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PROJECT: GEMINI 5

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BACKGROUND INFORMATION

Launch is scheduled no earlier than August 19.

2/5

NEWS NASA
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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NASA SCHEDULES
EIGHT-DAY MANNED
SPACE FLIGHT

The National Aeronautics and Space Administration will launch the Gemini 5 eight-day manned space flight mission no earlier than Aug. 19 at Cape Kennedy, Fla.

A full duration mission would achieve the longest manned space flight to date.

Astronaut L. Gordon Cooper, Jr., will be command pilot and Astronaut Charles Conrad, Jr., will be pilot for the mission.

The backup crew is Astronaut Neil A. Armstrong, Command pilot, and Elliott M. See, pilot. The backup crew will replace the primary crew should either member of that team become ineligible for the flight.

Gemini 5 will be launched by a two-stage Titan II, a modified U. S. Air Force Intercontinental Ballistic Missile, into an orbit with a high point of 219 statute miles and low point of 100 miles. Each orbit will take about 90 minutes and range between 33 degrees north and south of the Equator.

Flight time for Gemini 5 will be about 191 hours and 53 minutes during which it will complete 121 revolutions of the Earth. Landing is planned at the beginning of the 122nd revolution about 500 miles southwest of Bermuda in the West Atlantic Ocean.

This is the third manned Gemini flight. The first two of the previous four Gemini flights were unmanned.

Gemini 5 will be the second space flight for Astronaut Cooper and will give him more time in space than any other man--more than 226 hours. His first flight was 34 hours and 20 minutes aboard Faith 7, May 15, 1963, the longest flight of the Project Mercury Series.

This is the first space flight for Conrad, who joined the astronaut program in September 1962.

Primary objectives of Gemini 5 are:

(1) Demonstrate and evaluate the performance of the Gemini spacecraft for a period of eight days.

(2) Evaluate the performance of the rendezvous guidance and navigation system using the radar evaluation pod.

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(3) Evaluate the effects of prolonged exposure to the space environment of the two-man crew.

Seventeen experiments are scheduled to be conducted during the flight. Five are medical, six scientific and six technological. Six of the experiments are sponsored by the Department of Defense.

Six of the experiments repeat tests conducted on previous Gemini flights. They are: In-flight Exerciser, In-flight Phonocardiogram, Bone Demineralization, Electrostatic Charge, Terrain and Weather Photography.

New experiments include: Cardiovascular Conditioning, Human Otolith Function, Basic Object Photography, Nearby Object Photography, Celestial Radiometry, Surface Photography, Space Object Photography, Astronaut Visibility, Zodiacal Light Photography, Cloud Top Spectrometer and Visual Acuity.

The eight-day mission is about the time required for an Apollo crew to fly to the Moon, explore its surface and return to Earth. Gemini 5 is expected to demonstrate that the prolonged weightlessness of a manned Moon landing mission is not a threat to the health of the crew and that well-conditioned, well-trained astronauts can perform effectively over the duration of such a flight.

New equipment on Gemini 5 includes the rendezvous radar and guidance system, developed for rendezvous and docking with an orbiting Agena rocket. A radar evaluation pod will be carried in the adapter section of the spacecraft and ejected in space to simulate the Agena.

Instrumentation in the pod is similar to Agena instrumentation. It contains a rendezvous radio transponder, batteries, antenna and flashing lights. Its life expectancy is about six hours.

Purpose of the radar pod in Gemini 5 is to test equipment and provide practice in rendezvous techniques. Once the pod has been ejected the astronauts will pull away. Later they will seek it out as a test of the equipment. There will be no docking.

Use of a fuel cell as the electrical power also is new in Gemini 5. It is a device which converts electrical energy from the reaction of hydrogen and oxygen. The fuel cell replaces the storage batteries previously used and will supply all inflight electrical power for the spacecraft. Batteries will be used during reentry.

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The Gemini program is the second phase of the United State's manned space flight program. It is designed to provide experience in orbiting maneuvers, rendezvous and docking, space flights lasting up to 14 days and for manned scientific investigations in space.

Gemini is under the direction of the Office of Manned Space Flight, NASA Headquarters, Washington, D.C., and is managed by NASA's Manned Spacecraft Center, Houston. Gemini is a national space effort and is supported by the Department of Defense in such areas as launch vehicle development, launch operations, tracking and recovery.

(BACKGROUND INFORMATION FOLLOWS)

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MISSION DESCRIPTION

Activities described below and in the Summary Flight Plan will be affected by many variables such as weather, spacecraft day/night position and attitude control fuel remaining. The plan is flexible and may be altered in flight to meet changing conditions.

The Gemini 5 spacecraft is scheduled to be launched from Cape Kennedy Complex 19 at 9 a.m. EST on an azimuth of 72 degrees. Twenty seconds after second stage cut-off, at an inertial velocity of 25,807 feet per second, the spacecraft will be separated from the Gemini Launch Vehicle by firing the two 100-pound aft thrusters. This will add 10 fps to the inertial velocity and result in an 100-219 statute mile elliptical orbit about 600 miles from Cape Kennedy.

After insertion into orbit, the crew will check systems and prepare to adjust their perigee. At a ground elapsed time (GET) of 56 minutes, as the spacecraft nears first apogee, a horizontal posigrade maneuver of 10 fps will be executed to raise the perigee to approximately 106 miles. This is done prior to release of the Radar Evaluation Pod (REP) to insure an appropriate spacecraft perigee altitude when maneuvered to a co-elliptical orbit in connection with the REP exercise.

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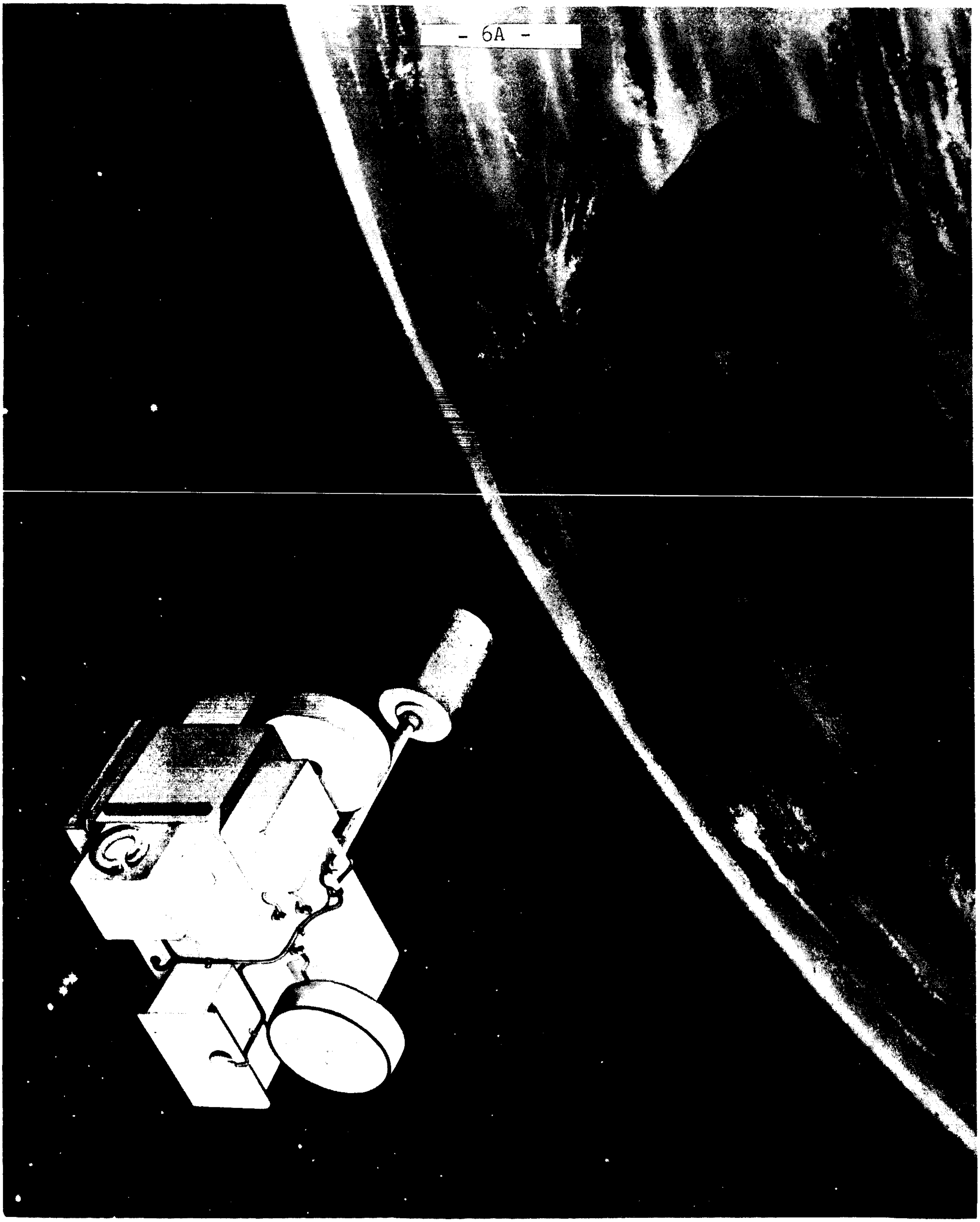

The REP will be ejected 13 minutes after the spacecraft enters darkness in the second revolution at GET of two hours and 25 minutes. For ejection, the spacecraft will be yawed right 90 degrees, and the REP will go north from the spacecraft at a rate of about five fps. The out-of-plane ejection will not affect the inplane motion between the two vehicles.

Because the spacecraft must remain within 900 feet of the REP for four minutes as part of the Celestial, Space and Terrestrial Object Radiometery experiments (D-4 and D-7), it will be necessary to decrease the range rate between the two vehicles. To accomplish this, two fps will be applied to the spacecraft toward the REP using the aft thrusters one minute after REP ejection.

At a GET of two hours and 59 minutes, the crew will execute a posigrade 16 fps horizontal maneuver using the aft thrusters. Purpose is to increase the spacecraft orbital period enough to allow it to trail behind the REP. The maneuver increases the spacecraft period by .17 minutes to 89.87 minutes. It also raises the apogee to approximately 229 miles.

At a GET of three hours and 39 minutes the crew will execute a retrograde and radially-up burn of 14 fps. This will lower the spacecraft perigee altitude about seven miles. below the perigee altitude of the REP, which is 106 miles, and adjust the phase angle desired at the time of the co-elliptical maneuver. The maneuver will be performed in a pitched-up attitude using the forward-firing thrusters. The orbital parameters after thrust will be approximately 100-229 miles with a period of 89.75 minutes. The spacecraft period will be .073 minutes larger than the REP period, and the spacecraft will lag behind. The spacecraft remains in this orbit for 52 minutes during which it achieves a maximum range from the REP of 52 miles.

A retrograde and radially-down maneuver of 29.8 fps will be performed at a GET of four hours and 31 minutes. This will place the spacecraft into an 99-212 mile orbit co-elliptical with the REP's orbit with an approximate altitude difference of seven miles between the two. The maneuver will be executed with the spacecraft pitched up, and the forward firing thrusters will be used. The spacecraft period will become 89.43 minutes, which is .24 minutes smaller than the REP's period. The spacecraft will stay in the co-elliptical orbit about 33 minutes, resulting in a phase angle of .183 degrees at terminal phase initiation.

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The pilot will switch the computer mode to rendezvous at a GET of four hours and 35 minutes. At five hours GET, with a range of 17.5 miles and a look-angle of 22.69 degrees, he will press the start computer button. Approximately four minutes later, when the range is 14.9 miles and the look-angle is 27.2 degrees, the terminal phase initiation maneuver of 15 fps is applied. At this time the in-plane thrust angle is equal to the REP look-angle, and the result is a line-of-sight burn.

At a GET of five hours, 16 minutes and 11 seconds, the first mid-course correction maneuver of 81.8 degrees is displayed to the crew on the Incremental Velocity Indicator (IVI). The vector components are displayed separately to maintain line-of-sight at a delta V cost of three fps.

The second mid-course correction maneuver is applied at a GET of five hours, 28 minutes, 11 seconds. This 33.6 degree maneuver costs five fps. After its completion, the closed-loop phase is completed and the crew will control the spacecraft throughout the rest of the exercise via a semioptical technique.

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The magnitude of the theoretical braking maneuver at a GET of five hours, 36 minutes, 32 seconds is about 16 fps. However, since the command pilot will be controlling final approach from about 1.7 miles by semioptical techniques, additional fuel will be used controlling the inertial line-of-sight rates and the range/range rate. The braking maneuver occurs about 10 minutes prior to leaving darkness in the fourth revolution and about six minutes prior to loss of signal at Carnarvon, Australia, tracking station.

After the braking maneuver, the spacecraft will be maneuvered in the near vicinity of the REP for the Nearby Object Photography experiment (D-2) until time for the final separation maneuver of a GET of six hours, 49 minutes. At that time the spacecraft will be at fifth apogee, and the crew will perform a five fps posigrade maneuver to separate from the REP. The orbital lifetime of the spacecraft following this maneuver is expected to be from 10 to 13 days. The remainder of the mission will be carried out with spacecraft exercises that do not involve in-orbit maneuvering.

Scheduling of experiments and other activities in the flight following completion of the REP exercise will be on a real-time basis.

Retrofire is planned at a GET of 191 hours, 29 minutes, 24 seconds while the spacecraft is between Hawaii and California in the 121st revolution. Landing is expected in the West Atlantic recovery area about 500 miles southwest of Bermuda at a GET of 191 hours, 53 minutes, 18 seconds and a Local Mean Time of 9 a.m.

CREW TRAINING BACKGROUND - GEMINI 5

The Gemini 5 flight crew was selected Feb. 8, 1965. Concentrated mission training began in September. In addition to the extensive general training received prior to flight assignment--such as familiarization with high accelerations, zero gravity, and various survival techniques--the following preparations have or will be accomplished prior to launch:

a. Familiarization with launch, launch abort, and reentry acceleration profiles of the Gemini 5 mission using the Naval Air Development Center, Johnsville, Pa., centrifuge.

b. Egress and recovery activities using a spacecraft boilerplate model and actual recovery equipment and personnel.

c. Celestial pattern recognition in the Moorehead Planetarium, Chapel Hill, N.C.

d. Parachute descent training over land and water using a towed parachute technique.

e. Zero gravity evaluation of extra vehicular activities, food and other on-board equipment.

f. Suit, seat, and harness fittings.

g. Launch abort simulations at Ling-Temco-Vought in a specially configured simulator.

h. Training sessions totaling over 110 hours per crew member on the Gemini mission simulators.

i. Detailed systems briefing; detailed experiment briefings; flight plan and mission rules reviews.

j. Participation in mock-up reviews, Service Engineering Department Report (SEDR) reviews, subsystem tests, and spacecraft acceptance review.

