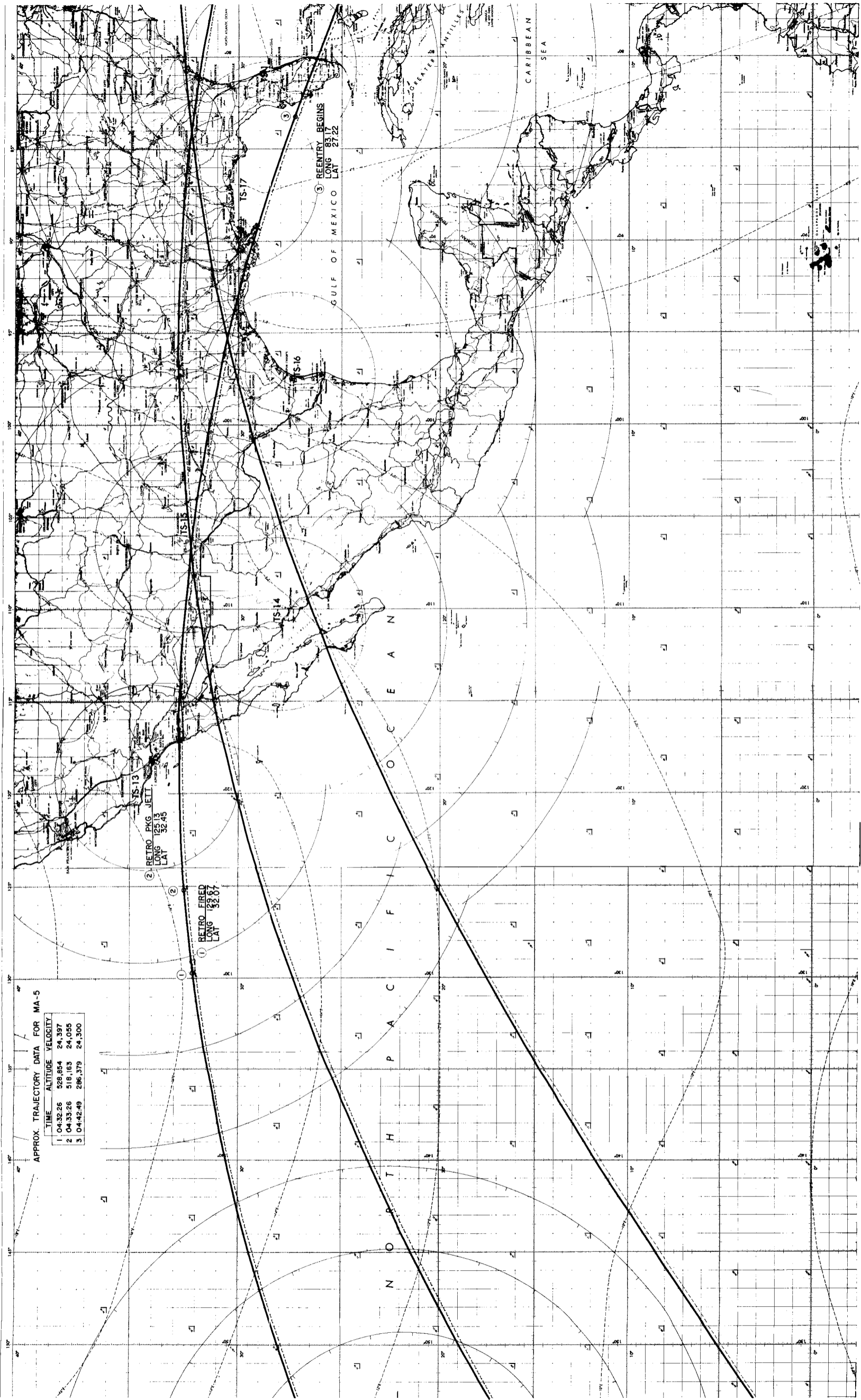


Figure 6. - Earth track of Mercury-Atlas 3-orbit trajectory showing locations of significant events and deployment of recovery forces.

