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PRESS KIT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546
TELS. WO 2-4155
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FOR RELEASE: WEDNESDAY AM'S
October 20, 1965

RELEASE NO: 65-327

PROJECT: GEMINI 6

CONTENTS

To be launched no earlier than October 25, 1965.

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NOTE TO EDITORS:

Supplemental information will be released as rapidly as it develops.

NEWS NASA
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NASA SCHEDULES

GEMINI 6 RENDEZVOUS,

DOCKING, MISSION

Late this month the National Aeronautics and Space Administration will attempt the most difficult manned space flight yet undertaken by the United States--a rendezvous and docking mission in which the Gemini 6 spacecraft will be flown to and linked with an Agena vehicle.

Development of the ability to rendezvous and dock is necessary for the accomplishment of such missions as the Apollo manned Moon landing, resupply of space stations and repair of unmanned satellites.

Gemini 6, scheduled no earlier than Oct. 25, will be the fourth manned mission in the National Aeronautics and Space Administration's two-man space flight program. The first two Gemini missions were unmanned.

Gemini 6 is planned as a two-day mission. However, if all objectives are accomplished by the end of one day, the flight will be ended then.

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Prime crewmen are Astronauts Walter M. Schirra, Jr., command pilot, and Thomas P. Stafford, pilot. The backup crew consists of the first two men to orbit the Earth in a Gemini spacecraft, Astronauts Virgil I. "Gus" Grissom, an Air Force lieutenant colonel, and John W. Young, a Navy commander. Schirra, a Navy captain, and Stafford, an Air Force major, were the backup crew for the Gemini 3 mission.

Target for the rendezvous and docking operations will be an Agena space vehicle, modified so that the Gemini can join and lock onto it. The Agena is scheduled to be launched from Cape Kennedy, Fla., at 10 a.m. EST. Plans call for Gemini to follow it into space an hour and 41 minutes later.

The crew will be required to maneuver their spacecraft until its orbit matches that of the Agena and then guide the Gemini into the target. Although both vehicles will be traveling more than 17,500 miles per hour (28,170 kilometers per hour), their relative speed at the time of docking must be less than one mile per hour.

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During the first part of the operation, they will be aided by radar and computers in the spacecraft and on the ground, but during the final few hundred feet, they will be guided by their eyes and their judgment.

If the mission goes as scheduled, Gemini 6 will be launched after the Agena has completed one revolution of the Earth and will dock with it during the fourth spacecraft revolution.

An Atlas launch vehicle will insert the Agena into a near circular 185-statute-mile (298 kilometer) orbit. The Gemini launch vehicle will place the spacecraft into an elliptical orbit with a perigee, or low point, of 100 miles (161 kilometers) and an apogee, or high point, of 168 miles (270 kilometers). The vehicles will be in the same plane, following the same path over the Earth.

At its second apogee, the spacecraft will be maneuvered to raise its perigee to 134 miles (216 kilometers). Because the spacecraft is in a lower orbit, it is traveling around the Earth faster than and catching up to the Agena. This maneuver will produce a range of about 161 miles (260 kilometers) between the vehicles at third apogee.

At third apogee, the crew will circularize the spacecraft's orbit at an altitude of 168 miles (270 kilometers). An hour and eleven minutes later, as the spacecraft enters darkness, the crew will begin to transfer the spacecraft into the Agena's orbit. At that time, Gemini will be 17 miles (28 kilometers) below and 39 miles (63 kilometers) behind the Agena. The initial docking could occur about a half-hour later.

Each astronaut will perform two dockings, one in daylight and one in darkness. They will conduct several experiments and both will sleep for about seven hours at the same time while docked. They will separate Gemini from Agena for the last time 18 hours and 27 minutes after the spacecraft was launched. The remainder of the flight will be spent conducting experiments.

Experiments include: weather photography, terrain photography to aid research in the fields of geology, geography and oceanography; photographing celestial bodies and the Agena; determining the mass of an orbiting body, and measuring radiation inside the spacecraft.

Primary objective of the mission is to demonstrate rendezvous and docking, using both spacecraft and Agena propulsion capabilities as required. Gemini must be launched within 2¼ hours after the Agena makes its first revolution to achieve rendezvous. This time span is known as the launch window, and if it cannot be met, spacecraft launch will be delayed until the next day when the window "opens" again. The Agena's active lifetime in flight is five days.

Rocket engines on the Agena give it the capability to be maneuvered by commands from the ground or from the Gemini. Agena propulsion must be used to effect rendezvous if the Gemini is not launched during the first 25 minutes of the window.