In final preparation for flight, the crew participates in network launch abort simulations, joint combined systems test, wet mock simulated launch, and the final simulated flight test. At T-2 days, the major flight crew medical examinations will be administered to determine readiness for flight and obtain data for comparison with post flight medical examination results.

Immediate Preflight Crew Activities

Seven hours prior to launch, the back-up flight crew reports to the 100-foot level of the White Room to monitor the positioning of all cockpit switches. By T-5 hours, the pilots' ready room, the 100-foot level of the White Room and the crew quarters are manned and made ready for the primary crew.

T-4 hours, 30 minutes	Primary crew awakened
T-4 hours	Medical examination
T-3 hours, 40 minutes	Breakfast
T-3 hours	Crew leaves O&C (Operations and Checkout) Building
T-2 hours, 50 minutes	Crew arrives at ready room on Pad 16

During the next hour, the biomedical sensors are placed, underwear and signal conditioners are donned, flight suits minus helmets and gloves are put on and blood pressure is checked. The helmets and gloves are then attached and communications and oral temperature systems are checked.

T-2 hours	Purging of suit begins
T-1 hour, 49 minutes	Crew leaves ready room
T-1 hour, 44 minutes	Crew arrives at 100-foot level
T-1 hour, 40 minutes	Crew enters spacecraft

From entry until ignition, the crew participates in or monitors system checks and preparations.

Flight Activities

At ignition the crew begins the primary launch phase task of assessing system status and detecting abort situations. At 45 seconds after staging the command pilot jettisons the nose and horizon scanner fairings. Twenty seconds after SECO, the command pilot initiates forward thrusting and the pilot actuates spacecraft separation and selects rate command attitude control. Ground computations of insertion velocity corrections are received and velocity adjustments are made by forward or aft thrusting. After successful insertion and completion of the insertion check list, the detailed flight plan is begun.

In addition to frequent housekeeping tasks such as systems tests, biomedical readouts and eating, the following significant events are planned:

SUMMARY FLIGHT PLAN

Day:Hr		
0:00	Lift-off	
	Align PLAT, INSERTION Checklist	
	RAD-FLOW,	
	CRO: GO/NO GO 6-4, GO/NO GO D-4/D-7	
	Align PLAT - SEF	
	COOLED Spectrometer Align (D-4/D-7)	
	RADAR-ON, REP EJECT	
	COOLED SENSOR REP Measurements (D-4/D-7)	
	Align PLAT - SEF	
	S/C CLOSING MANEUVER, Radar Test No. 1	
	Radar Test No. 2, No. 3	
0:04	Radar Test No. 2	
	CO-ELLIPTICAL MANEUVER	
	$\omega T = 180^\circ$ Transfer Maneuver	
	$\omega T = 82^\circ$ Correction Maneuver	
	$\omega T = 34^\circ$ Correction Maneuver	
	RENDEZVOUS, D-2	
	SEPARATION MANEUVER	
	POWER DOWN: COMPUTER, RADAR, PLATFORM and SCANNER	
	GO/NO GO 18-1	
0:08	RAD & IR SPECT. Align (D-4/D-7)	
	PWR-DOWN S/C	
	D-4/D-7 CRYOGENIC Gas Lifetime	PILOT EAT
	PLA UPDATE 9-3 thru 13-2	
	D-4/D-7 CRYOGENIC Gas Lifetime	
		CMD SLEEP
0:12	D-4/D-7 CRYOGENIC Gas Lifetime	
	MED DATA (Pilot)	PILOT EAT
	S-8/D-13 Vision Test (Pilot)	
	M-9 TEST (Pilot)	BRIEFING
	M-9 TEST (CMD)	
	S-8/D-13 Vision Test (CMD)	CMD EAT
0:16	MED DATA (CMD)	
		PILOT SLEEP
	PLA UPDATE 14-2 thru 19-4	
0:20		CMD EAT
	FLIGHT PLAN UPDATE FOR US PASSES	BRIEFING
		PILOT EAT
	MED DATA (PILOT)	CMD NAP
1:00	CNV: D-4/D-7 Missile MEASUREMENT	

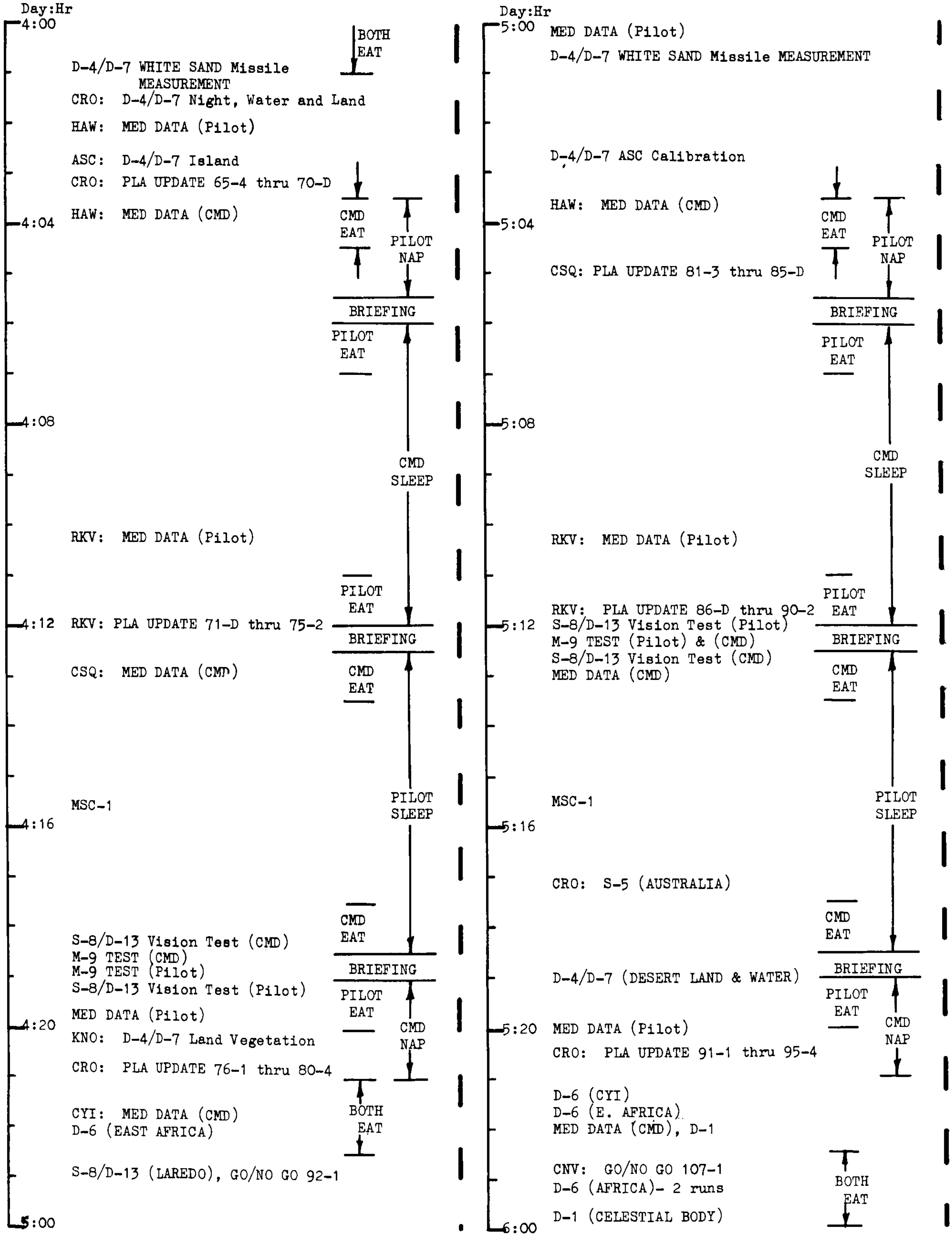
Day:Hr		
1:00	D-6 (CYI)	
	D-6 (E. AFRICA)	
	CRO: D-4/D-7 STAR	
	D-6 (U.S.)	
	CNV: GO/NO GO for 33-1	
	D-6 (W. AFRICA)	
	D-6 (E. AFRICA), MED DATA (Pilot)	BOTH EAT
	D-1 MOON TRACK, D-4/D-7 MOON MEASUREMENT	
	D-6 (U.S.)	
	D-6 (U.S.) D-6 (S. AFRICA)	
	CRO: PLA UPDATE 20-4 thru 24-3	
1:04	S-8/D-13 (LAREDO) plus Window MEASUREMENT	
	MED DATA (CMD)	PILOT NAP
	S-7 {Eastern Pacific, Caribbean / White Calibration CARD}	CMD EAT
		BRIEFING
		PILOT EAT
1:08	MSC-1	
	RKV: PLA UPDATE 25-D thru 29-2	CMD SLEEP
1:12		
	RKV: MED DATA (Pilot)	PILOT EAT
	S-8/D-13 Vision Test (Pilot)	
	M-9 TEST (Pilot)	BRIEFING
	M-9 TEST (CMD),	
	S-8/D-13 Vision Test (CMD)	CMD EAT
	MED DATA (CMD)	
	S-7 (Phillipines-GUAM)	
1:16		
	S-7 (Phillipines-GUAM)	PILOT SLEEP
	MSC-1	
	Apollo Landmark (W. AFRICA)	CMD EAT
1:20	CRO: PLA UPDATE 30-2 thru 34-1	BRIEFING
	MED DATA (Pilot)	PILOT EAT
	CRO: FLIGHT PLAN UPDATE FOR U.S. PASSES	CMD NAP
	MED DATA (CMD)	
2:00	S-8/D-13 (LAREDO PHOTO PASS)	

SUMMARY FLIGHT PLAN

Day:Hr		
2:00		
	CRO: D-4/D-7 (STARS)	BOTH EAT
	D-6 (U.S.), GO/NO GO for 47-1 D-6 (W. AFRICA)	
	CRO: MED DATA (Pilot)	
	S-8/D-13 (LAREDO)	
	CRO: MED DATA (CMD)	
2:04	PLA UPDATE 35-4 thru 39-3 S-7 (U.S., CARIBBEAN)	
		PILOT NAP
	S-7 (U.S., CARIBBEAN)	CMD EAT
		BRIEFING
	D-4/D-7 (16mm Camera) Apollo Landmark (SO. AMERICA)	PILOT EAT
2:08		
	HAW: D-4/D-7 (ISLAND)	
	HAW: MED DATA (Pilot)	CMD SLEEP
2:12	RKV: PLA UPDATE 40-D thru 44-2	PILOT EAT
	S-8/D-13 Vision Test (Pilot) M-9 TEST (Pilot) M-9 TEST (CMD)	BRIEFING
	S-8/D-13 Vision Test (CMD)	CMD EAT
	MED DATA (CMD), S-7 (Phillipines-GUAM)	
2:16		PILOT SLEEP
	MSC-1	
		CMD EAT
	CYI: PLA UPDATE 45-2 thru 49-4	
		BRIEFING
2:20	CRO: FLIGHT PLAN UPDATE FOR U.S. PASSES	PILOT EAT
		CMD NAP
	CRO: MED DATA (Pilot)	
	S-5 (MEXICO)	
	S-5 (EAST AFRICA) CRO: MED DATA (CMD)	
	S-8/D-13 (LAREDO), GO/NO GO 62-1	
3:00		

Day:Hr		
3:00	CRO: D-4/D-7 (Milky Way & Void)	BOTH EAT
	D-6 (EL CENTRO)	
	CRO: D-4/D-7 (ZODIACAL Light) HAW: MED DATA (Pilot)	
	CRO: PLA UPDATE 50-4 thru 54-D	
3:04	HAW: MED DATA (CMD) S-7 (CARIBBEAN)	PILOT NAP
		CMD EAT
	S-7 (CARIBBEAN)	BRIEFING
		PILOT EAT
3:08		
		CMD SLEEP
	RKV: PLA UPDATE 55-D thru 59-2	
		PILOT EAT
3:12	S-8/D-13 Vision Tests (Pilot) M-9 TEST (Pilot) M-9 TEST (CMD)	BRIEFING
	S-8/D-13 Vision Tests (CMD) MED DATA (CMD)	CMD EAT
3:16	MSC-1	PILOT SLEEP
		CMD EAT
	CYI: PLA UPDATE 60-2 thru 64-4	
		BRIEFING
	CRO: FLIGHT PLAN UPDATE FOR U.S. PASSES	PILOT EAT
3:20		CMD NAP
	CRO: MED DATA (Pilot)	
	CYI: Apollo Landmark	
	CRO: MED DATA (CMD)	
	TEX: S-8/D-13 (LAREDO) CNV: GO/NO GO for 77-1	BOTH EAT
4:00		

SUMMARY FLIGHT PLAN



Day:Hr

4:00

BOTH EAT

D-4/D-7 WHITE SAND Missile MEASUREMENT

CRO: D-4/D-7 Night, Water and Land

HAW: MED DATA (Pilot)

ASC: D-4/D-7 Island

CRO: PLA UPDATE 65-4 thru 70-D

4:04 HAW: MED DATA (CMD)

CMD EAT

PILOT NAP

BRIEFING

PILOT EAT

4:08

CMD SLEEP

RKV: MED DATA (Pilot)

PILOT EAT

4:12 RKV: PLA UPDATE 71-D thru 75-2

BRIEFING

CSQ: MED DATA (CMD)

CMD EAT

MSC-1

PILOT SLEEP

4:16

CMD EAT

S-8/D-13 Vision Test (CMD)
M-9 TEST (CMD)
M-9 TEST (Pilot)
S-8/D-13 Vision Test (Pilot)

BRIEFING

PILOT EAT

MED DATA (Pilot)

CMD NAP

4:20 KNO: D-4/D-7 Land Vegetation

CRO: PLA UPDATE 76-1 thru 80-4

BOTH EAT

CYI: MED DATA (CMD)
D-6 (EAST AFRICA)

S-8/D-13 (LAREDO), GO/NO GO 92-1

5:00

Day:Hr

5:00 MED DATA (Pilot)

D-4/D-7 WHITE SAND Missile MEASUREMENT

D-4/D-7 ASC Calibration

HAW: MED DATA (CMD)

CMD EAT

PILOT NAP

5:04

CSQ: PLA UPDATE 81-3 thru 85-D

BRIEFING

PILOT EAT

5:08

CMD SLEEP

RKV: MED DATA (Pilot)

PILOT EAT

RKV: PLA UPDATE 86-D thru 90-2

5:12 S-8/D-13 Vision Test (Pilot)
M-9 TEST (Pilot) & (CMD)
S-8/D-13 Vision Test (CMD)
MED DATA (CMD)

BRIEFING

CMD EAT

MSC-1

PILOT SLEEP

5:16

CRO: S-5 (AUSTRALIA)

CMD EAT

BRIEFING

D-4/D-7 (DESERT LAND & WATER)

PILOT EAT

CMD NAP

5:20 MED DATA (Pilot)