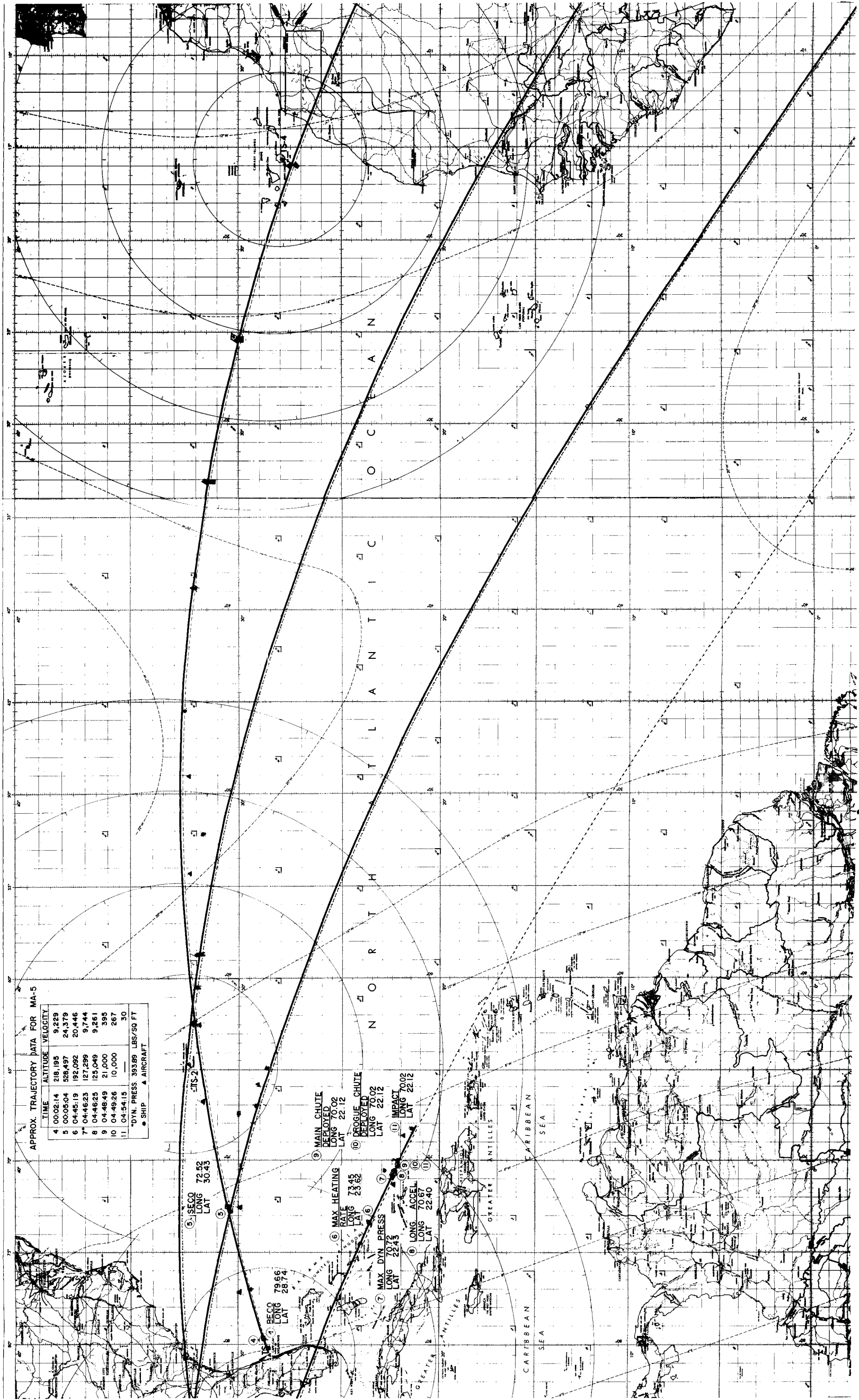