Secondary mission objectives are:

1. Conduct rendezvous and docking using onboard radar and computer.

2. Have both crewmen conduct dockings under various lighting conditions.

3. Evaluate attitude and translation capability of the docked vehicles.

4. Demonstrate reentry guidance capability and landing point control.

5. Evaluate spacecraft command of Agena while undocked.

6. Determine useful lifetime and ground control capability of the Agena.

7. Evaluate the visibility of the Agena under various lighting conditions and ranges.

8. Conduct systems tests and in-flight experiments.

After the spacecraft has landed in the West Atlantic recovery area, fuel in the Agena will be expended by maneuvering the target vehicle into various orbits. Maneuver commands will be sent from the Mission Control Center at NASA's Manned Spacecraft Center, Houston, Tex.

The Gemini Program is under the direction of the Office of Manned Space Flight, NASA Headquarters, Washington, D.C., and is managed by the Manned Space Flight Center. 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 information presented in this press kit is based on a normal mission. Plans may be altered prior to or during flight to meet changing conditions.

ORBITS - REVOLUTIONS

The spacecraft's course is measured in revolutions around the Earth. A revolution is completed each time the spacecraft passes over 80 degrees west longitude, or at Gemini altitudes about once every 96 minutes.

Orbits are space referenced and in Gemini 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. Although the spacecraft completes an orbit in about 90 minutes, it takes another six minutes for the spacecraft to reach 80 degrees west longitude and complete a revolution.

Gemini completes 16 orbits per day, but in 24 hours crosses the 80th meridian of longitude 15 times -- hence 15 revolutions per day.

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NASA's John F. Kennedy Space Center has the overall responsibility for pre-flight testing, checkout and launching of the Gemini and Atlas/Agena vehicles for the Gemini 6 mission.

The Gemini launch vehicle was shipped to KSC by aircraft with the first stage arriving Aug. 2 and the second stage a day later. The stages were erected at launch complex 19, Cape Kennedy Aug. 30-31. The Gemini 6 spacecraft was flown to KSC from St. Louis, Aug. 4. It was taken to the pyrotechnic installation building, Merritt Island, for receiving inspection, ordnance installation and assembly checks. The rendevous and recovery section and reentry control section of the spacecraft were mated, and the "premate buildup" was completed with installation of the pilot ejection seats, seat pyrotechnics and parachutes.

The modified Atlas booster for the target vehicle, known as a standarized launch vehicle (SLV), first arrived at the Cape in December of last year.

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The Agena and its docking adapter were shipped to the Kennedy Center July 26-27. These two components and the Gemini spacecraft were mounted atop a 50-foot "Timber Tower" at KSC's Radio Frequency Test Systems site Aug. 25. The prime Gemini 6 crew and their backups boarded the spacecraft on the tower to conduct a series of Radio Frequency Capability Tests between Gemini 6 and the Agena target. Docking compatibility checks also were made between the two vehicles. The spacecraft was transported to launch complex 19 Sept. 9 and hoisted above the launch vehicle. Following a series of premate verifications tests, that included a simulated flight to verify spacecraft systems, the Gemini 6 was mechanically mated to its Titan II rocket Sept. 16.

The launch crew then conducted some two weeks of individual and combined tests of the spacecraft and launch vehicle to insure that all systems of both were ready for flight. The spacecraft was removed for installation of fresh batteries and remated for final systems and simulated flight testing. The pilots participated in their space suits. Mechanical mating of the Atlas booster and the Agena was performed Oct. 2. Combined interface and joint systems tests were conducted with the complete vehicle. On Oct. 7 a major milestone was passed when a simulataneous launch countdown -- a complete "Dress Rehersal" -- was completed.

The Gemini 6 count actually is a combination of 11 different countdowns, mostly running simultaneously. The different counts are associated with the two launch vehicles, the two spacecraft, Houston Mission Control and the worldwide tracking network, the Eastern Test Range and the Radio-Command Guidance System.

Timing is critical in this count in order to complete the rendezvous. In the so-called final countdown on launch day the Atlas Agena count starts at T-530 minutes, the spacecraft at T-360 minutes, and the Gemini launch vehicle joins the combined count at 240 minutes (all these times are set in relation to the GLV liftoff).

Liftoff for the target vehicle is scheduled for the 95-minute mark in the simultaneous count. The Gemini spacecraft will be launched approximately 101 minutes later, depending on the exact location and performance of the orbiting Agena. If necessary, a built-in hold will be called at T-3 minutes to adjust the Gemini liftoff time to coincide with the Agena target's first pass over the Cape. After the launch sequence adjustments are computed, the count will resume.