CRO: PLA UPDATE 91-1 thru 95-4

D-6 (CYI)
D-6 (E. AFRICA)
MED DATA (CMD), D-1

CNV: GO/NO GO 107-1
D-6 (AFRICA)- 2 runs

BOTH EAT

D-1 (CELESTIAL BODY)

6:00

SUMMARY FLIGHT PLAN

Day:Hr		
6:00	D-6 (U.S.) MED DATA (Pilot)	
	S-8/D-13 (LAREDO)	
	MED DATA (CMD)	CMD EAT PILOT NAP
6:04	CSQ: PLA UPDATE 96-3 thru 101-D	
		BRIEFING
		PILOT EAT
6:08		CMD SLEEP
	MED DATA (Pilot)	PILOT EAT
	S-8/D-13 Vision Test (Pilot)	
	M-9 TEST (Pilot)	BRIEFING
6:12	M-9 TEST (CMD)	
	S-8/D-13 Vision Test (CMD)	CMD EAT
	MED DATA (CMD)	
	RKV: PLA UPDATE 102-2 thru 106-1	
		PILOT SLEEP
	MSC-1	
6:16		
		CMD EAT
	CRO: FLIGHT PLAN UPDATE FOR U.S. PASSES	BRIEFING
		PILOT EAT CMD NAP
	CYI: MED DATA (Pilot)	
6:20		
	CRO: PLA UPDATE 107-1 thru 111-3	
	D-6 (CYI)	
	D-6 (E. AFRICA)	
	CRO: MED DATA (CMD)	
	GO/NO GO 122-1, Apollo Landmark	BOTH EAT
	S-1	
7:00		

Day:Hr		
7:00	Apollo Landmark (FLORIDA)	
	MED DATA (Pilot)	
	S-8/D-13 (LAREDO) plus Window MEASUREMENT	
	MED DATA (CMD)	CMD EAT PILOT NAP
7:04		
		BRIEFING
	HAW: PLA UPDATE 112-3 thru 116-D	PILOT EAT
	MED DATA (Pilot)	
7:08		CMD SLEEP
		PILOT EAT
		BRIEFING
	MED DATA (CMD)	CMD EAT
7:12	RKV: PLA UPDATE 117-2 thru 121-1	
		PILOT SLEEP
7:16		
		CMD EAT
		BRIEFING
	S-8/D-13 (Pilot)	PILOT EAT CMD NAP
	MED DATA (Pilot)	
	CRO: PLA UPDATE 122-1 thru 126-3	
7:20	S-8/D-13 Vision Tests (Pilot)	
	M-9 TEST (Pilot) M-9 TEST (CMD)	
	S-8/D-13 Vision Test (CMD)	
	MED DATA (CMD), D-4/D-7 (SUN)	
	GYM: POWER-UP Checklist	BOTH EAT
	Preretro Checklist	
	POST-RETRO Checklist	
	Guidance initiate	
8:00	Post-Landing Checklist	

FLIGHT DATA

Launch Azimuth -- 72 degrees.

Flight Duration -- Approximately 191½ hours.

Initial Orbital Parameters -- 100 - 219 miles.

Reentry Velocity -- About 24,000 feet per second; 16,450 miles per hour.

Reentry Temperature -- About 3,000 degrees F on heat shield surface.

Landing Point -- Atlantic Ocean about 500 miles southwest of Bermuda; 70 degrees west, 29 degrees north.

Oxygen -- Cabin Enviornment, 100 per cent oxygen pressurized at five pounds per square inch.

Retrorockets -- Each of four retrorockets produce approximately 2,500 pounds of thrust for 5.5 seconds. Fire sequentially.

ORBITS - REVOLUTIONS

During Gemini flights the spacecraft's course is measured in revolutions around the Earth. A revolution is completed when the spacecraft passes over 80 degrees west longitude, about once every 96 minutes.

Orbits are space referenced and take about 90 minutes.

The longer time for revolutions is caused by the Earth's rotation. As the spacecraft circles the Earth, the Earth moves about 22.5 degrees in the same direction.

-more-

Although the spacecraft completes an orbit in about 90 minutes, it takes another six minutes for the spacecraft to reach 80 degrees west longitude.

For this reason, it is simpler to record revolutions from fixed positions on Earth. Gemini completes 16 orbits per day, but only crosses the 80th longitude 15 times -- hence, 15 revolutions.

WEATHER REQUIREMENTS

Recovery capability is based primarily on reports from recovery force commanders to the recovery task force command at Mission Control Center.

The following are guide lines only. Conditions along the ground track will be evaluated prior to and during the mission.

Launch Area

Surface Winds -- 18 knots with gusts to 25 knots.
Ceiling -- 5,000 feet cloud base minimum.
Visibility -- Six miles minimum.
Wave Height -- Five feet maximum.

Planned Landing Areas

Surface Winds -- 30 knots maximum.

Ceiling -- 1,500 feet cloud base minimum.

Visibility -- Six miles minimum.

Wave Height -- Eight feet maximum.

Contingency Landing Areas

Weather and status of contingency recovery forces will be continually monitored. Recommendations will be made to the Mission Director who will make the go-no-go decision based upon conditions at the time.

Pararescue

The decision to use pararescue personnel depends upon weather conditions, surface vessel locations and the ability to provide air dropped supplies until the arrival of a surface vessel. The final decision to jump will be made by the jumpmaster. Weather guidelines for pararescue operations are:

Surface Winds -- 25 knots maximum.
Ceiling -- 1,000 feet cloud base minimum.
Visibility -- Target visible.
Waves -- Five feet maximum, swells 10 or 11 feet maximum.

-more-

LAUNCH COUNTDOWN

T-1 day	Preparations for launch countdown.
T-270 minutes	Awaken crew.
T-240 minutes	Begin countdown.
T-225 minutes	Engine cutoff, shutdown and destruct test complete.
T-190 minutes	Start electrical connection of Stage I and II destruct iniatiators.
T-175 minutes	Ordnance electrical connections complete, safety pins removed.
T-170 minutes	Begin sensor placement and suiting of crew; blockhouse door sealed.
T-168 minutes	Launch vehicle tank pressurization completed.
T-150 minutes	Start launch vehicle securing preparations.
T-118 minutes	Simulated malfunction test.
T-115 minutes	Verify launch vehicle "Go" for flight.
T-100 minutes	Crew enters spacecraft.
T-40 minutes	White Room evacuation complete; erector lowering preparations complete; erector cleared to lower. Unstow "D" rings
T-35 minutes	Start lowering erector; start range telemetry readout.
T-30 minutes	Activate spacecraft communications links.
T-23 minutes	Spacecraft to internal power.
T-20 minutes	Command transmitter on.
T-15 minutes	Spacecraft static firing.

T-6 minutes	Final status and communications check.
T-5 minutes	Start range telemetry recorders.
T-4 minutes	Start analog and event recorders
T-3 minutes	Set in launch azimuth (72 degrees).
T-2 minutes, 30 seconds	Range clearance
T-1 minute, 30 seconds	Roll program armed.
T-0	Engine start signal.

CREW SAFETY

Every Gemini system affecting crew safety has a redundant (back-up) feature. The Malfunction Detection System in the launch vehicle monitors subsystem performance in the vehicle and warns the crew of a potentially catastrophic malfunction in time for escape.

During the powered phase of flight there are three modes for crew escape:

(1) Ejection seats.

(2) Firing the retrorockets to separate the spacecraft from the launch vehicle, then initiating the spacecraft recovery system.

(3) Normal spacecraft separation followed by use of the thrusters and retrorockets.

Escape procedures will be initiated by the command pilot following two valid cues that a malfunction has occurred. Abort procedures are:

(1) Lift-off to 50 seconds -- Immediate ejection for all malfunctions.

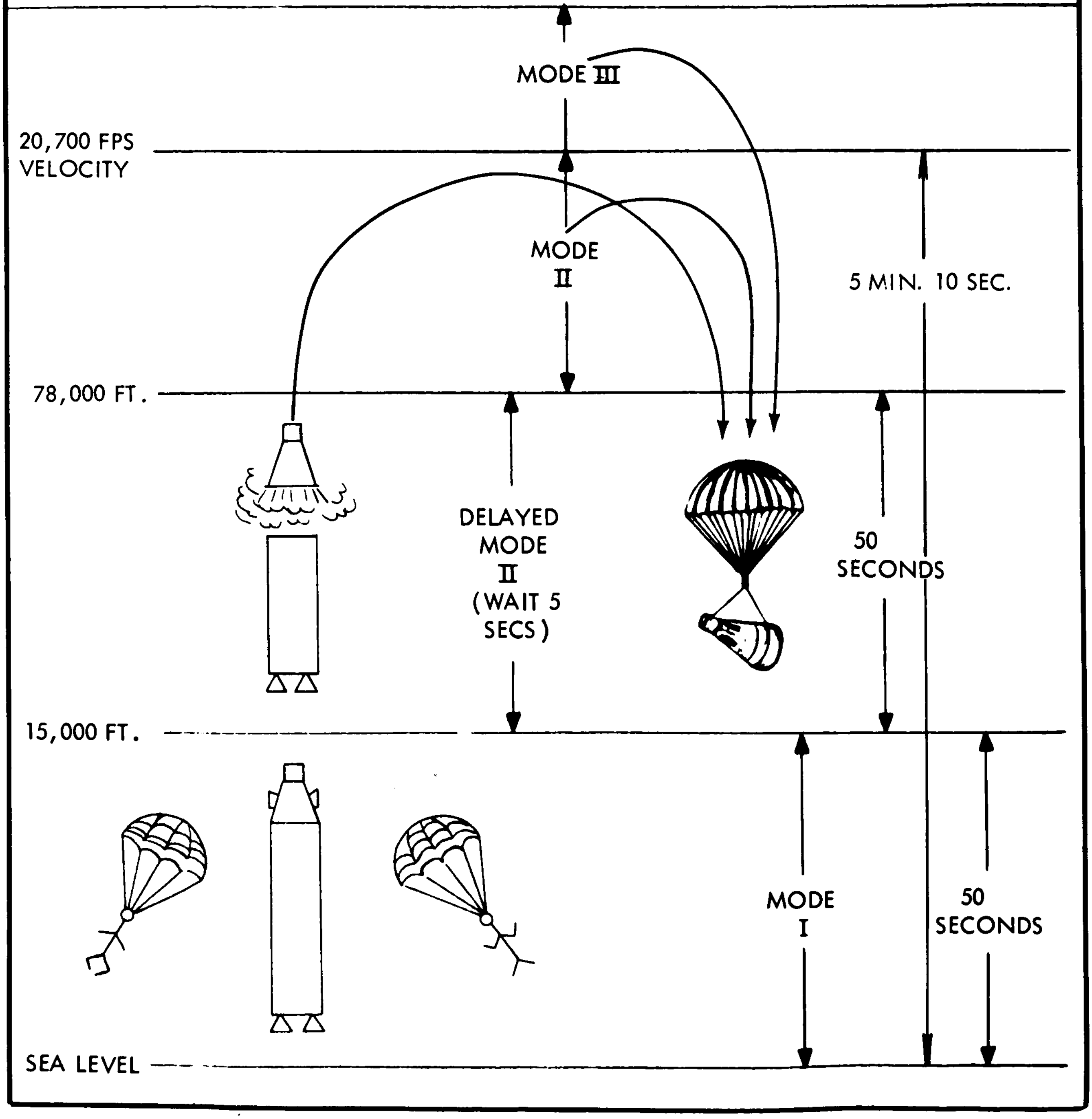
(2) Fifty seconds to 100 seconds -- Delayed retro-abort for all malfunctions.

ABORT PROCEDURES

MODE I - EJECT AFTER SHUTDOWN

MODE II - SALVO RETROS AFTER SHUTDOWN

MODE III - SHUTDOWN, SEPARATE, TURN AROUND,
RETROFIRE



This consists of arming abort circuits, waiting about five seconds after engine shutdown until aerodynamic pressure has decreased, then salvo firing the four retrorockets to separate from the launch vehicle.

(3) After 100 seconds of flight, aerodynamic drag will have decreased to the point where no delay is required for separation. Retro-abort will be used until a velocity of approximately 20,700 fps (14,000 mph) or 80 percent of that required to get into orbit is achieved. Where more than 80 percent of velocity required for orbit has been achieved, normal spacecraft separation will be used for all malfunctions. The crew will then resume retroattitude, insert landing area parameters in the computer, retrofire, and descend to a planned recovery area.

Inflight

There are no single point failures which would jeopardize crew safety during inflight operations. All systems and subsystems have back-up features or there is an alternate method.

The space suit itself is a back-up system. Should cabin pressure fail, the space suit provides life support.

Reentry, Landing and Recovery

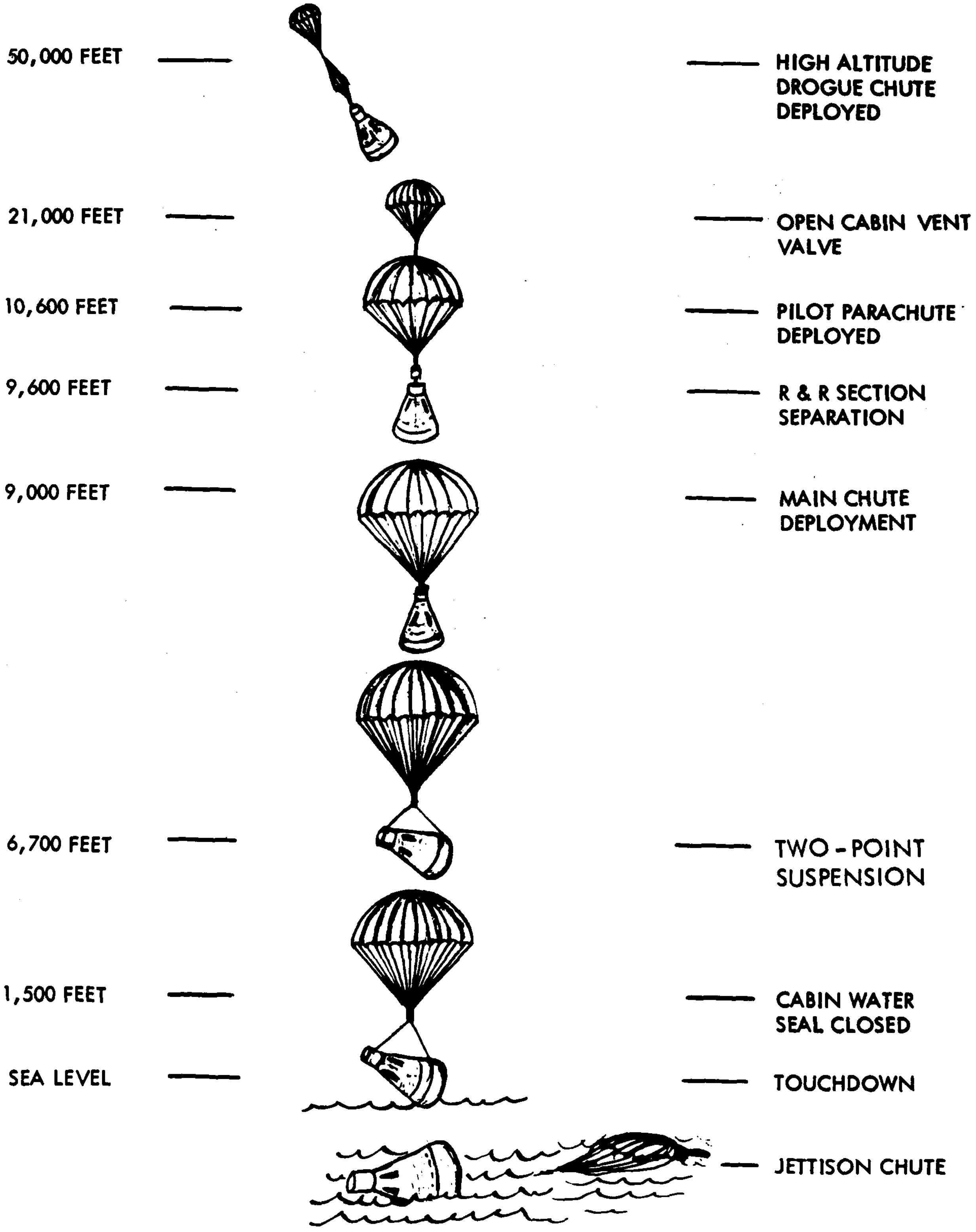
The Reentry Control System (RCS) controls the spacecraft attitude during retrorocket firing and reentry. Two complete and independent systems provide 100 per cent redundancy. The four retrorockets are wired with dual igniters.

