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George M. Low

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PROJECT MERCURY:

TECHNICAL INFORMATION SUMMARY

OF

MERCURY-ATLAS MISSION NO. 5/9

(Capsule No. 9) (U)

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

(NASA TMX - - -)

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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.

(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.

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^2)	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)	00:01:00	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 acceleration	04:46:23	127,299	9,744	646 E.	441	22°25'49" N.	70°42'48" W.
	04:46:25	125,049	9,261	649 E.	440	22°24'28" N.	70°39'48" W.
Drogue chute deployed	04:48:49	21,000	395	689 E.	95	22°06'38" N.	70°00'33" W.
Main chute deployed	04:49:26	10,000	267	689 E.	61	22°06'38" N.	70°00'33" W.
Impact	04:54:15	—	30	689 E.	1	22°06'38" N.	70°00'33" W.

*East of launch site

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

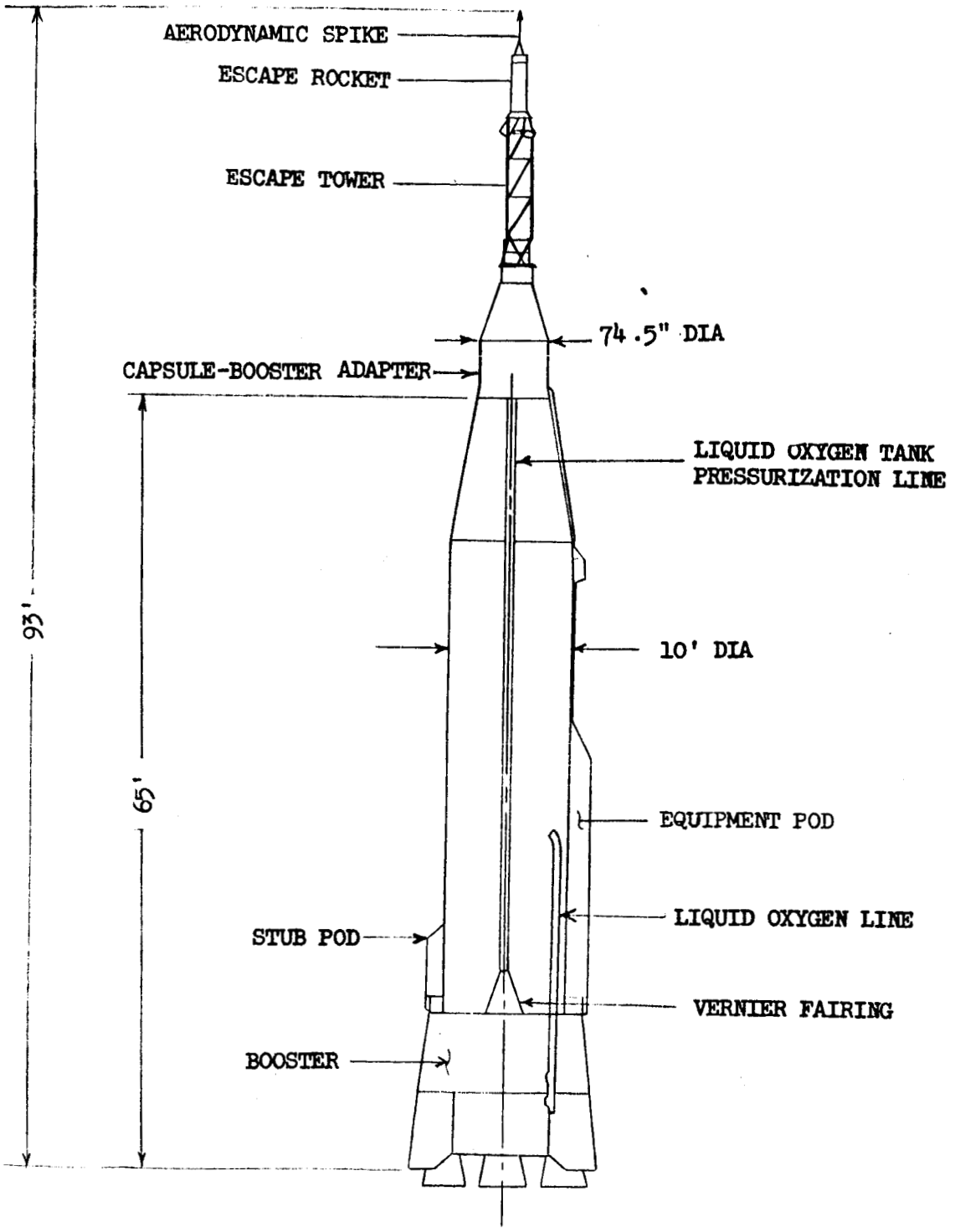


Figure 1.-
Mercury-Atlas launch vehicle configuration.