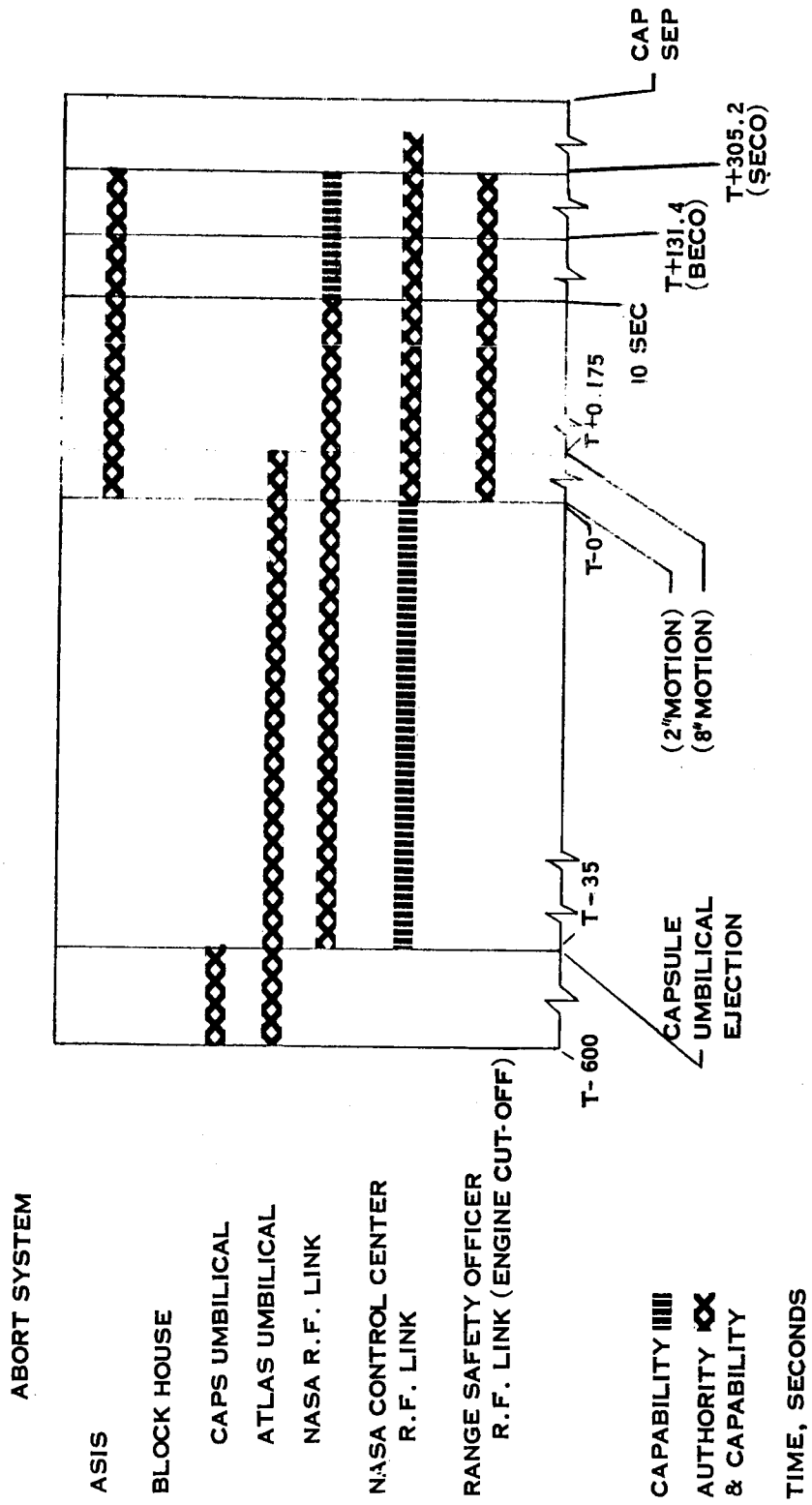