The Orbiting Attitude Maneuvering System is used to perform translation maneuvers along three axes of the spacecraft and provide attitude control during orbital phases of the mission.

Parachutes are used for descent following spacecraft reentry. If there is a parachute malfunction the crew will eject from the spacecraft and use personal chutes for landing. Survival equipment is carried on the backs of the ejection seats and remains attached to the astronauts until they land.

Recovery forces will be provided by the military services and during mission time will be under the operational control of the Department of Defense Manager for Manned Space Flight Support Operations.

GEMINI PARACHUTE LANDING SEQUENCE



Planned and contingency landing areas have been established. Planned areas are those where the probability of landing is sufficiently high to justify pre-positioning of recovery forces for support and recovery of crew and spacecraft within given access times.

Contingency areas are all other areas along the ground track where the spacecraft could possibly land. The probability of landing in a contingency area is sufficiently low that special search and rescue techniques will provide adequate recovery support.

There are four types of planned landing areas:

(1) Primary Landing Area -- Landing will occur with normal termination of the mission after 121 revolutions. This area is in the Atlantic Ocean, about 500 miles southwest of Bermuda.

(2) Secondary Landing Areas -- Where a landing would occur if it is desirable to terminate the mission early for any cause. Ships and aircraft will be stationed to provide support. Aircraft will be able to drop pararescue personnel and flotation equipment within one hour after spacecraft landing.

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(3) Launch Abort Landing Areas -- Along the launch ground track between Florida and Africa where landings would occur following aborts above 45,000 feet and before orbital insertion. Surface ships with medical personnel and retrieval equipment, and search and rescue airplanes with pararescue personnel, flotation equipment and electronic search capability will be stationed in this area before launch. After the successful insertion of the spacecraft into orbit, some of the ships and planes will deploy to secondary areas to provide support on later revolutions and the remainder will return to home stations.

(4) Launch Site Landing Area -- Landing will occur following an abort during countdown, launch and early powered flight in which ejection seats are used. It includes an area of approximately 41 miles seaward and three miles toward the Banana River from Pad 19. Its major axis is oriented along the launch azimuth.

A specialized recovery force of land vehicles, amphibious craft, ships and boats, airplanes and helicopters will be stationed in this area from the time the astronauts enter the spacecraft until lift-off plus five minutes.

Contingency Landing Areas:

Search and rescue aircraft equipped with electronic search equipment, pararescue men and flotation equipment will be staged along the ground and sea track so that the spacecraft will be located and assistance given to the astronauts within 18 hours after recovery forces are notified of the probable landing position.

GEMINI SURVIVAL PACKAGE

The Gemini survival package contains 14 items designed to support an astronaut if he should land outside normal recovery areas.

The package weighs 23 lbs. and has two sections. One section, holding a 3½-pound water container and machete is mounted by the astronaut's left shoulder. The main package, containing the life raft, and related equipment, is mounted on the back of the ejection seat. Both packages are attached to the astronaut's personal parachute harness by a nylon line. After ejection from the spacecraft, as the seat falls clear and the parachute deploys, the survival kit will hang on a line, ready for use as soon as the astronaut lands.

Inflated, the one-man life raft is five and one half feet long and three feet wide. A CO_2 bottle is attached for inflation. The raft is also equipped with a sea anchor, sea dye markers, and a sun bonnet of nylon material with an aluminized coating which the astronaut can place over his head.

In his survival kit, the astronaut also has a radio beacon, a combination survival light, sunglasses, a medical kit, and a desalter kit assembly.

The combination survival light is a new development for the Gemini kit, combining many individual items which were carried in the Mercury kit. About the size of a paperback novel, it contains a strobe light for signaling at night, a flashlight, and a signal mirror built in on the end of the case. It also contains a small compass.

There are three cylindrical cartridges inside the case. Two contain batteries for the lights. The third contains a sewing kit, 14 feet of nylon line, cotton balls and a striker for kindling a fire, halazone tablets for water purification and a whistle.

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The desalter kit includes eight desalter brickettes, and a processing bag. Each brickette can desalt one pint of seawater.

The medical kit contains a one-cubic-centimeter injector for pain, and a two-cubic-centimeter injector for motion sickness. There also are stimulant, pain, motion sickness, and antibiotic tablets and aspirin.

GEMINI 5 SUIT

The space suit worn by both astronauts for the Gemini 5 mission incorporates all the advances of the 4-C or extravehicular suit, without the bulkiness of extra protective layers. The suit retains the double zipper arrangement, the thick, extra strong faceplate, and attachment points for the sun visor. However, the Gemini 5 suit will not be used for extravehicular activity.

The basic suit has five layers. The innermost layer is a white constant wear undergarment made of cotton. A blue nylon comfort layer provides astronaut wearability during long periods of time. The third layer is the pressure garment, a black neoprene coated nylon. The fourth layer is a link net dacron and teflon used to restrain the pressure layer.

The outer layer is HT-1 nylon, a protective layer which gives protection against wear and solar reflectance.

It is a full pressure suit which works in conjunction with the environmental control system. Gaseous oxygen is distributed through the suit ventilation system for cooling and respiration. A 100-per cent oxygen environment at five pounds per square inch in a pressurized cabin or 3.7 psia in an unpressurized cabin is provided.

FOOD FOR GEMINI 5

Six basic meals, comprised of 22 items, will be carried aboard Gemini 5. Except for juices, all the food is bite-size and needs no rehydration. This allows storage of more food for longer missions, and permits easier handling and preparation by the crew.

Astronauts will eat three meals daily. These meals are stored in 24 packages in compartments between the command pilot and pilot. They are marked by day and meal, with the first meal of the first day on top. Packages are connected by a thin nylon lanyard to prevent them from getting out of order while floating weightless in their compartments.

Juices are rehydrated with water from the crew's drinking supply, employing a special water gun designed to allow the crew to drink even while suited and pressurized. Bite-size items need no rehydration, but are surface treated with special coatings to prevent crumbling. Six cubes are wrapped together in special plastic containers for easy dispensing.

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The food formulation concept was developed by the U.S. Army Laboratories, Natick, Mass. Overall food procurement, processing, and packaging was performed by the Whirlpool Corp., St. Joseph, Mich. Principal food contractors are Swift and Co., Chicago, and Pillsbury Co., Minneapolis.

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TWO-DAY MENU CYCLE
GEMINI 5

DAYS 1-3-5-7

Meal A	Calories
Bacon Squares	102
Chicken Sandwiches	184
Gingerbread	183
Peanut Cubes	296
Grapefruit Juice	83
Total	848

Meal B	
Beef Bites	167
Apricot Cubes	281
Date Fruit Cake	202
Cinnamon Toast	76
Orange-Grapefruit Juice	83
Total	809

Meal C	
Beef Sandwiches	202
Pineapple Fruit Cake	211
Peanut Cubes	296
Grapefruit Juice	83
Total	792
Grand Total	2449

DAYS 2-4-6-8

Meal A	Calories
Cheese Sandwiches	231
Strawberry Cereal Cubes	156
Brownies	249
Bacon Squares	102
Orange-Grapefruit Juice	83
Total	821

Meal B	
Bacon & Egg Bites	283
Toasted Bread Cubes	165
Pineapple Cubes	283
Orange Juice	83
Total	814

Meal C	
Chicken Bites	163
Peanut Cubes	296
Apricot Cereal Cubes	154
Toasted Bread Cubes	165
Grapefruit Juice	83
Total	861
Grand Total	2496

MEDICAL CHECKS

Three medical checks a day will be made by each crew member. They will be performed over a convenient ground station. A check will consist of the following operations: an oral temperature measure, blood pressure measurement, an exercise of 30 pulls (one per second) on the exerciser. A second blood pressure measurement and a food and water intake evaluation.

BODY WASTE DISPOSAL

Two separate systems have been devised for the collection of body wastes.

A plastic bag with an adhesive lip to provide secure attachment to the body is used for the collection of feces. It contains a germicide which prevents formation of bacteria and gas. Soiled items, toilet tissues and a wet towel, are placed in the bag following use. The adhesive lip is then used to form a liquid seal and the bag is rolled and stowed in the empty food container spaces and brought back to Earth for analysis.

Urine is collected into a horn-shaped receptacle with a self adjusting opening. The receptacle is connected by a hose to a pump device which either transfers the liquid to a container or dumps it overboard. The system is much like the relief tube used in military fighter planes.

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GEMINI SPACECRAFT

The Gemini spacecraft is conical 18 feet, 5 inches long, 10 feet across at the base and 39 inches across at the top. It has two major sections, the reentry module and the adapter section.

Reentry Module

The reentry module is 11 feet high and $7\frac{1}{2}$ feet in diameter at its base. It has three primary sections: (1) rendezvous and recovery section (R&R); (2) reentry control section (RCS); (3) cabin section.

The rendezvous and recovery section is the forward (small) portion of the spacecraft. Housed in this section are the drogue, pilot and main parachutes and the rendezvous radar.

The reentry control system is located between the rendezvous and recovery section and the cabin section. It contains fuel and oxidizer tanks, valves, tubing and thrust chamber assemblies (TCA). A parachute adapter assembly is on the forward face for the main parachute attachment.

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The cabin section is located between the reentry control section and the adapter section. It houses the crew seated side-by-side, electrical and life support equipment and experimental devices. Above each seat is a hatch opening for entering and leaving the cabin. The crew compartment is pressurized and spaces containing equipment that require no pressurization or which are internally pressurized are located between the pressurized section and the outer shell. The outer shell is covered with overlapping shingles to provide aerodynamic and heat protection. A dish-shaped heat shield forms the large end of the cabin section and reentry module.

Adapter Section

The adapter is 7½ feet high and 10 feet in diameter at the base. It consists of a retrograde section and an equipment section.

The retrograde section contains retrograde rockets and part of the radiator for the cooling system.

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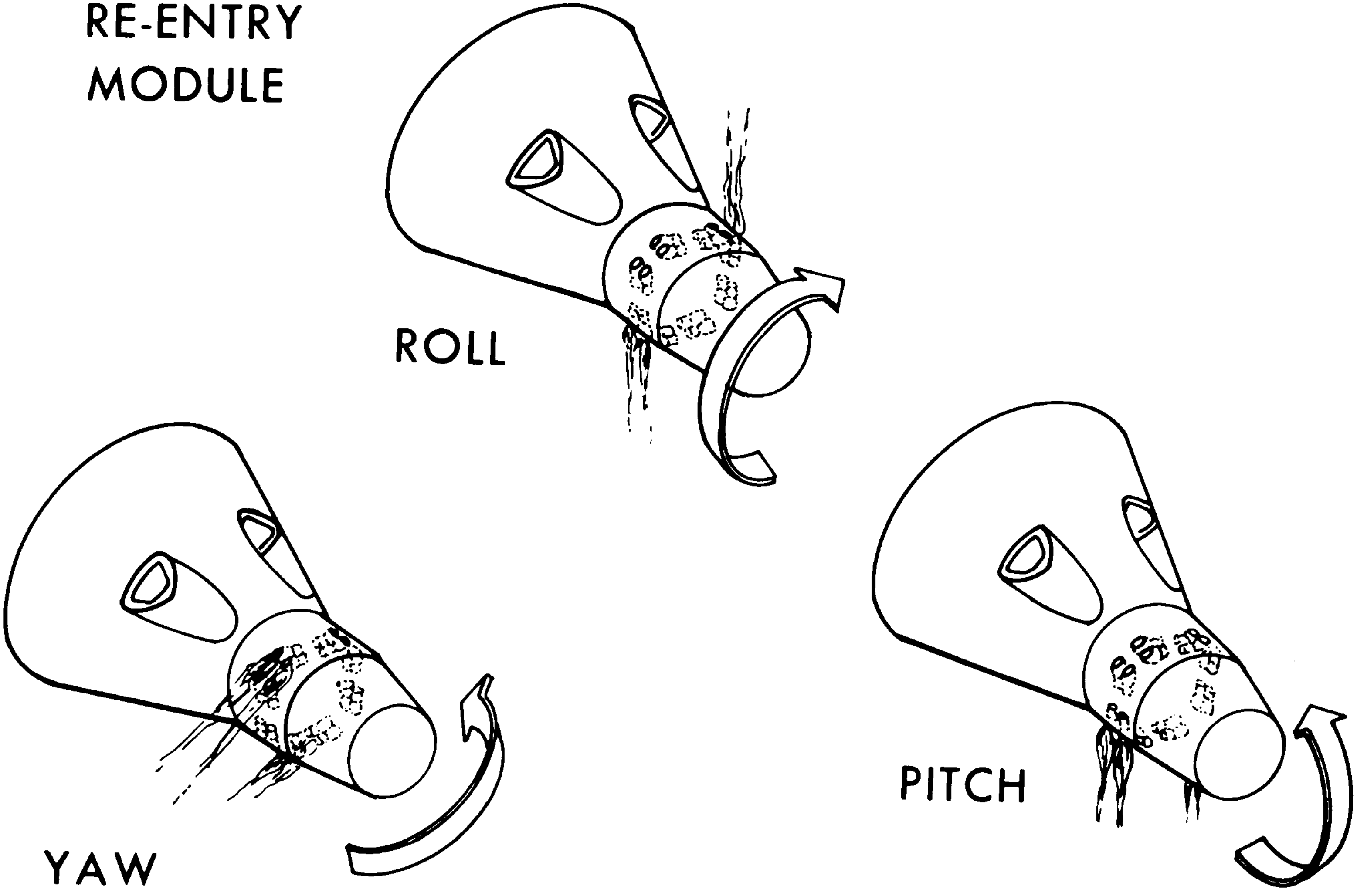
The equipment section holds batteries for electrical power, fuel for the orbit attitude and maneuver system (OAMS), the primary oxygen for the environmental control system. It also serves as a radiator for the spacecraft's cooling system which is contained in the section. The equipment section is jettisoned immediately before the retrorockets are fired for reentry and the retrograde section is jettisoned after the retrorockets are fired.