LENGTH OF OVERALL CAPSULE CONFIGURATION
24.5 FEET

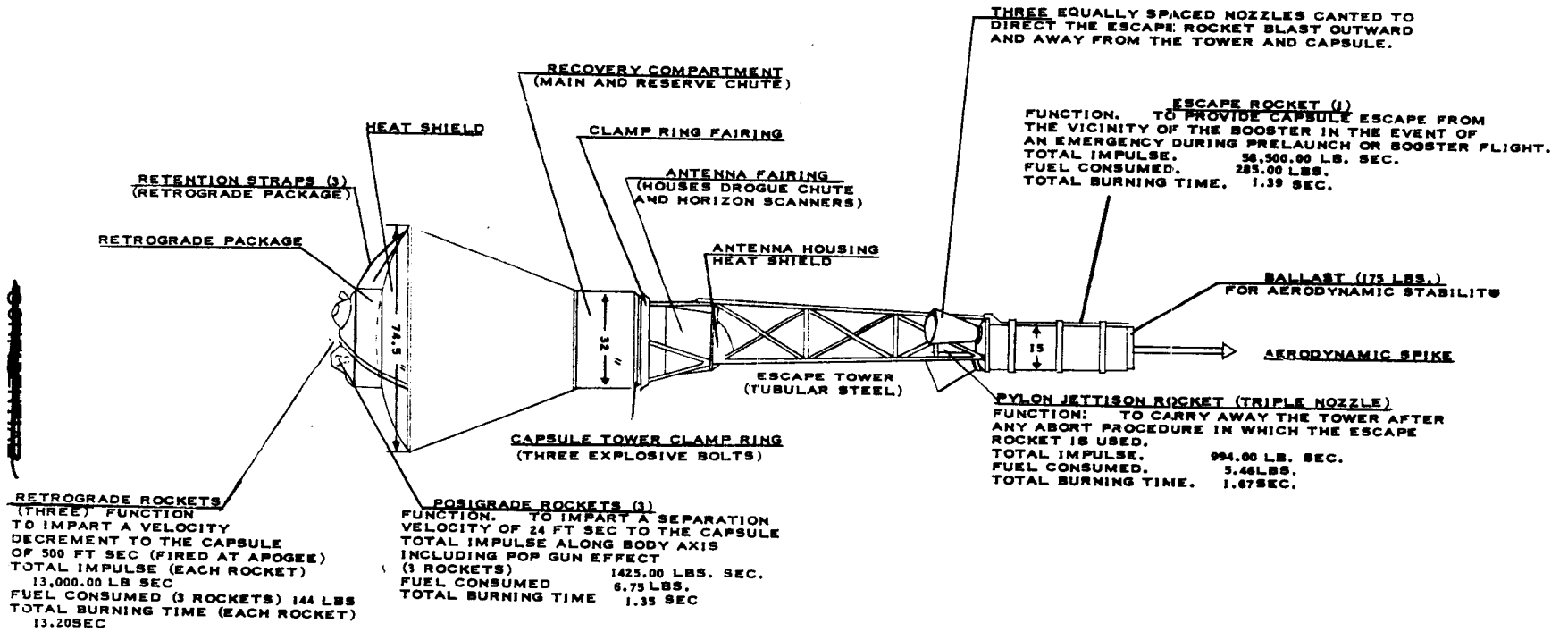


FIGURE 2.- CAPSULE CONFIGURATION

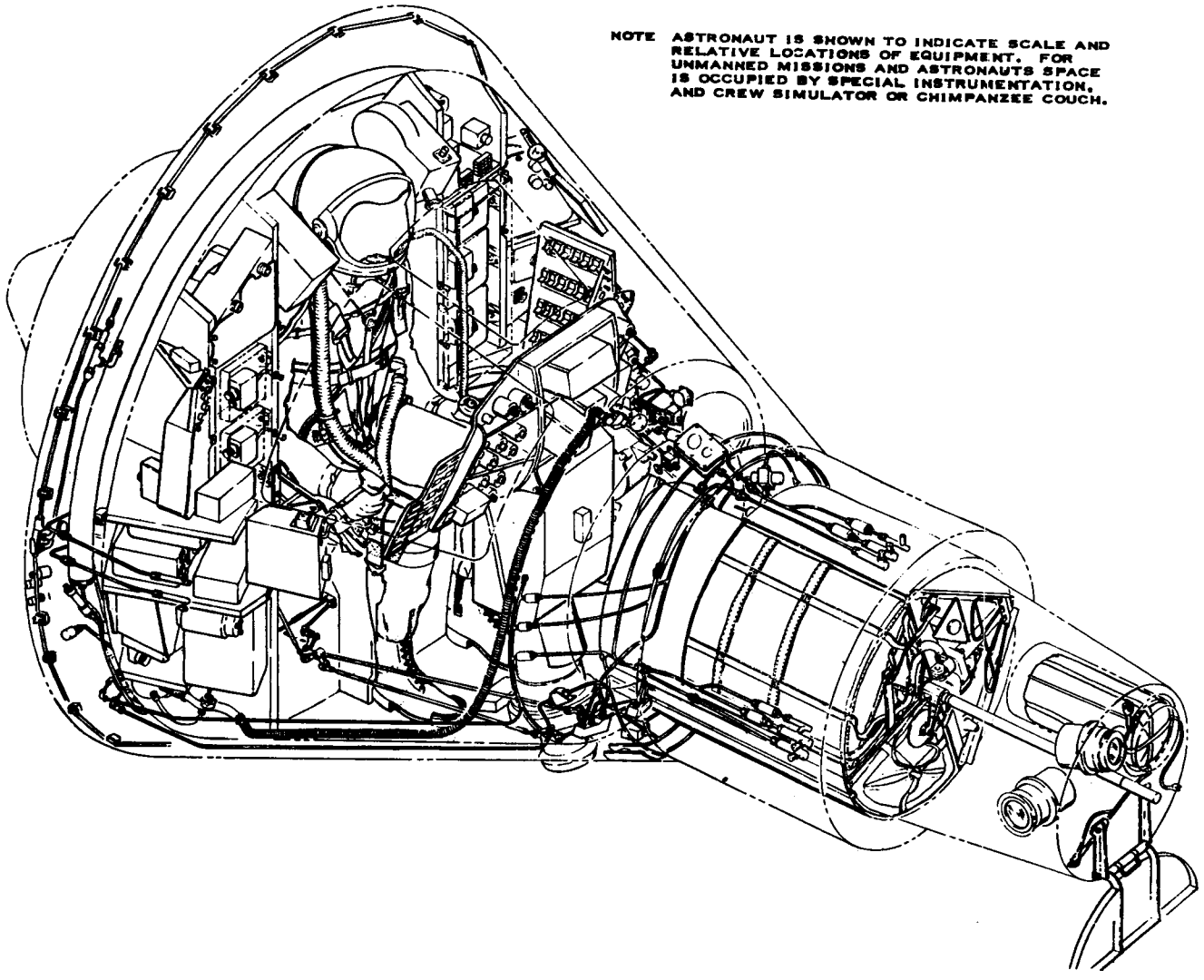


Figure 3.- General interior arrangement of capsule.