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LAUNCH VEHICLE COUNTDOWN

TIME	GEMINI	ATLAS-AGENA
F-3 days	Start pre-count	Countdown
F-1 day	Start mid-count	
T-12 hours	GLV propellant loading	
T-530 minutes		Begin terminal count
T-390 minutes	Complete propellant loading	
T-300 minutes	Begin terminal countdown	
T-235 minutes		Start tower removal
T-120 minutes	Flight Crew to Complex 19	
T-115 minutes	Crew enters spacecraft	
T-95 minutes		Lift off
T-83 minutes		insertion into orbit
T-75 minutes	Close spacecraft hatches	
T-50 minutes	White room evacuation	
T-35 minutes	Begin erector lowering	
T-15 minutes	Spacecraft OAMS static firing	
T-04 seconds	GLV ignition	
T-0 seconds	Lift off	
T+2 minutes 36 seconds	Booster engine cutoff (BECO)	
T+5:41	Second stage engine cutoff (SECO)	
T+5:57	Spacecraft-launch vehicle separation	

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T+6:07	Insertion into orbit

REENTRY

(Elapsed Time from Gemini lift-off)

46 hours: 10 minutes 20 seconds	Retrofire
46:11:05	Jettison retrograde section
46:30:39	400,000 feet altitude
46:33:13	Communications blackout
46:38:05	Blackout ended
46:39:41	Drogue chute deployed (50,000 feet)
46:40:39	Pilot chute deployed (10,600 feet)
46:41:22	Main chute fully deployed (9,800 feet)
46:45:45	Spacecraft landing

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EXPERIMENTS

Mass Determination

The object of this experiment is to develop a technique by which the propellant mass in an orbiting vehicle can be determined. This technique involves accelerating the Agena vehicle and Gemini spacecraft while docked by using the Gemini thrusting system. The mass of the propellant can then be determined knowing the resultant acceleration, total Gemini and Agena spacecraft mass, and thrust level.

Method -- Before docking, the command pilot will calibrate the forward firing thrusters by calculating the force they exert. He will measure the velocity on the incremental velocity indicator and determine the mass of the spacecraft by adding the weight of the remaining propellant to the spacecraft. The mass of the Gemini is multiplied by the change in velocity and divided by the time of burn to obtain the exact thrust.

When the spacecraft is docked with the Agena, the thrusters will be fired again for 25 seconds. The same formula will be used to determine the mass of the Agena, since the force of the thrusters, the acceleration they produce, and the mass of the spacecraft is known. The total mass obtained from this calculation can be subtracted from the mass of the spacecraft to obtain the mass of the Agena.

experiment. The following spacecraft equipment will be involved in the experiment:

Gemini Computer

Manual Data Insertion Unit

Event Timer

Orbital Attitude Maneuver System

Instrumentation System

On-Board voice recorder

WEIGHT: None

VOLUME: None

LOCATION: Part of the spacecraft systems

POWER REQUIREMENTS: Electrical -

Fuel - 20 lbs
a. Translations 17 lbs
b. Attitude Control 3 lbs.

OPERATIONS: Communications - No special communications are required.

TELEMETRY: The Gemini data acquisition system will be used to provide either stored or transmitted signals for ground analyses.

VOICE: All parameters shall be recorded on the Gemini voice tape recorder.

GROUND SUPPORT: No additional ground support is required.

PERFORMED: The calibration translation will be performed inflight prior to docking. This rigidized translation will be performed while in the docked position. Both maneuvers will take approximately five minutes.

Radiation

Purpose -- To measure the radiation level and distribution inside the spacecraft.

Equipment -- Seven sensors in the spacecraft. Five are on the wall of the pressure vessel and two are inside the cabin. One of the sensors is shielded to simulate the amount of radiation crew members are receiving beneath their skin.

Method -- Shield will be removed during pass through the South Atlantic anomoly, the area where the radiation belt dips closest to the Earth's surface. This experiment was flown on Gemini 4.

Synoptic Terrain Photography

Purpose -- To obtain photos of selected parts of Earth's surface for use in research in geology, geophysics, geography, oceanography. This experiment has been flown on every flight since MA-8.

Equipment -- 70 mm Hasselblad camera with 80 mm Zeiss F2.8 lens; two packs of color film with 65 exposures each.

Areas of Interest -- Southern Mexico, Africa, and the deltas of the Mississippi, Amazon, Congo and Nile Rivers. Photographs also will be taken of the Bahama Islands to compare with pictures taken on Gemini 5 before Hurricane Betsy.

Scientists will compare the photographs for evidence of changes to underwater ridges, coral, reefs, etc.

Synoptic Weather Photography

Purpose -- To obtain selective, high quality, color cloud photographs to study the fine structure of the Earth's weather system. This experiment also was performed on Gemini 3, 4, and 5.