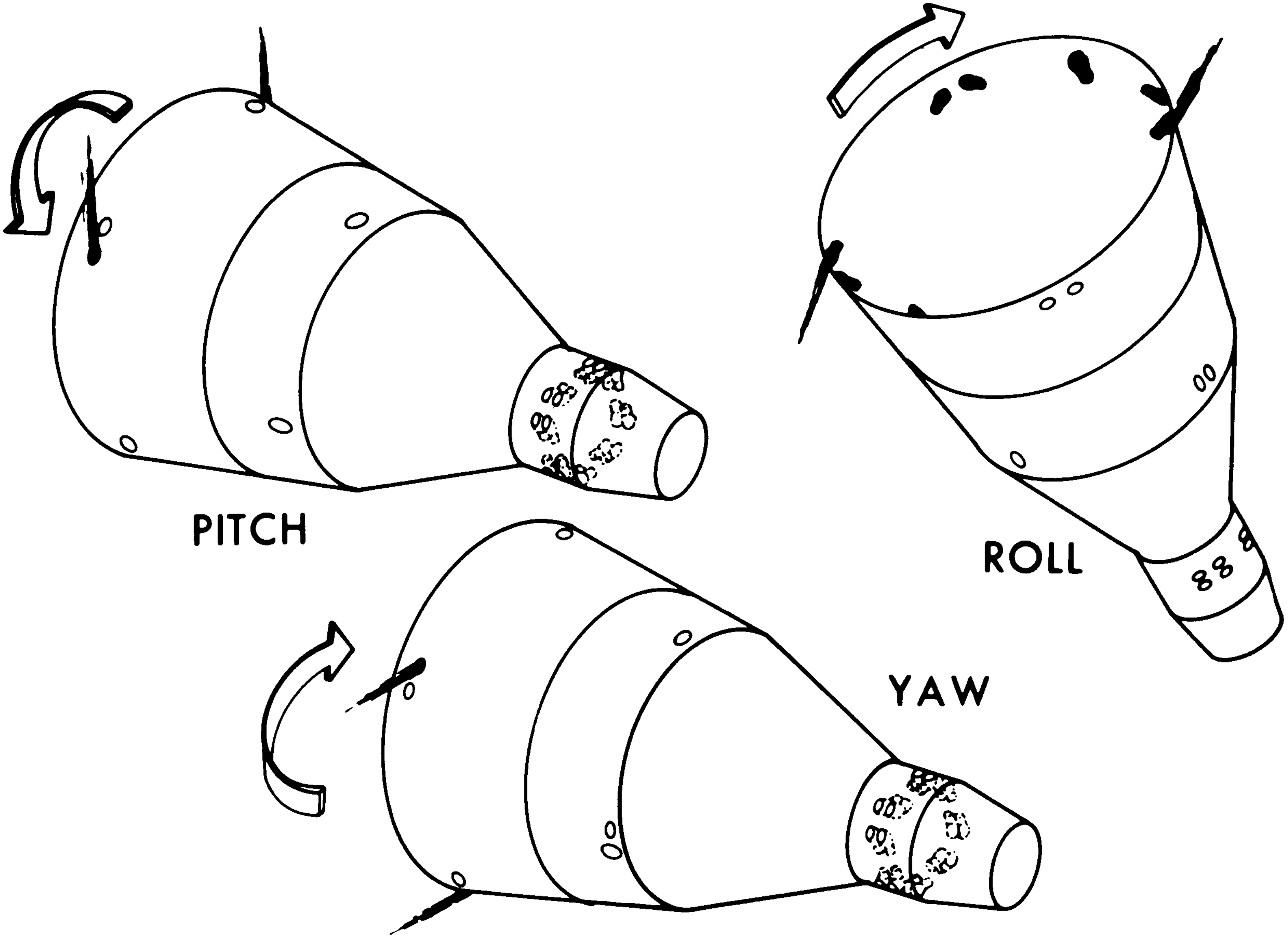
The Gemini spacecraft weighs approximately 7,000 pounds at launch. The reentry module weighs about 4,700 pounds when it lands.

McDonnell Aircraft Corp., St. Louis, is prime contractor for the Gemini spacecraft.

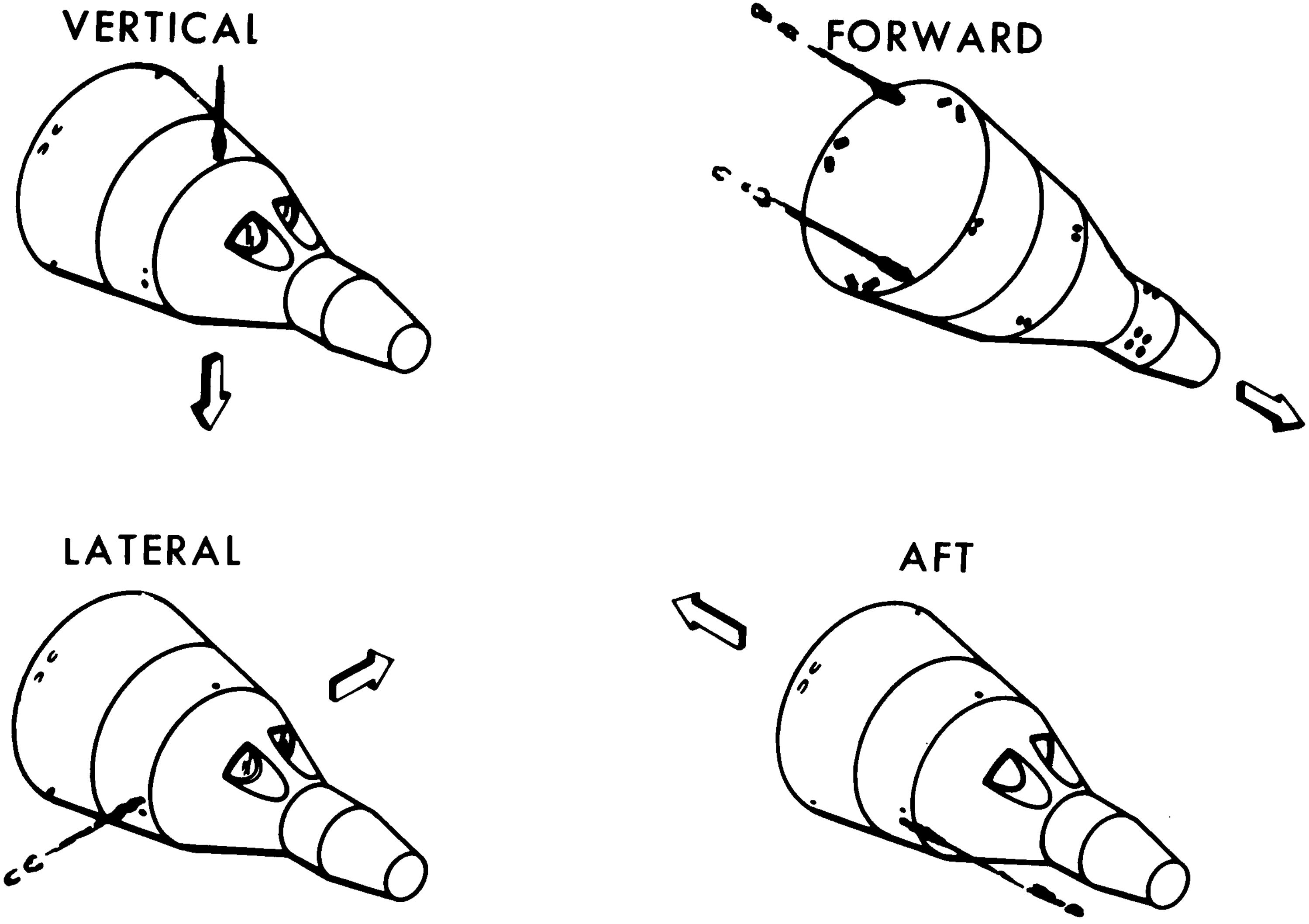
RCS FUNCTION



SPACECRAFT RESPONSES TO ORBIT ATTITUDE CONTROL THRUST



MANEUVERING CONTROL



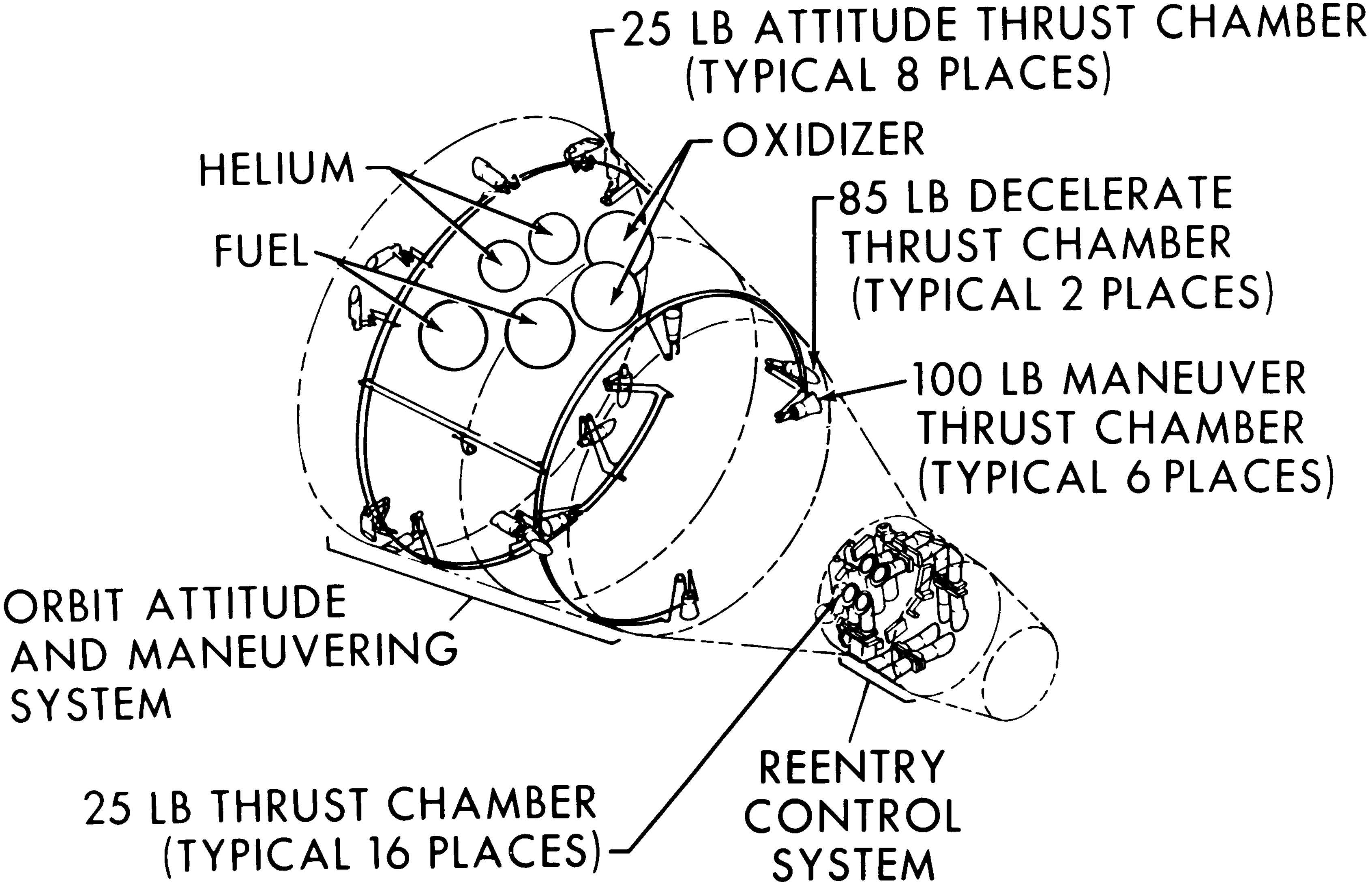
VERTICAL

FORWARD

LATERAL

AFT

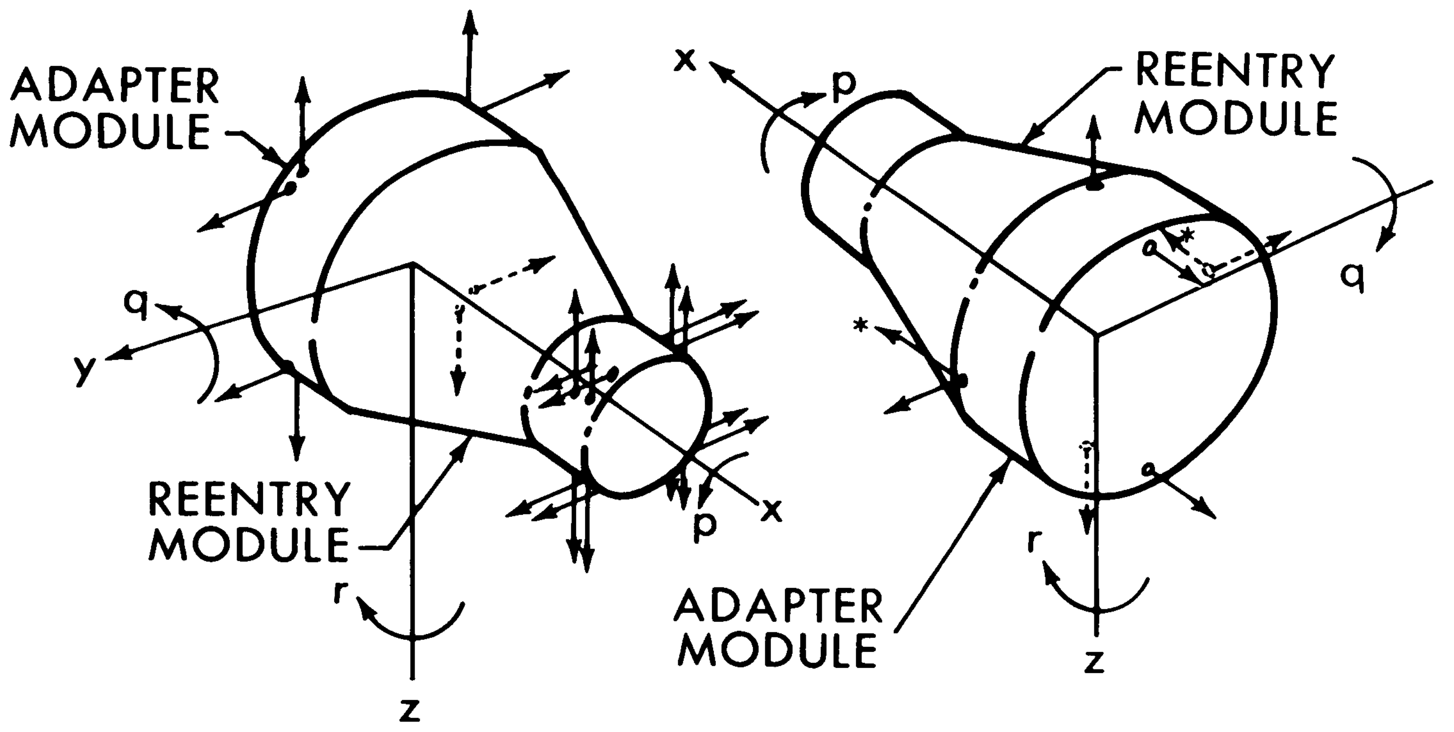
LIQUID ROCKET SYSTEMS GENERAL ARRANGEMENT



THRUST CHAMBER ARRANGEMENT

ATTITUDE CONTROL
25 LBS. THRUST PER UNIT

MANEUVER CONTROL
100 LBS. THRUST PER UNIT
* 85 LBS. THRUST PER UNIT AFT



ELECTRICAL POWER SYSTEM

The fuel cell power subsystem includes two 68-pound pressurized fuel cell sections, each containing three fuel cell stacks of 32 series-connected cells. Operating together, these sections produce up to two kilowatts of DC power at peak load.