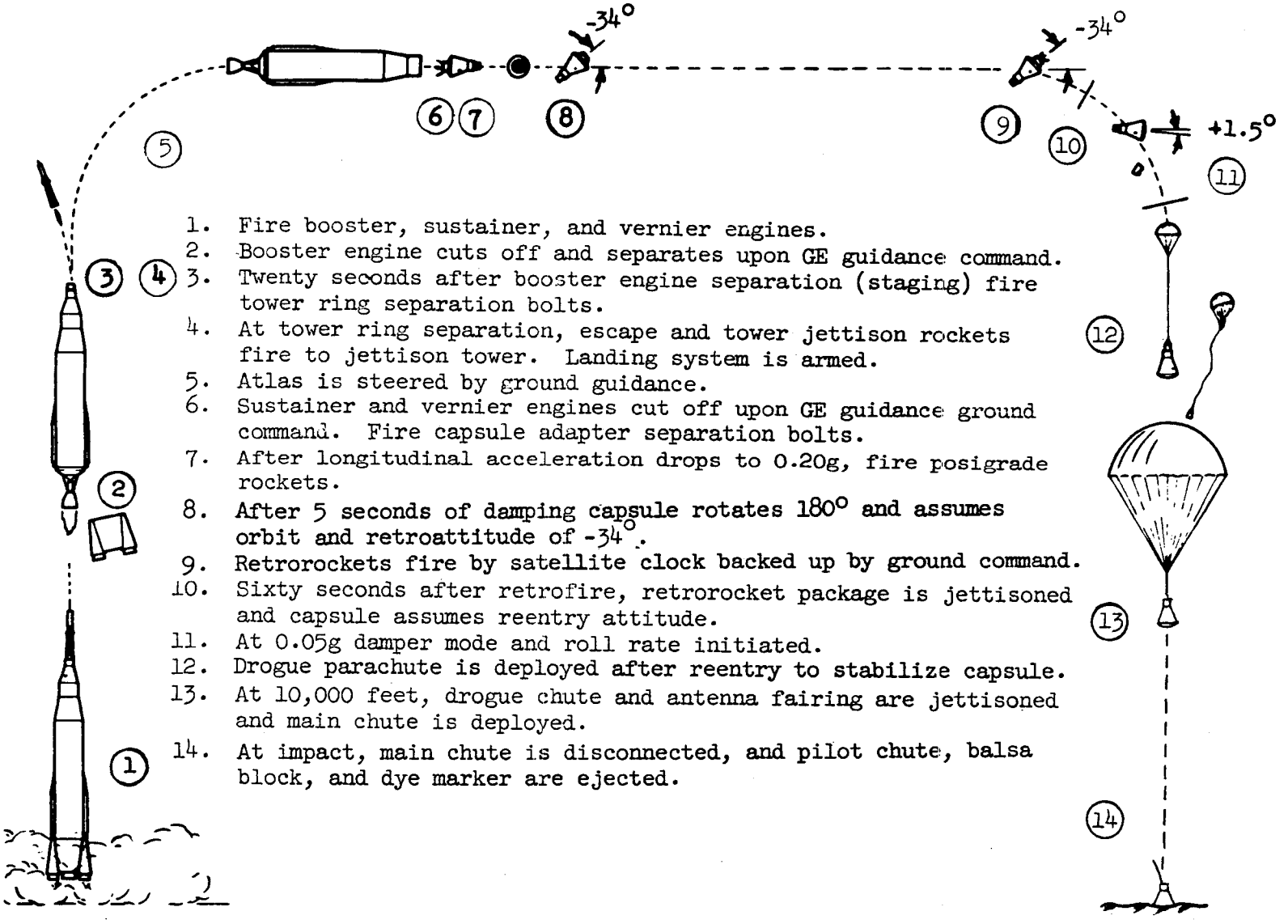