Equipment -- 70 mm Hasselblad camera with 80 mm Zeiss F2.8 lens; two magazines of color film with 65 exposures each.

Areas of Interest -- Squall line clouds, thunderstorm activity not associated with squall lines, frontal clouds and views of fronts, jetstream cirrus clouds, typical morning stratus of Gulf states, coastal cloudiness, tropical and extra-tropical cyclones, intertropical convergence zone, cellular patterns in subtropical phenomenon, wave clouds induced by islands and mountain ranges, broad banding of clouds in the trade winds or other regions.

Bio-Chemical Analysis of Body Fluids*

Purpose -- To collect body fluids before, during and immediately after flight for analysis of hormones, electrolytes, proteins, amino acids and enzymes which might result from space flight.

Method -- Urine will be collected in a special bag for each elimination. A specified amount of tritiated water will be added automatically. The water has a tracer amount of radioactive tritium. By comparing the amount of tritium in the sample with the known amount of tritium placed in it, biochemists can measure the total volume. Sixteen 75 cc capacity sample bags will be carried. A sample will be drawn for each elimination. The remaining urine will be transfered into the urine dump system of the spacecraft.

* Purposes of this experiment are to flight qualify and evaluate the equipment for later missions. It will not be a complete experiment on Gemini 6.

70MM HASSELBLAD CAMERA

I. Camera

A. Equipment

1. Camera
2. 80 MM lens
3. 250 MM lens
4. Photo event indicator
5. Ring Sight
6. UV filter
7. Film backs

B. Characteristics

1. 80 mm focal length
2. f2.8 to f22.0 aperture
3. Time exposures and speeds up to 1/500 second
4. Resolution: approximately 125 lines/mm.
5. Approximately 1.5X magnification

II. Film

A. Three film magazines of Kodak S.O. 217, MS, Ektachrome ASA-64 color emulsion on 2.5 mil Estar Polyester base

III. Purpose

Weather and Terrain
General Purpose

70MM HASSELBLAD CAMERA

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III. Purpose

Weather and Terrain
General Purpose

16MM MAURER MOVIE CAMERA

I. Camera

A. Equipment

1. two cameras
2. 75 mm lens (one camera)
3. 75 mm, 25 mm, 18 mm lens set (second camera)

B. Characteristics

1. Six frames/second
2. f-11 aperture
3. 1/200 second shutter speed
4. 40 lines/mm resolution

II. Film

A. Twenty magazines each containing 113 feet of film

B. Kodak S.O. 217 color film

III. Purpose

Agena and rendezvous photographs
General Purpose

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GEMINI 6 NOMINAL MANEUVERS

Maneuver	Rev. No.	Ground Elapsed Time	Thruster	Perigee/ Apogee	Lighting Conditions
Separation	1	00:06:00	Aft	100/168	Day
Height Adjustment	2	1:35:23	Aft	100/168	Day
Phase Adjustment	2	2:19:14	Aft	134/168	Night
Co-elliptical Maneuver	3	3:48:34	Aft	168/168	Night
Terminal Phase Initiation	4	4:59:58	Aft	168/185	Night
1st Correction	4	5:12:19	As re-quired	168/185	Night
2nd Correction	4	5:24:21	As re-quired	168/185	Night
Velocity Match	4	5:32:40	Forward	185/185	Night
S/C Agena Separation	12	18:26:56	Forward	179/185	Day
Retrofire	29	46:10:20	Retros		Night

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CHECKS WHILE DOCKED

These are not experiments, but are designed to gather information about the performance of crew and vehicles for use in later Gemini and Apollo flights.

Lateral Translation Check

A 10-second out-of-plane maneuver will be performed using left firing spacecraft thruster. It will require use of the Agena attitude control system to control attitude of combined Gemini/Agena. Purpose of the maneuver is to determine Gemini/Agena dynamics.

Attitude Control Check

Roll, pitch, yaw (attitude) maneuvers, using Gemini OAMS will also be performed at a rate of about three degrees/second. The crew will maneuver 90 degrees in all attitudes to determine Gemini/Agena dynamics.

Platform Parallelism Check

Crew will use both Agena and spacecraft attitude control systems in maneuvering to various attitudes. They will observe performance visually and record data from incremental velocity indicator to determine alignment of the two vehicles while maneuvering together.

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LASER BEAM OBSERVATION

At an elapsed time of 25 hours, 30 minutes, crew will attempt to acquire visually a two-watt argon laser beacon aimed toward them from ground at White Sands Missile Range. This is preliminary to a Manned Spacecraft Center laser communications experiment to be flown aboard Gemini 7. The crew will orient their spacecraft in an attitude toward White Sands, then look for pinpoint of blue-green laser light.