Four conventional silver zinc batteries provide backup power to the fuel cells during launch and primary power for reentry, landing and post-landing. Three additional batteries are isolated electrically to activate pyrotechnics aboard the spacecraft. (The four main batteries can also be brought on line for this purpose if necessary.)

Besides its two cylindrical sections, the fuel cell battery subsystem includes a reactant supply of hydrogen and oxygen, stored at supercritical pressures and cryogenic temperatures.

Energy is produced in the fuel cell by forcing the reactants into the stacks where they are chemically changed by an electrolyte of polymer plastic and a catalyst of platinum. Resultant electrons and ions combine with oxygen to form electricity, heat and water. This chemical reaction will theoretically

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continue as long as fuel and oxidant are supplied. Electricity is used for power, heat is rejected by the spacecraft coolant system, and water is diverted into the spacecraft drinking supply tanks where it is separated from the crew's drinking supply by a bladder and used as pressurant to supply drinking water.

RENDEZVOUS RADAR

The rendezvous radar system, being flown for the first time aboard Gemini 5, enables the crew to measure the range, range rate and bearing angle of the Radar Evaluation Pod in space. The radar supplies essential data to the Inertial Guidance System computer so the crew can determine the maneuvers necessary to accomplish rendezvous.

The REP substitutes for the Agena spacecraft to be used on future rendezvous missions, and carries a transponder which receives radar impulses from the Gemini's radar and returns them to the spacecraft at a specific frequency and pulse width. This is called cooperative radar. Only those signals processed by the transponder in the REP are accepted by the spacecraft's radar system, allowing the crew to recognize the REP by its coded return signal. The radar receiver aboard Gemini is configured to accept only the modified return signal from the REP transponder.

The radar is installed in the small end of the Gemini spacecraft on the forward face of the rendezvous and recovery section. It uses four dual-spiral antennae -- one to transmit, three to receive. Besides the antenna system, it contains a receiver, power supplies, and computer, display and power input interfaces. The entire radar, except for controls and indicators, takes up less than two cubic feet, weighs less than 70 pounds, and requires less than 30 volts and fewer than 80 watts of power.

The spacecraft radar transmits a coded signal outward until it finds the REP which receives the signal, modifies it and retransmits the altered pulses to the Gemini spacecraft. Upon receipt of the return signal, a "lock-on" light in the crew compartment tells the crew the REP has been acquired. The computer processes range, rate and bearing information for the necessary maneuvering information to effect rendezvous.

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GEMINI LAUNCH VEHICLE

The Gemini Launch Vehicle is a modified U.S. Air Force Titan II intercontinental ballistic missile consisting of two stages.

The first stage is 63 feet high and the second stage is 27 feet high. Diameter of both stages is 10 feet. Overall height of the launch vehicle plus the spacecraft is 109 feet. Launch weight including the spacecraft is about 340,000 pounds.

The first stage has two rocket engines and the second stage has a single engine. All engines burn a 50-50 blend of monomethyl hydrazine and unsymmetrical-dimethyl hydrazine as fuel with nitrogen textroxide as oxidizer. The fuel is hypergolic, that is it ignites spontaneously when it comes in contact with the oxidizer, and is storable.

The first stage engines produce a combined 430,000 pounds of thrust at lift-off and the second stage engine produces about 100,000 pounds thrust at altitude.

Titan II was chosen for the Gemini program because of its simplified operation, thrust and availability. The following modifications were made in the Titan II to make it suitable for manned space flight launches:

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1. Addition of a malfunction detection system to detect and transmit information of problems in the booster system to the crew.

2. Modification of the flight control system to provide a back-up system should the primary system fail in flight.

3. Modification of the electrical system.

4. Substitution of radio guidance for inertial guidance.

5. Deletion of retro rockets and vernier rockets.

6. New second stage equipment truss.

7. New second stage forward oxidizer skirt assembly.

8. Simplification of trajectory tracking requirements.

9. Modification of hydraulic system.

10. Modification of instrument system.

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Gemini Launch Vehicle program management for NASA is under the direction of the Space Systems Division of the Air Force Systems Command. Contractors include:

Air Frame and system integration, Martin Co., Baltimore Divisions, Baltimore.

Propulsion systems, Aerojet-General Corp., Sacramento, Calif.

Radio command guidance system, General Electric Co., Syracuse, N.Y.

Ground guidance computer, Burroughs Corp., Paoli, Pa.

Systems engineering and technical direction, Aerospace Corp., El Segundo, Calif.

GEMINI 5 EXPERIMENTS

Seventeen experiments are scheduled during the Gemini 5 flight. Five are medical experiments, six Department of Defense experiments, five are scientific and one engineering.

A definite amount of fuel has been alloted for supporting those experiments which require spacecraft maneuvering. The experiment will be terminated when the fuel for that particular experiment has been consumed.

Medical Experiments

In-Flight Exercise: Work Tolerance*

The astronauts will use a bungee cord to assess their capacity to do physical work under space flight conditions. The bungee cord requires a 60-pound pull to stretch it to its limit of one foot. The cord will be held by loops about the astronaut's feet rather than being attached to the floor as in Project Mercury tests.

Plans call for each of the Gemini 5 astronauts to make the 60-pound stretch once per second for a minute at various times during the flight. Heart and respiratory rates and blood pressure will be taken before and after the exercise for evaluation. Time for heart rate and blood pressure to return to pre-work levels following the exercise is an index of the general condition of the astronaut.

In-Flight Phonocardiogram*

The purpose of this experiment is to serve as a sensitive indicator of heart muscle deterioration when compared to a simultaneous electrocardiogram. Heart sounds of the Gemini 5 astronauts will be picked up by a microphone on their chests and recorded on the biomedical recorder. This will be compared with the electrocardiogram to determine the time interval between heart contraction.

Bone Demineralization*

X-rays using a special technique (bone denisitometry) will be taken before and after the flights. The heel bone and the end bone of the fifth finger on the right hand of each astronaut will be studied to determine whether any demineralization has taken place and, if so, to what extent. The anticipation of possible loss of calcium from the bones during weightless flight is based on years of clinical experience with patients confined to bed or in casts.

- more -

Cardiovascular Conditioning

The purpose of this experiment is to determine the effectiveness of pneumatic cuffs in preventing cardiovascular (heart and blood distribution system) deterioration induced by prolonged weightlessness.

This test will be conducted by the pilot only. The cuffs will be applied to the upper thighs and be automatically pressurized to 80mmHg for two minutes out of every six minutes. The system will remain activated during the awake cycle each day of flight. It may be left activated continuously if desired.

Human Otolith Function

A visual tester will be used to determine the astronauts orientation capability during flight. The experiment will measure changes in otolith (gravity gradient sensors in the inner ear) functions.

The tester is a pair of special light proof goggles, one eye piece of which contains a light source in the form of a movable white line. The astronaut positions the white line with a calibrated knurled screw to what he judges to be the right pitch axis of the spacecraft. The second astronaut then reads and records the numbers.

The medical experiments are sponsored by the NASA Office of Manned Space Flight's Space Medicine Division.

*Repeat Experiment

Cardiovascular Effects of Space Flight

This is a continuation of experiments to evaluate the effects of prolonged weightlessness on the cardiovascular system. It is considered an operational procedure and no longer an experiment.

Comparisons will be made of the astronaut's preflight and postflight blood pressures, blood volumes, pulse rates, and electrocardiograms. The data will reveal the cardiovascular and blood volume changes due to heat stress, the effect of prolonged confinement, dehydration, fatigue, and possible effects of weightlessness. There are no inflight requirements.

- more -

Measurements will be taken before, during, and after a head-up tilt of 80 degrees from the horizontal.

If the astronauts remain in the spacecraft while it is hoisted aboard the recovery vessel, portable biomedical recorders will be attached to each one before he leaves the spacecraft, and blood pressure and electrocardiogram measurements will be taken. Each astronaut then will leave the spacecraft and stand on the ship's deck. Blood pressure and electrocardiogram measurements will be recorded automatically before, during, and for a short time after the crew leaves the spacecraft. The astronauts will then go to the ship's medical facility for the tilt-table tests.

SCIENTIFIC EXPERIMENTS

Synoptic Terrain Photography Experiment (S-5)*

Primary objective is to get high-quality pictures of large land areas that have been previous well-mapped by aerial photography. Such photographs can serve as a standard for interpretation of pictures of unknown areas on Earth, the Moon, and other planets.

A secondary objective is to obtain high-quality pictures of relatively poorly-mapped areas of the Earth for specific scientific purposes. For example, geologists hope that such photographs can help to answer questions of continental drift, structure of the Earth's mantle, and overall structure of the continents.

Mexico, East Africa and Arabian Peninsula and Australia will be the priority photographic objectives. Of particular interest are rift valleys which are geologically analogous to the rills found on the Moon. These rift valleys extend from Turkey, through Syria, Jordan, the Red Sea area and and eastern Africa as far south as Mozambique. By photographing these rift valleys, geologists feel that they may gain a better understanding of the crust and upper mantle of the Earth as well as the rills on the Moon.

Photography will be performed during periods of maximum daylight, from 9 A.M. to 3 P.M. local time. If cloud cover is over 50 percent in the priority areas, the astronauts will photograph subjects of opportunity -- any interesting land areas.

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A 70-mm modified Hasselblad (Swedish make), Model 500C will be used. The magazine capacity of this camera is 55 frames per roll. The nose of the Gemini 5 spacecraft will be tilted straight down. Normally, the camera will be in use from five to ten minutes, taking a photograph every six seconds of a 100-mile-wide area, thus giving continent-wide coverage when the individual frames are mounted as a continuous photographic strip.

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Space photography, in comparison with aerial photography, is thought to have the advantage of providing greater perspective, wider coverage, greater speed, and rapid repetition of coverage. These factors suggest applications in many areas of geology, weather, topography, hydrology and oceanography. For example:

(1) Geologic reconnaissance can tell us more of our own planet, leading to better interpretation of the geology of the Moon and other planets.

(2) Topographic mapping of Earth can give us newer and better maps with a scale of 1:1,000,000.

(3) Hydrology mapping could, for example, permit estimates of the amount of snowfall in particular regions and what the amount of run-off would be in the springtime, of great interest in flood prevention and control.

(4) Oceanographic mapping could, among other things, show the distribution and temperature of ocean currents; the location of ice of danger to shipping.

Space photography also shows potential for forestry mapping, for example, noting vegetation changes.

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It also can supplement the TV-type photography of our weather satellites since film provides greater resolution.

The experiment is being conducted by Dr. Paul D. Lowman, Jr., a geologist at NASA's Goddard Space Flight Center, Greenbelt, Md.

Synoptic Weather Photography Experiment (S-6)*

The synoptic Weather Photography experiment is designed to make use of man's ability to photograph cloud systems selectively--in color and in greater detail than can be obtained from the current TIROS meteorological satellite.

The Gemini 5 crew will photograph various cloud systems. They will be using the same 70-mm Hasselblad camera and Ektachrome film as for the Synoptic Terrain Photography experiment.

A primary purpose of the experiment is to augment information from meteorological satellites. Observations from meteorological satellites are contributing substantially to knowledge of the Earth's weather systems. In many areas they provide information where few or no other observations exist. Such pictures, however, are essentially television views of large areas taken from an altitude of 400 miles or more.

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They lack the detail which can be obtained in photographs taken from the Gemini height of about 100 miles.

One of the aims of the S-6 experiment in the Gemini 5 and subsequent flights is to get a better look at some of the cloud patterns seen on TIROS pictures, but not fully understood. There are cellular patterns, cloud bands radiating from a point, apparent shadows of indistinguishable high clouds on low cloud decks, and small vortices sometimes found in the lee of mountainous islands.

Another objective is to get pictures of a variety of storm systems, such as weather fronts, squall lines, or tropical disturbances, so that their structure can be better understood.

Finally, the experimenters hope to get several sets of views of the same area on subsequent passes of the spacecraft to see how various weather phenomena move and develop.

The experimenters are Kenneth M. Nagler and Stanley D. Soules, both of the Weather Bureau's National Weather Satellite Center. Nagler has a dual role in the Gemini 5 spaceflight, serving both as an experimenter in the weather photography effort and as Head of the Spaceflight Meteorology Group which provides NASA the forcasting support for its manned spaceflight programs.

Zodiacal Light Photography (S-1)

The origin of the zodiacal light has long been a matter of scientific speculation. During Gemini 5 the astronauts will photograph the light in an attempt to determine its origin.

The zodiacal light appears as a cloudy, hazy light seen in the west after twilight and in the east before sunrise. It will be visible to the astronauts for about four minutes just before sunrise and another four minutes just after sunset. During these periods, the astronauts will photograph the phenomenon using a hand held 35-mm Widelux camera loaded with high speed color film.

There will also be attempts to photograph air glow, a faint background illumination of the night sky.

Cloud Top Spectrometer (S-7)

In this experiment, several spectrograms will be taken of various types of cloud formations. The equipment to be used is essentially a 35-mm camera fitted with a defraction grating and containing infrared film.