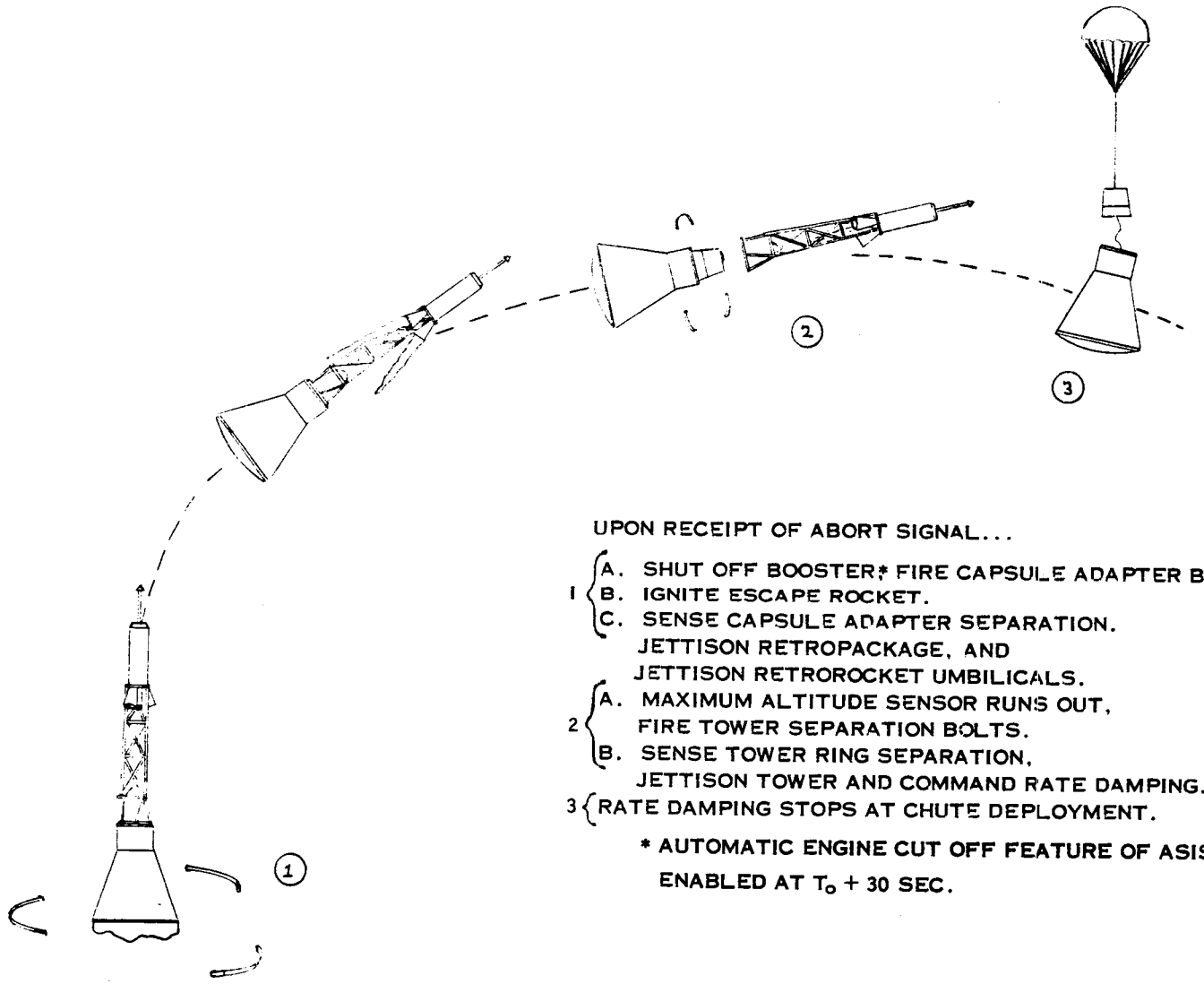