CREW TRAINING BACKGROUND - GEMINI 6

In addition to the extensive general training received prior to flight assignment and the training received for the Gemini 3 mission, the following preparations have or will be accomplished prior to launch:

1. Launch abort training in the Gemini Mission Simulator and the Dynamic Crew Procedures Simulator.

2. Egress and recovery activities using a spacecraft boilerplate model and actual recovery equipment and personnel. Pad emergency egress training using elevator and slide wire.

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

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4. Parachute descent training over water using a towed parachute technique.

5. Zero gravity training in KC-135 aircraft.

6. Suit, seat, and harness fittings.

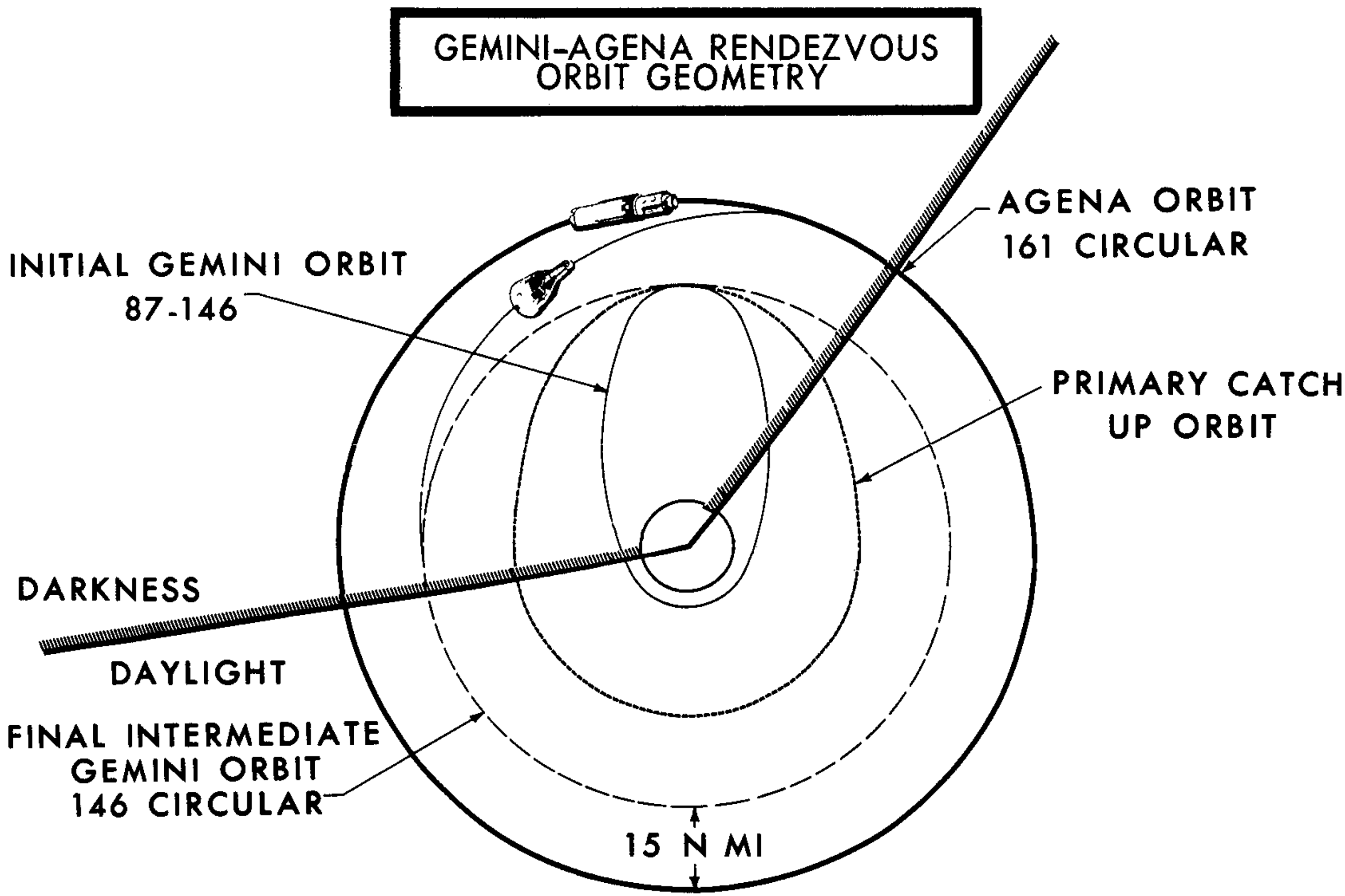
7. Training sessions totaling approximately 90 hours per crew member on the Gemini mission simulators.