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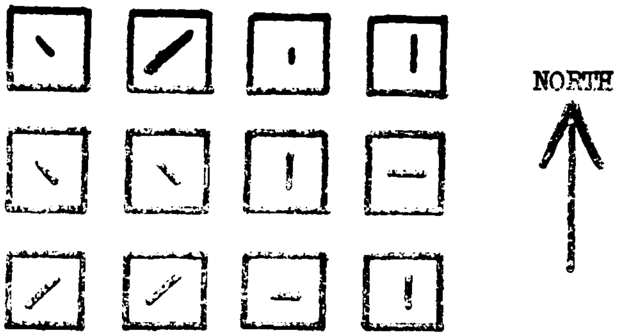
Results of the experiment will be valuable in aiding scientists in the design of weather satellites. Present day weather satellites, TIROS, yield extremely useful and detailed cloud photographs. However, they do not give the altitude of the clouds, an important factor in determing the severity of weather formations.

Visual Acuity (S8 and D13)

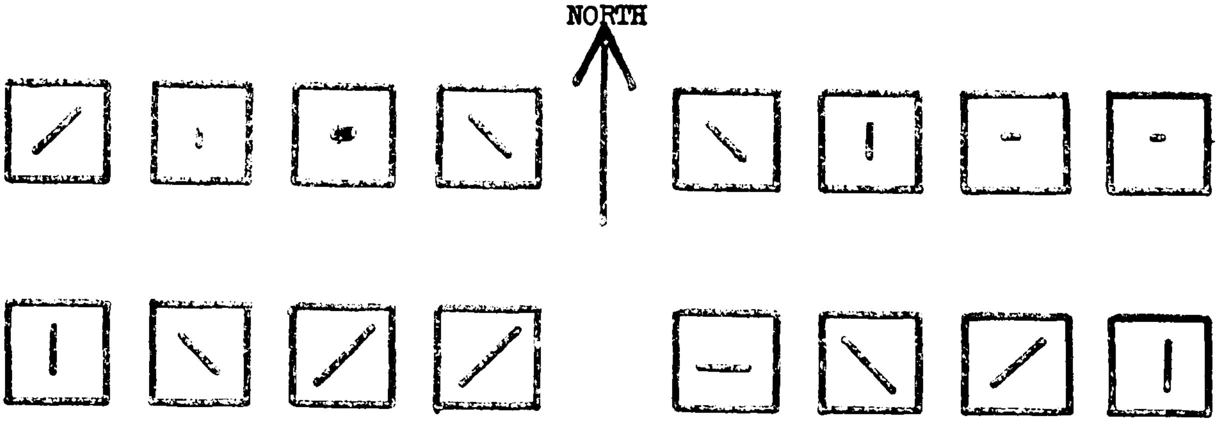
The visual ability of the astronauts in the detection and recognition of objects on the earth's surface will be tested in this experiment.

The astronaut will view well know ground patterns which have been laid out near Laredo, Tex., and near Carnavon, Australia, on the Woodleigh Ranch.

The Texas site consists of 12 background test areas. The markings are made out of white gypsum. In Australia, the markings are made from white shells obtained from deposits along the coast.



Arrangement of ground markings at Southern Texas site.



Arrangement of ground markings at Western Australian site.

During passage of the spacecraft over the sites, the command astronaut shall be responsible for maintaining the proper spacecraft attitude while the second astronaut observes the target area and makes verbal comments to the principal investigator at the site.

For five minutes in each 24 hour period, each astronaut will use the on-board vision tester to test his own visual acuity on an opportunity basis.

-more-

For one 10-minute period near the end of the flight, both astronauts will cooperate in obtaining a photometer scan of the window. This photometer scan serves to determine the gradient of scattering across the window and must be done while the spacecraft window is pointed at a black part of the sky and at an angle to the sun.

A NASA Visibility Laboratory instrumented trailer van will be at the selected areas during the mission to record light and atmospheric conditions. An Air Force C-130 instrumented by the Visibility Laboratory will fly over the area at the time of the orbits used for sighting to document the pertinent optical properties of the atmosphere as a function of altitude.

ENGINEERING EXPERIMENT

Electrostatic Charge (MSC-1)

This is a repeat of an experiment conducted on Gemini 4. Objective is to detect and measure any accumulated electrostatic charge on the surface of the Gemini spacecraft. Natural charging mechanisms and charged particles ejected from rocket engines can cause an electrostatic potential, and this must be investigated before rendezvous and docking missions are attempted.

Differences in potential between docking space vehicles can cause an electrical discharge which could damage the vehicle skin and electronic equipment and ignite pyrotechnics aboard the spacecraft. If the spacecraft potential and capacitance is known, it will be possible to calculate the net charge on the spacecraft and the energy available for an electrical discharge between the spacecraft and another space vehicle of known potential.

Any accumulated charge on the surface of the Gemini 5 spacecraft will be measured by an electrostatic potential meter. The experiment will be conducted during all periods of extensive spacecraft attitude maneuvering and during retrofire. Data obtained will be telemetered to ground stations.

-more-

The electrostatic potential meter consists of a sensor unit and an electronics unit. Both are located in the spacecraft's adapter section. The sensor unit's face is flush with the outer surface of the spacecraft and obtains electrical signals proportional to the spacecraft potential.

TECHNOLOGICAL EXPERIMENTS (DOD)

Basic Object Photography (D-1)

The purpose of this experiment is to determine man's ability to acquire, track and photograph objects in space. The astronaut will have a list of objects to be photographed. It includes the booster, rendezvous evaluation pod and natural celestial bodies such as the Moon.

Equipment to be used is a 35mm Zeiss contarex camera which will be mounted on the pilot's side, right window. A 1270mm lens will be used for celestial body photographs. It and a 200mm lens will be used for the pod photographs.

Nearby Object Photography (D-2)

This experiment will be conducted after completion of the radar rendezvous tests and is designed to test man's proficiency in obtaining high resolution photographs of an orbiting object while maneuvering, station keeping and observing in a manual control mode.

The same camera equipment as in D-1 will be used.

In carrying out the experiment the command pilot will maneuver to within 40 feet of the REP and circle it. Photographs will be taken with the 200mm lens at seven points about the REP.

Celestial Radiometry (D-4)

For this experiment the spacecraft is equipped with radiometric measuring devices using common mirror optics that can measure radiant intensity from the ultra-violet through infrared as a function of wave length.

The results of this experiment will provide information on the spectral analysis of regions of interest, supplied by the star fields, principal planets, Earth and Moon.

Instrumentation for this (and the later described D-7 experiment) include a three channel spectro-radiometer, a dual channel Michelson Interferometer-Spectrometer and a cryogenically cooled Michelson Interferometer-Spectrometer. These sensing units will be housed in the Gemini adapter section. (See D-7)

Surface Photography (D-6)

The objective of the surface photography experiment is to investigate technical problems associated with man's ability to acquire, track and photograph terrestrial objects.

The astronauts will have a list of subject areas to be photographed. The areas include selected cities, rail, highways, harbors, rivers, lakes, illuminated night-side sites, ships and wakes. All subject areas are within the United States and Africa.

The camera to be used is a 35mm Zeiss contarex single lens reflex with interchangeable lenses.

Space Object Radiometry (D-7)

This is an extension of the D-4 experiment and uses the same basic equipment. However, camera equipment will also be used to obtain a visual correlation if possible.

The objectives for both this and the D-4 experiment are to determine the threshhold of sensitivity values for earth objects and sky background radiation and radiation signatures of various objects in space and on the ground.

In the D-7 experiment the astronauts will attempt to observe the Titan II second stage, REP, exhaust plumes of rocket vehicles launched from the Eastern or Western Test Ranges, rocket sled exhausts at Holloman Air Force Base, volcanoes and forest fires as well as contrasting background areas such as deserts and warm ocean currents.

The following are active volcanoes which lie within the Gemini 5 flight path:

Kilauea - Hawaii
San Miguel - El Salvador
Telica, Nicaragua
Irazu, Costa Rica
Langla - New Britain Islands

The experiment sponsors believe that pointing accuracy, ability to change sensitivity levels and other basic control functions can best be accomplished by a human operator.

Visual Acuity (D-13)

Joint NASA experiment, see S-8.

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MANNED SPACE FLIGHT TRACKING NETWORK

The Manned Space Flight Network for Gemini 5 is composed of spacecraft tracking and data acquisition facilities throughout the world: The Mission Control Center, Cape Kennedy; Mission Control, Houston; and real-time (no delay) computing centers at the Goddard Space Flight Center, Greenbelt, Md., and the Manned Spacecraft Center. In addition Goddard will serve as the mission communications center.

The basic network for Gemini 5 consists of seven primary land sites, three ships, (the Rose Knot, Coastal Sentry and Wheeling) **six** additional land stations, and remote voice data switching sites. This network and its operating procedures remain unchanged from the Gemini 4 mission. As in Gemini 4 the primary mission control and computing will be the responsibility of the Mission Control Center, Manned Spacecraft Center.

The Locations of the land stations are as follows:

Primary Stations	Additional Stations
Cape Kennedy, Fla., and downrange Air Force Eastern Test Range sites	Kano, Nigeria Madagascar (Tananarive)
Bermuda	Canton Island
Grand Canary Island	Point Arguello, Calif.

Carnarvon, Australia
Hawaii
Guaymas, Mexico
Corpus Christi, Tex.
Three Ships: The USNS Rose Knot, USNS Coastal Sentry, and USNS Wheeling

White Sands, N.M.
Eglin AFB, Fla.

Other tracking and data acquisition facilities, such as relay aircraft, instrumentation ships, communications, relay stations, etc., will be called up as required and integrated into the basic network. Total ground station facilities number 24.

Goddard Computer Support

Countdown phase -- The Goddard Realtime Computing Center will provide computing support to the Manned Spacecraft Center Realtime Computing Complex throughout the countdown phase. During the pre-launch countdown Goddard will be responsible for checking the Manned Space Flight Network's readiness to support Gemini 5 through its CADFISS (Computer and Data Flow Integrated Subsystems) Tests.

The GSFC Realtime Computing Center also will provide prime computer support for all network tracking and data acquisition systems (Radars-Digital Command System-Pulse

Code Modulation telemetry and the Launch Monitor Subsystem) roll call.

Data flow tests from the world-wide network to the Manned Spacecraft Center's Realtime Computing Complex will be conducted from MSC RTCC under the direction of Goddard's CADFISS Test Director.

Goddard's prime computing responsibilities for Gemini 5 does not include full-time, real-time back-up for the Houston RTCC as in Gemini 4.

Mission Computing Requirements

Goddard's prime computing requirements in support of Gemini 5 occur in three principal areas:

(a) Full mission network systems testing through CADFISS Test Program.

(b) Booster lifetime tracking data processing.

(c) REP (Radar Evaluation Pod) tracking data processing from approximately 145 minutes after liftoff through the rendezvous experiment (approximately seven hours)

NASA Communications Network (NASCOM)

This Division, a Goddard responsibility, will establish and operate the world-wide ground communications network that provides teletype, voice, and data links between the stations and control centers for the network.

It links 89 stations, including 34 overseas points, with message, voice and data communications. Its circuits and terminals span 100,000 route miles and 500,000 circuit miles.

For Gemini 5 the Communications Network (NASCOM) will be used in the same basic configuration as for Gemini 4.

During Gemini 4, voice communication with the spacecraft via the Syncom III communications satellite and NASCOM ground stations was successfully achieved over the Pacific Ocean. For Gemini 5 a similar exercise is planned utilizing Syncom III.

Also part of NASCOM is the voice communication net.

A switchboard system, with multiple dual-operating consoles, enables one operator to concentrate on special mission conferences. This system is called SCAMA II (Station

Conferencing and Monitoring Arrangement). SCAMA II can now handle 100 lines and can ultimately be expanded to handle 220 lines. Both point-to-point connections and conference arrangements are possible. All lines can be connected into one conference without loss of quality. The SCAMA operator can add conferees or remove them. He also controls which of the conferees can talk and which can listen only.

The SCAMA has 10 times the capability of the network used for Mercury.

Spacecraft Communications

All Manned Space Flight Network stations having both high frequency (HF) and ultra high frequency (UHF) spacecraft communications can be controlled either by the station or remotely controlled by Goddard, Mission Control Center, Houston, or Mission Control Center, Cape Kennedy.

The following sites have a Capsule Command Communicator who controls spacecraft communications at the site: Canary Island; Carnarvon; Kuai, Hawaii; Corpus Christi; Guaymas; USNS Rose Knot; and USNS Coastal Sentry.

The following stations will not have Capsule Communicators and will be remoted to the appropriate Mission Control Center: Grand Bahama Island; Tananrive (Madagascar); Kano, Nigeria; Bermuda; Grand Turk Island; Antigua Island; Ascension Island; Canton Island; Pt. Arguello, Calif. USNS Wheeling (ship) and the voice relay aircraft.

Network Responsibility

Goddard Space Flight Center. NASA's Office of Tracking and Data Acquisition has centralized the responsibility for the planning, implementation, and technical operations of manned space flight tracking and data acquisition at Goddard. Technical operation includes operation, maintenance, modification, and augmentation of tracking and data acquisition facilities as an instrumentation network in response to mission requirements. About 370 persons directly support the network at Goddard.

Manned Spacecraft Center. The MSC has the overall management responsibility of the Gemini program. The direction and mission control of the network immediately preceding and during a mission simulation or an actual mission is the responsibility of the MSC.

Weapons Research Establishment. The WRE, Department of Supply, Commonwealth of Australia, is responsible for the maintenance and operation of the network stations in Australia. Contractual arrangements and agreements define this cooperative effort.

Department of Defense. DOD is responsible for the maintenance and operational control of those DOD assets and facilities required to support Gemini. These include network stations at the Eastern Test Range, Western Test Range, the Air Proving Ground Center and the White Sands Missile Test Range.