Figure 6. - Earth track of Mercury-Atlas 3-orbit trajectory showing locations of significant events and deployment of recovery forces.



**FIGURE 7- ABORT CAPABILITY/AUTHORITY OF MERCURY-ATLAS.**

**SENSORS**

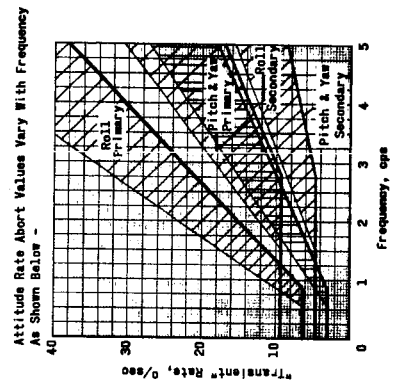
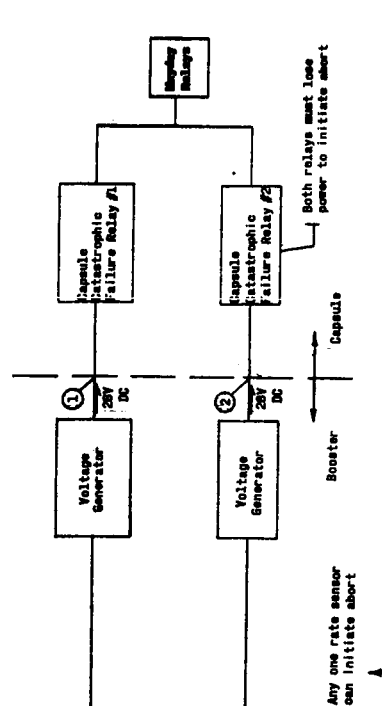
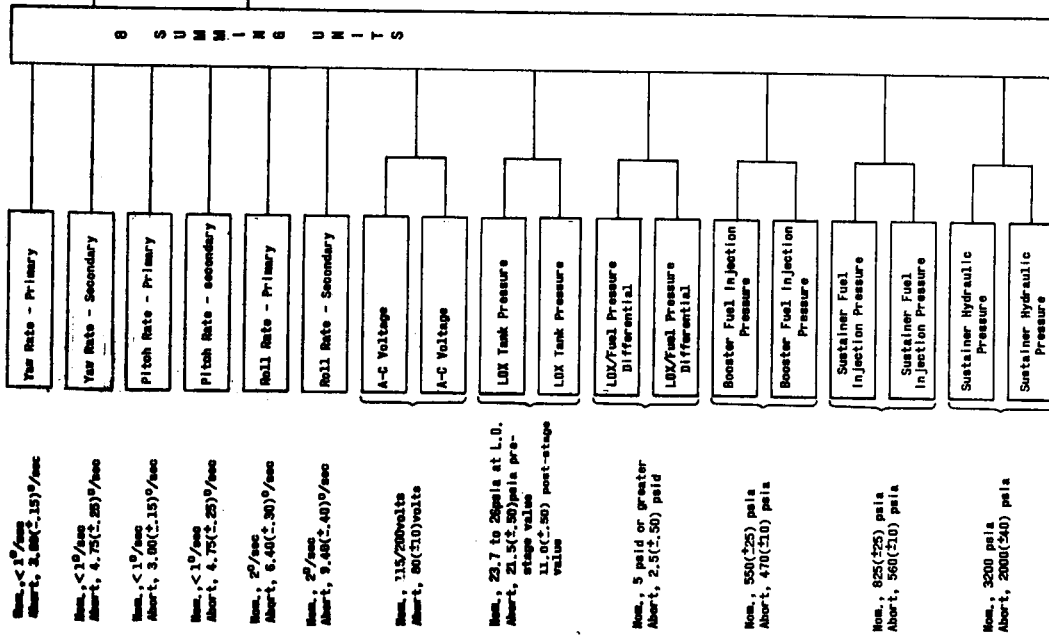


Figure 8. - BLOCK DIAGRAM OF ABORT SENSING AND IMPLEMENTATION SYSTEM.