8. Training sessions totaling approximately 20 hours per crew member on the Gemini translation and docking simulator.

9. Detailed systems briefing; detailed experiment briefings; flight plans and mission rules reviews.

10. Participation in mock-up reviews, systems review, sub-system tests, and spacecraft acceptance review.

During 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 tests. At T-2 days, the major flight crew medical examinations will be administered to confirm readiness for flight and obtain data for comparison with post flight medical examination results.


GEMINI-AGENA RENDEZVOUS
ORBIT GEOMETRY
INITIAL GEMINI ORBIT
87-146
AGENA ORBIT
161 CIRCULAR
PRIMARY CATCH
UP ORBIT
DARKNESS
DAYLIGHT
FINAL INTERMEDIATE
GEMINI ORBIT
146 CIRCULAR
15 N MI

Immediate Preflight Crew Activities

T-7 hours	Back-up flight crew reports to the 100-foot level of the White Room to participate in final flight preparations.
T-5 hours	Pilots' ready room, 100-foot level of White Room and crew quarters manned and made ready for prime crew.
T-4 hours, 30 minutes	Primary crew awakened
T-4 hours	Medical examination
T-3 hours, 40 minutes	Breakfast
T-3 hours, 15 minutes	Crew leaves quarters
T-3 hours, 5 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 temperatures systems are checked.

T-2 hours, 15 minutes	Purging of suit begins
T-2 hours, 4 minutes	Crew leaves ready room
T-1 hour, 59 minutes	Crew arrives at 100-foot level
T-1 hour, 55 minutes	Crew enters spacecraft.

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

Flight Activities

At ignition the crew begins the primary launch phase task of assessing system status and detecting abort situations. 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.

MISSION DESCRIPTION
(all miles are statute)

Simultaneous Countdown -- Countdowns of all vehicles involved are coordinated so that if a hold is encountered in one, the others may be held also.

Launch Times -- Atlas-Agena - 10 a.m. EST, Launch Complex 14. Gemini 6 - 11:40:52 a.m. EST, Launch Complex 19.

Launch Window -- Begins approximately 101 minutes after Agena launch and extends for $2\frac{1}{4}$ hours. If the launch occurs during the first 25 minutes of that period, rendezvous can be achieved using spacecraft propulsion only. If launch occurs later in the window, Agena as well as spacecraft propulsion must be used.

A spacecraft launch at the beginning of the window permits rendezvous during latter part of the fourth revolution. A delay of 100 seconds slips the rendezvous to the fifth revolution. A delay of 200 seconds moves the rendezvous to sixth revolution. A delay past 200 seconds into the window would put the rendezvous in the 15th revolution. However, because of tracking limitations rendezvous would be planned for the 16th revolution.

If the spacecraft cannot be launched within the $2\frac{1}{4}$-hour window, launch must be delayed for one day, when the window will be available again. Agena's active lifetime in flight is five days.

Azimuth -- Atlas-Agena biased from 83.7 to about 85.7 to provide for yaw steering during Atlas sustainer burn to shift orbital equatorial nodes or crossings 4.2 degrees to east. This shift equals about 17 minutes of Earth rotation, therefore allows 17 additional minutes in which to use Gemini launch vehicle capability to launch spacecraft into Agena's plane. The launch azimuth places the Agena back over launch site after one revolution. Because of the Earth's rotation this would not be possible if the azimuth was fixed. Gemini launch vehicle azimuth will be 92.8 degrees, but will be biased slightly so that a small amount of yaw steering in second stage will place the spacecraft in Agena's plane.

Out-of-Plane Capability -- Fuel budget allows spacecraft to burn one-half of one degree out-of-plane if necessary if booster yaw steering does not place Gemini in Agena's plane. Corrections of greater magnitude must be performed by the Agena, capable of 10 degrees out-of-plane maneuvering.

Inclination -- 28.87 degrees for both Agena and Gemini Launch Vehicle (GLV).

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Orbits -- Agena at near-circular 185 miles (298 kilometers). Gemini initially in elliptic 100-168 miles (161-270 kilometers).

Height Adjustment -- Because of drag during initial spacecraft orbit, a one foot-per-second posigrade burn is scheduled at first perigee to raise apogee about .58 miles (.93 kilometers). Insertion dispersions may necessitate a larger maneuver. The object is to achieve a 168-mile (270 kilometers) apogee, or 17 miles below Agena orbit.

Phase Adjustment -- Near spacecraft second apogee at an time of 2 hours, 19 minutes, 14 seconds (2:19:14) ground elapsed time. Posigrade horizontal velocity addition of 53.5 feet per second will raise perigee to about 134 miles (198 kilometers). It will reduce the catchup rate from about 6.68 degrees to 4.51 degrees per orbit and provide necessary phase relation at third apogee.