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	C-Band Radar	Telemetry Receive and Record	Telemetry Real-Time Display	Telemetry Data Dump	Telemetry Experiment Read & Record	High-Speed Telemetry Data	Remote Site Data Summary	Gemini Launch Vehicle Telemetry	Gemini Launch Vehicle Command	Digital Command System	Down Range Up Link	RF Command	Voice (SCAMA)	Teletype (NASCOM)	High Speed Radar Data	Flight Control Team Manned	Acquisition Aid	Telemetry Receiving Antenna	Flight Control Team Air to Ground	Air Ground Remoting from MCC-H
Mission Control Center Houston			X	X		X	X	X		X			X	X	X	X			X	X
Mission Control Center Kennedy		X		X	X	40.8	X	X		X			X	X			X	X		X
Merritt Island Launch(K)	X														X					
Cape Kennedy		X						X	X		X	X			X			X		X
Patrick AF Base	X														X					
Grand Bahama Island		X		X	40.8			X	X		X	X			X			X		X
Grand Turk Island	X	X		X	40.8			X	X		X	X			X		X	X		X
Bermuda	X	X		X	2.0			X			X	X	X	X	X		X			X
Canary Islands	X	X	X	X			X			X		X	X	X		X	X		X	X
Kano, Nigeria		X		X	X								X	X			X			X
Tananarive, Madagascar		X											X	X			X			X
Carnarvon, Australia	X	X	X	X	X		X			X		X	X	X		X	X			X
Canton Island		X											X	X			X			X
Kauai, Hawaii	X	X	X	X	X		X			X		X	X	X		X	X		X	X
Guaymas, Mexico		X	X	X	X		X						X	X		X	X		X	X
Point Arguello, Calif.	X	X			X								X	X			X			X
Corpus Christi, Texas		X	X	X	X	2.0	X			X	X	X	X	X		X	X		X	X
White Sands, New Mexico	X												X	X			X			
Eglin Field, Florida	X												X	X			X			
Antigua	X	X		X		40.8					X	X			X			X		X
Ascension Island	X	X			X										X			X		X
USNS Coastal Sentry(Ship)		X	X	X			X			X		X	X	X		X	X		X	X
USNS Rose Knot		X	X	X			X			X		X	X	X		X	X		X	X
USNS Wheeling	X	X											X	X			X			X
Aircraft		X		X																X
Wallops													X	X						
Pretoria	X														X					

CREW BIOGRAPHIES

L. (for Leroy) Gordon Cooper, Jr., Gemini 5 command pilot

BORN: Shawnee, Okla, Mar. 6, 1927.

HEIGHT: 5 ft., 8 in., WEIGHT: 155 lbs.; Brown hair, blue eyes.

EDUCATION: Bachelor of Science degree in aeronautical engineering, Air Force Institute of Technology, 1956.

MARITAL STATUS: Married to the former Trudy Olson of Seattle, Wash.

CHILDREN: Camala, Nov. 16, 1948; Janita, Mar. 15, 1950.

EXPERIENCE: Cooper, an Air Force lieutenant colonel, received an Army commission after completing three years of schooling at the University of Hawaii. He transferred that commission to the Air Force and was placed on extended active duty by that service in 1949 and given flight training.

Upon completion of flight training, Cooper was assigned to the 86th Fighter Bomber Group in Munich, Germany, where he flew F-84's and F-86's for four years. While in Munich, he attended the European extension of the University of Maryland Night School.

On returning to the United States, he was assigned as a student at the Air Force Institute of Technology and received his degree in aeronautical engineering in 1956 following two years work there.

After graduation from AFIT, Cooper attended the Air Force Experimental Flight Test School at Edwards Air Force Base, Calif. He was graduated from this school in April 1957, and subsequently assigned to duty in the Performance Engineering Branch of the Flight Test Division at Edwards. He participated in the flight testing of experimental fighter aircraft, working as an aeronautical engineer and a test pilot.

Cooper has logged more than 3,400 hours flying time, including more than 2,300 hours in jet aircraft.

- more -

CURRENT ASSIGNMENT: Cooper was one of the seven Project Mercury astronauts named by NASA in April 1959. On May 15-16, 1963, he piloted his "Faith 7" spacecraft on a 22-orbit mission which completed the operational phase of Project Mercury. During the flight, which lasted 34 hours and 20 minutes, he attained a maximum altitude of 166 statute miles, a speed of 17,546 miles per hour, and traveled 546,167 statute miles. He was awarded the NASA Distinguished Service Medal for his flight. Also awarded Astronaut Wings.

Cooper is the son of Mrs. Leroy G. Cooper of Carbondale, Colo. His father, a retired Air Force colonel, died in March 1960.

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Charles Conrad, Jr., Gemini 5 pilot

BORN: Philadelphia, Pa., June 2, 1930

HEIGHT: 5 ft., 6 in.,WEIGHT: 142 lbs.; Blonde hair, blue eyes.

EDUCATION: Bachelor of Science degree in aeronautical engineering from Princeton University, 1953.

MARITAL STATUS: Married to the former Jane DuBose of Uvalde, Tex.

CHILDREN: Peter, Dec. 25, 1954; Thomas, May 3, 1957; Andrew, Apr. 30, 1959; Christopher, Nov. 26, 1960.

PROFESSIONAL ORGANIZATIONS: Member, American Institute of Aeronautics and Astronautics; Associate Member of Society of Experimental Test Pilots.

EXPERIENCE: He entered the Navy following his graduation from Princeton University and became a naval aviator. He is now a Navy Lieutenant Commander.

Conrad attended the Navy Test Pilot School at Patuxent River, Md, 1959-1961, and following completion of that school was a project test pilot in the armaments test division there. He also served at Patuxent as a flight instructor and performance engineer.

He served as a F4H flight instructor and as Safety Officer for Fighter Squadron 96 at the Marimar, Calif, Naval Air Station.

He has logged more than 3,200 flying hours, including more than 2,400 hours in jet aircraft.

CURRENT ASSIGNMENT: Conrad was in the second group of astronauts selected by NASA in September 1962. In addition to participating in the overall astronaut training program, his duties included monitoring the Apollo Command Service and Lunar Excursion Modules before his selection to the Gemini 5 crew.

Conrad is the son of Charles Conrad, Sarasota, Fla., and Mrs. Frances V. Sargent, Haverford, Pa.

Neil A. (for Alden) Armstrong, Gemini 5 backup crew, command pilot.

BORN: Wapakoneta, Ohio, Aug. 5, 1930

HEIGHT: 5 ft., 10 1/2 in., WEIGHT: 168 lbs, Blonde hair, blue eyes.

EDUCATION: Bachelor of Science degree in aeronautical engineering from Purdue University, 1955.

MARITAL STATUS: Married to the former Janet Shearon of Evanston, Ill.

CHILDREN: Eric, June 30, 1957; Mark, Apr. 8, 1963.

PROFESSIONAL ORGANIZATIONS: Charter member of the Society of Experimental Test Pilots; associate fellow of the American Institute of Aeronautics and Astronautics; and member, Soaring Society of America. He was the recipient of the 1962 Institute of Aerospace Sciences Octave Chanute Award.

EXPERIENCE: Armstrong was a Naval aviator from 1949 to 1952 and flew 78 combat missions during the Korean action.

He joined NASA's Lewis Research Center in 1955 (then NACA Lewis Flight Propulsion Laboratory) and later transferred to the NASA High Speed Flight Station at Edwards, Calif., as an aeronautical research pilot for NACA and NASA.

Armstrong has participated in flight test work on the F-100, F-104, B-47, F-102, and the X-15.

He has logged more than 3,200 hours flying time, including 1,800 hours in jet aircraft.

CURRENT ASSIGNMENT: Armstrong was selected as an astronaut by NASA in September 1962. In addition to participating in all phases of the overall astronaut training program, he has had a variety of special assignments. He was in charge of Operations and Training in the Astronaut Office before his assignment to back-up crew for Gemini 5.

Armstrong is the son of Mr. and Mrs. Stephen Armstrong, Wapakoneta, Ohio.

- more -

Elliot M. (for McKay) See, Jr., Gemini 5 backup crew, pilot

BORN: Dallas, Tex., July 23, 1927

HEIGHT: 5 ft., 8 in., WEIGHT: 150 lbs; Brown hair, blue eyes.

EDUCATION: Bachelor of Science degree, U. S. Merchant Marine Academy, 1949; Master of Science degree in engineering, University of California at Los Angeles, 1962.

MARITAL STATUS: Married to the former Marilyn J. Denahy of Georgetown, Ohio.

CHILDREN: Sally, Feb. 22, 1956; Carolyn, Nov. 16, 1957; David, Aug. 12, 1962.

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS: Member of Society of Experimental Test Pilots; Associate Fellow of American Institute of Aeronautics and Astronautics.

EXPERIENCE: Naval aviator from 1953 to 1956.

General Electric Co. from 1949 to 1953 and 1956 to 1962 as a flight test engineer, group leader, and experimental test pilot. Served as project pilot on J79-8 engine development program in connection with F4H aircraft. Conducted powerplant flight tests on the J-47, J-73, J-79, CJ805 and CJ805 aftfan engines. This work involved flying in F-86, XF4D, F-104, F11F-1F, RB-66, F4H, and T-38 aircraft.

He has logged more than 3,900 hours flying time, including more than 3,300 in jet aircraft.

CURRENT ASSIGNMENT: See was selected as an astronaut in the group named in September 1962. He participates in all phases of the astronaut training program and had specific responsibility for monitoring the design and development of guidance and navigation systems, and aiding in the coordination for mission planning, before his assignment to Gemini 5.

See is the son of Mr. & Mrs. Elliot M. See, Dallas.

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PREVIOUS GEMINI FLIGHTS

Gemini 1, April 8, 1964

This was an unmanned orbital flight to test the Gemini launch vehicle performance and the ability of the spacecraft and launch vehicle to withstand the launch environment. The first production Gemini spacecraft was used. It was equipped with instrumentation designed to obtain data on exit heating, structural loads, temperature, vibrations and pressures. The launch vehicle was essentially the same configuration as will be flown on all Gemini missions.

Primary objectives of Gemini 1, all successfully accomplished:

1. Demonstrate and qualify Gemini launch vehicle performance.

2. Determine exit heating conditions on the spacecraft and launch vehicle.

3. Demonstrate compatibility of the launch vehicle and spacecraft through orbital insertion.

4. Demonstrate orbital insertion.

The combined spacecraft and launch vehicle second stage orbited for about four days. Recovery was not attempted.

Gemini 2, Jan. 19, 1965

This was an unmanned ballistic flight to qualify spacecraft reentry heat protection and test the major Gemini systems required for manned orbital flights.

Primary objectives of Gemini 2, all successfully accomplished:

1. Demonstrate the adequacy of the spacecraft afterbody heat protection during a maximum heating rate reentry.

2. Demonstrate spacecraft separation from the launch vehicle and separation of the equipment and retrograde sections.

3. Qualify all spacecraft and launch vehicle systems as required for manned orbital flights.

4. Demonstrate combined spacecraft and launch vehicle checkout and launch precedures.

5. Demonstrate spacecraft recovery systems and recover the spacecraft.

The Gemini 2 flight was delayed three times by adverse weather -- damage to the electrical systems by lightning in August 1964, by Hurricanes Cleo and Dora in September. In

December the attempted launch was terminated because of a hydraulic component failure. The vehicle had shifted to the back-up hydraulic system but the man-rating capability of the launch vehicle prohibits liftoff when the vehicle is operating on a back-up system.

Gemini 3, March 23, 1965.

This was the first manned flight. Astronauts Virgil I. Grissom and John W. Young made three orbits of the Earth in four hours and 53 minutes. The spacecraft landed about 50 miles short of the planned landing area in the Atlantic Ocean because the spacecraft did not provide as much lift as expected during the reentry and landing phase.

Objectives of the Gemini 3 mission:

1. Demonstrate manned orbital flight in the Gemini spacecraft and qualify it for long-duration missions.

2. Evaluate the Gemini design and its effects on crew performance capabilities for the mission period.

3. Exercise the orbital orientation and maneuvering system.

- more -

4. Evaluate controlled flight path reentry by controlling the spacecraft roll and utilizing the force resulting from an offset in the spacecraft center of gravity.

5. Conduct experiments.

Gemini 4, June 3-7, 1965

This second manned Gemini flight completed 62 revolutions and landed in the primary recovery area in the Atlantic Ocean after 97 hours, 59 minutes of space flight. Astronaut James A. McDivitt was command pilot, with Astronaut Edward H. White II as pilot. White conducted 22 minutes of Extravehicular Activity (EVA) using a self-maneuvering unit for the first time in space. The crew conducted 11 scientific experiments successfully, but failed in an attempt to perform a near-rendezvous maneuver with the Titan second stage because of inadequate maneuvering fuel quantities. Because of a malfunction in the Inertial Guidance System, crew made a zero lift ballistic reentry.

Objectives of the Gemini 4 mission:

1. Demonstrate and evaluate performance of spacecraft systems for a period exceeding four days.

2. Evaluate effects of prolonged exposure to space environment of the crew.

3. Evaluate EVA equipment, including Hand-Held Self-Maneuvering Unit (HHSMU), and man's ability to perform useful work outside the spacecraft.

4. Demonstrate OAMS capability to perform retrofire back-up maneuver.

5. Demonstrate capability of spacecraft and crew to make in-plane and out-of-plane maneuvers.

6. Conduct experiments.

PROJECT OFFICIALS

George E. Mueller	Associate Administrator, Office of Manned Space Flight, NASA Headquarters. Acting Director, Gemini Program.
William C. Schneider	Deputy Director, Gemini Program, Office of Manned Space Flight, NASA Headquarters.
E. E. Christensen	Director, Mission Operations, NASA Headquarters Mission Director
Charles W. Mathews	Gemini Program Manager, Manned Spacecraft Center, Houston
Christopher C. Kraft	Flight Director, Manned Spacecraft Center, Houston
Lt. Gen. Leighton I. Davis	USAF, National Range Division Commander and DOD Manager of Manned Space Flight Support Operations.
Maj. Gen. V. G. Huston	USAF, Deputy DOD Manager
Col. Richard C. Dineen	Director, Directorate Gemini Launch Vehicles, Space Systems Division, Air Force Systems Command.
Lt. Col. John G. Albert	Chief, Gemini Launch Division, 6555th Aerospace Test Wing, Air Force Missile Test Center, Cape Kennedy, Fla.
R. Admiral B. W. Sarver	USN, Commander Task Force 140.

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U.S. MANNED SPACE FLIGHTS

MISSION	SPACECRAFT HRS.			MANNED HOURS IN MISSION			TOTAL MANNED HRS. CUMULATIVE		
	HRS.	MIN.	SEC.	HRS.	MIN.	SEC.	HRS.	MIN.	SEC.
MR-3 (Shepard)		15	22		15	22		15	22
MR-4 (Grissom)		15	37		15	37		30	59
MA-6 (Glenn)	4	55	23	4	55	23	5	26	22
MA-7 (Carpenter)	4	56	05	4	56	05	10	22	27
MA-8 (Schirra)	9	13	11	9	13	11	19	35	38
MA-9 (Cooper)	34	19	49	34	19	49	53	55	27
Gemini 3 (Grissom & Young)	4	53	00	9	46	00	63	41	27
Gemini 4 (McDivitt & White)	97	56	11	195	52	22	259	33	49

CONVERSION TABLE

Feet Per Second	Miles Per Hour	Kilometers Per Hour
3	2.04	3.3
5	3.40	5.5
10	6.8	11.0
14	9.5	15.4
15	10.2	16.5
16	10.9	17.6
29.8	20.26	32.78
20,700.00	14,076.00	22,770.00
24,000.00	16,320,00	26,400.00
25,807.00	17,549.00	28,254.00

Statute Miles	Kilometers
1.7	2.77
6.0	9.66
7.0	11.27
14.9	23.99
17.5	28.18
99.0	159.59
100.0	161.00
106.0	170.66
212.0	341.32
219.0	352.6
229.0	368.69
500.0	805.00