Figure 4.- General Sequence of Events Planned for this mission.



UPON RECEIPT OF ABORT SIGNAL...

1 { A. SHUT OFF BOOSTER;* FIRE CAPSULE ADAPTER BOLTS.
B. IGNITE ESCAPE ROCKET.
C. SENSE CAPSULE ADAPTER SEPARATION.
JETTISON RETROPACKAGE, AND
JETTISON RETROROCKET UMBILICALS.

2 { A. MAXIMUM ALTITUDE SENSOR RUNS OUT,
FIRE TOWER SEPARATION BOLTS.
B. SENSE TOWER RING SEPARATION,
JETTISON TOWER AND COMMAND RATE DAMPING.

3 { RATE DAMPING STOPS AT CHUTE DEPLOYMENT.

* AUTOMATIC ENGINE CUT OFF FEATURE OF ASIS IS ENABLED AT T_o + 30 SEC.

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

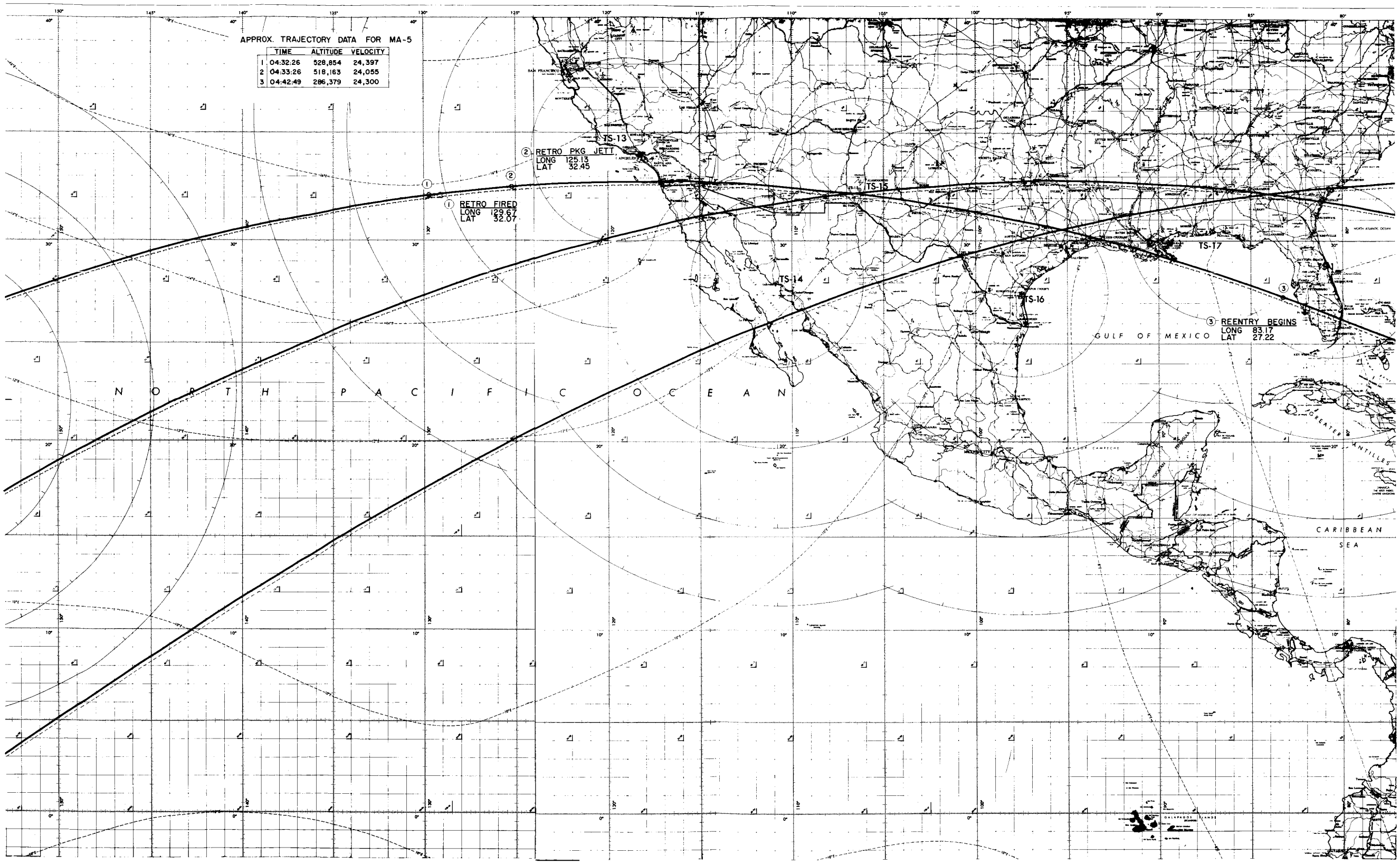
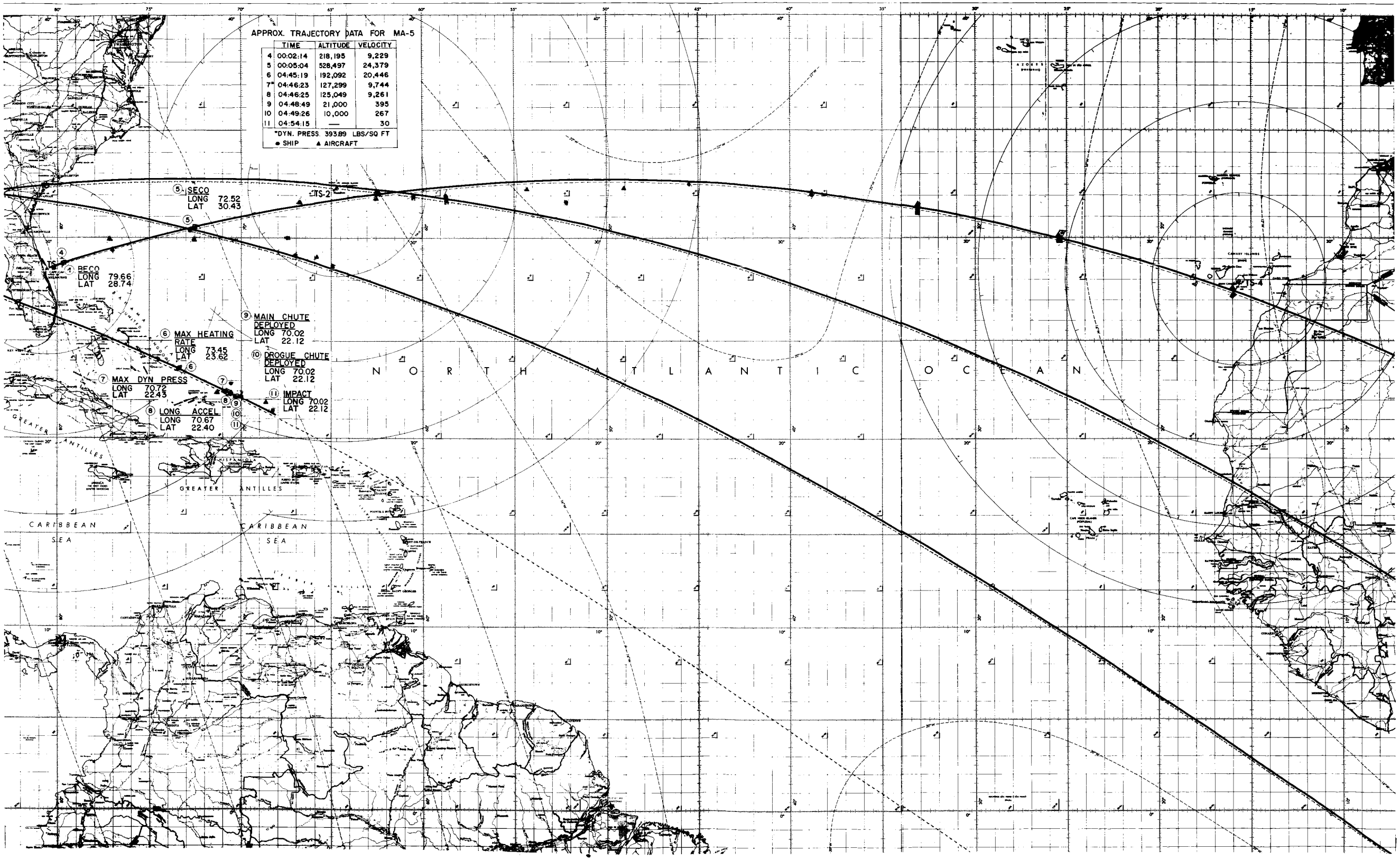