Co-elliptical Maneuver -- Near the third spacecraft apogee at 3:48:34, the crew will circularize orbit to 168 miles (270 kilometers). This will be achieved by a posigrade maneuver of 52.4 fps with spacecraft pitched up 4.5 degrees. At this time, spacecraft trails Agena by about 161 miles (259 kilometers) and should have onboard radar lock-on.

Terminal Phase Maneuver -- At 3:52:34, crew will switch computer to rendezvous mode and begin terminal phase systems checkout and procedures. At 4:59:58, about one minute after entering darkness, crew will perform a burn of 32 fps along line-of-sight of Agena. Range to Agena will be about 39 miles (63 kilometers), and spacecraft will be 130 degrees of angular travel from point of rendezvous. Spacecraft will be pitched up 27 degrees for the posigrade maneuver.

Intermediate Corrections -- Twelve minutes after initial impulse, computer displays first correction to be applied by the crew. Twelve minutes later, at 5:24:21 another correction is applied. Range is then about 4½ miles (7¼ kilometers) and crew begins a semi-optical approach to Agena. The crew will use radar information directly to read out range and range rate.

Velocity Matching Maneuver -- The magnitude of a theoretical velocity-matching maneuver at 5:32:40 is about 43 fps. However, since the command pilot will be controlling final approach by semi-optical techniques, he will make real-time decisions. He will reduce velocity difference between two vehicles to 4 fps at about 2,000 feet, then continue reducing velocity until docking at less than 1 fps. Initial docking could occur as early as five hours and 33 minutes after lift-off.

Activities Following Initial Docking -- During the next two revolutions, three more docking practices will be performed. The command pilot and pilot will each perform a docking in daylight and in darkness. Other activities scheduled during this period are: Gemini-Agena lateral translation check, mass determination experiment, Gemini-Agena attitude control check, photography of target vehicle, platform parallelism check, and Agena yaw maneuver. After completing these activities, the crew will begin 7-hour rest period while docked.

Final Separation from Agena -- At 18:27 during 12th revolution, the spacecraft will separate from Agena with a retrograde maneuver of 7 fps. This will occur about five minutes before entering darkness over Carnarvon and will provide proper conditions for Apollo sextant sighting experiment involving Agena and star background. The spacecraft will fall below Agena by about 3½ miles (5¼ kilometers) at perigee and will lead it by about 21 miles after one revolution. Final Gemini orbit will be 179-185 miles (289-298 kilometers) until retrofire, and spacecraft will continue to get ahead of Agena by about 21 miles per revolution.

Nominal End of Mission -- Retrofire is at 46:10:20 at west longitude of 168.7 degrees during spacecraft's 29th revolution. Landing in West Atlantic recovery area (27 N/62 W) is planned at 46:45:45, or about 10:25 a.m. EST. Should the mission be ended after one day, retrofire will occur at 23:40:50 at 5 N/174 W during 15th revolution. Landing area does not change.

Agena Activities Following Spacecraft Landing -- Ground control will exercise Agena to gain further information on its capabilities. Exercises will probably simulate typical rendezvous mission maneuvers requiring Agena propulsion. They will begin about 24 hours after spacecraft landing when Agena again passes over North America. Following these exercises, ground will command Agena to a circular orbit of about 276 miles (445 kilometers), where it will be left as potential non-powered target for future Gemini missions. This orbit would decay to about 185 miles (271 kilometers) in four months.

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MANNED SPACE FLIGHT TRACKING NETWORK
GEMINI 6 MISSION REQUIREMENTS

NASA operates the Manned Space Flight Tracking Network by using its own facilities and those of the Department of Defense for mission information and control.

For Gemini 6 the network will provide flight controllers:

(1) Continuous tracking, command and telemetry data from launch through orbital insertion of the Agena Target Vehicle and the Gemini spacecraft.

(2) Verification of the proper operation of the systems onboard the Gemini and Agena target.

The network also will update via the control center, the spacecraft computer to provide ephemeris (computed space position) and reentry displays for the astronauts.

Immediate computing support will be provided from launch through impact by the Real-Time Computer Complex (RTCC) at the Manned Spacecraft Center. During powered flight, the RTCC will receive launch trajectory data from Bermuda and Air Force Eastern Test Range (AFETR) radars via the Cape Kennedy CDC-3600 computing complex.