Figure 6. - Earth track of Mercury-Atlas 3-orbit trajectory showing locations of significant events and deployment of recovery forces.



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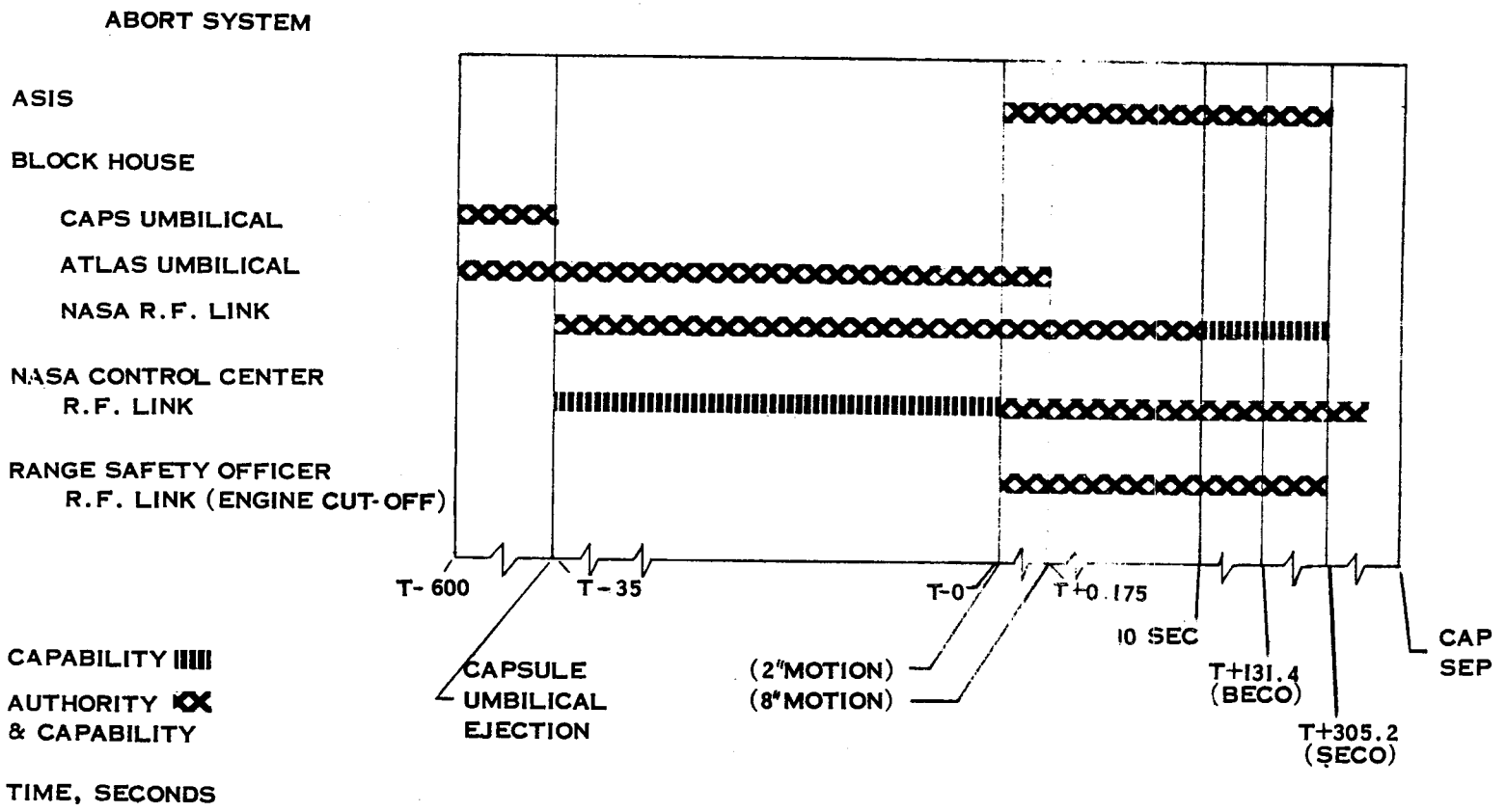

FIGURE 7.- ABORT CAPABILITY/AUTHORITY OF MERCURY-ATLAS.

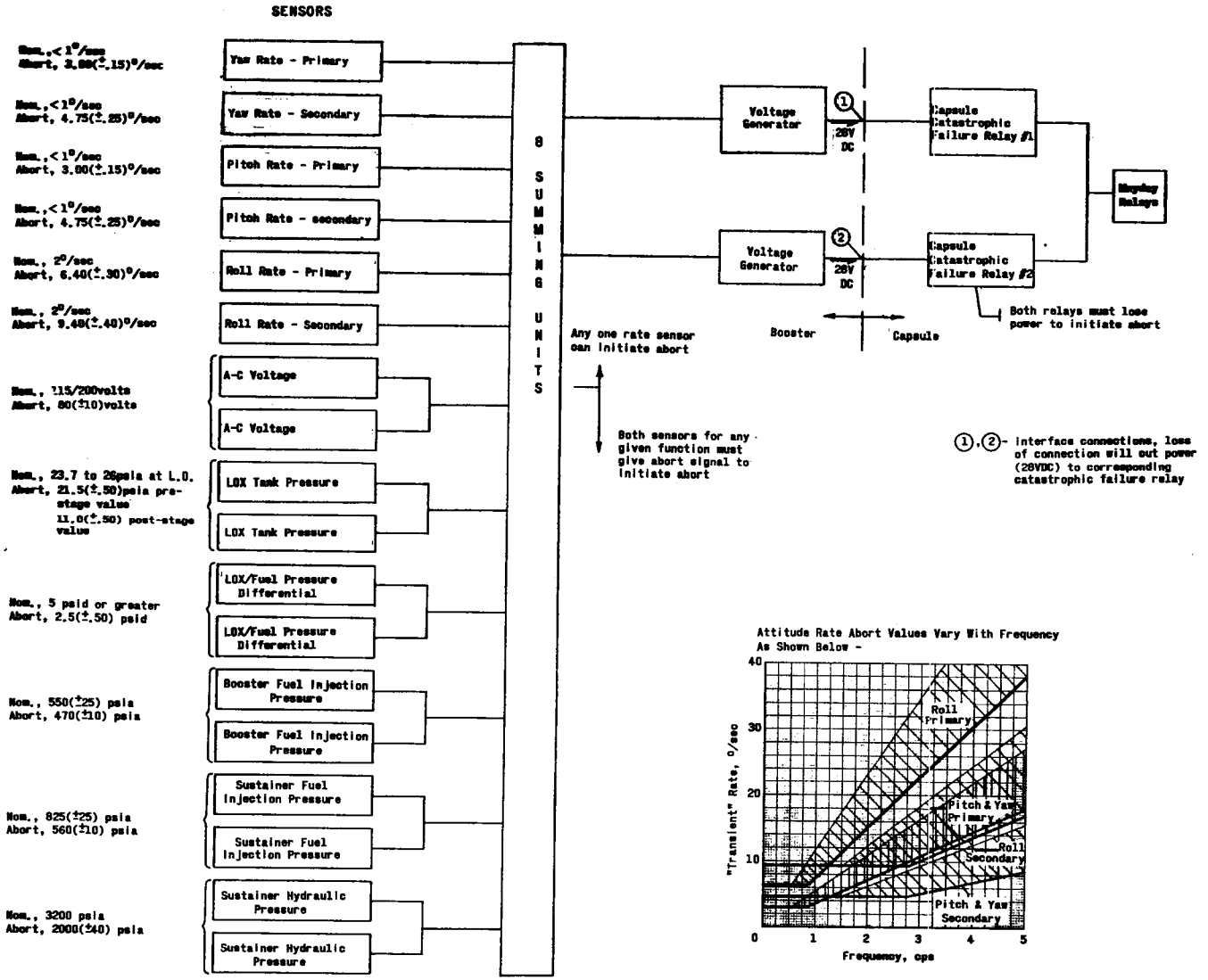

Figure 8.- BLOCK DIAGRAM OF ABORT SENSING AND IMPLEMENTATION SYSTEM.