TRACKING

For the first time a Gemini mission will require separate tracking of four space vehicles: the Gemini spacecraft, the Agena Target Vehicle (ATV), Titan II which is the Gemini Launch Vehicle (GVL), and as required, the Atlas Booster called SLV-3. The Gemini spacecraft will carry two C-band tracking beacons. The Agena Target Vehicle will carry one C-band and one S-band beacon. Skin tracking (radar signal bounce) of the spacecraft, Agena target vehicle, and Gemini launch vehicle throughout orbital lifetime is a mission requirement. The MSFN Wallops Station (WLP) Space Range Radar (SPANDAR) and various facilities of the North American Air Defense Command (NORAD) will be used for this mission. However, NORAD will not track during the rendezvous phase.

For Gemini 6, various combinations of spacecraft tracking assignments will be carried out according to individual station capability. Some sites have radar systems capable of providing space position information on both the Gemini and Agena vehicles simultaneously through their Verlort (S-band) and FPS-16 (C-band) antennas. Data transmission links, however, have only a single system capability, therefore, priority will be established by the Mission Director or Flight Dynamics Officer according to their needs.

After Titan II launch, the spacecraft will be the prime target for C-band tracking.

Manned Space Flight Tracking Network Configuration

Cape Kennedy	Grand Canary Island
Merritt Island	Pt. Arguello, Calif.
Patrick AFB	White Sands, N. M.
Grand Bahama Island	Kauai, Hawaii
Ascension Island	USNS Rose Knot
Antigua Island	USNS Coastal Sentry
Bermuda Island, B.W.I.	USNS Range Tracker
Pretoria, South Africa	Grand Turk Island
Carnarvon, Australia	Eglin, Fla.
	Corpus Christi, Texas

Stations Capable of C-Band Tracking are:

Merritt Island	White Sands, N. M.
Patrick AFB	USNS Range Tracker
Grand Bahama Island	Eglin, Fla.
Antigua Island	Grand Turk Island
Ascension Island	Grand Canary Island
Carnarvon, Australia	Pt. Arguello, Calif.
Bermuda Island, B.W.I.	Kauai, Hawaii
Pretoria, South Africa	

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Stations Capable of S-Band Tracking are:

Cape Kennedy	Carnarvon, Australia
Grand Bahama Island	Kauai, Hawaii
Grand Turk Island	Pt. Arguello, Calif.
Bermuda Island, B.W.I.	Guaymas, Mexico
Grand Canary Island	Corpus Christi, Tex.

Stations Capable of Skin (radar signal bounce) Tracking the Gemini Launch Vehicle, Spacecraft, and the Agena Target Vehicle are:

Merritt Island	Carnarvon, Australia
Patrick AFB	White Sands, N. M.
Grand Bahama Island	
Antigua Island	Eglin, Fla.
Ascension Island	Grand Turk Island

Skin tracking procedures will be used as needed and mission priorities permit.

Other Computer Support

The Goddard Space Flight Center realtime computing support for Gemini 6 includes the processing of realtime tracking information obtained from the Titan II and Agena systems beginning with mission simulations through Gemini spacecraft recovery and Agena lifetime.

Goddard's computer also will certify the worldwide network's readiness to support Gemini 6 through a system-by-system, station-by-station, computer-programmed checkout method called CADFISS tests. CADFISS (Computation and Data Flow Integrated Subsystem) checkout of network facilities also will be performed by Goddard during postlaunch periods when the spacecraft are not electronically "visible" by some stations and continue until the vehicles are again within acquisition range.

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

Control of the entire Gemini 6 mission will be exercised by the Mission Control Center in Houston, Texas. As it did on Gemini 4 and Gemini 5, Houston's Realtime Complex will serve as the computer center.

Gemini Spacecraft

The spacecraft has two tracking beacons. The model ACF* beacon (spacecraft) will be installed in the reentry module and the DPN-66* model beacon (adapter) in the adapter package.

*Contractor nomenclature

The ACF beacon will be prime for launch, insertion, and reentry phase, using the DPN-66 as a backup for these periods.

AGENA TARGET VEHICLE

The Agena Target Vehicle will contain one C-band and one S-band beacon. The C-band beacon will be a modified DPN-66. Each beacon will use one lineararly polarized antenna. The C-band beacon will be prime for Agena Target Vehicle prior to the Gemini launch. The Gemini spacecraft will be the prime target for C-band tracking following launch.

ACQUISITION SYSTEMS

Sites with spacecraft aid systems capable of tracking the Agena and Gemini spacecraft simultaneously will provide radio frequency (RF) inputs and pointing data to their associated telemetry receivers and steerable antennas. Sites which do not have simultaneous-tracking capability will track the Gemini spacecraft only. All stations will track the Agena Target Vehicle until orbital insertion of the Gemini spacecraft.

MISSION MESSAGE REQUIREMENTS

Times and types of flight data transmission (on-site teletype summaries) from flight controller manned stations will be sent to the Houston Mission Control Center immediately.

Bermuda and Corpus Christi transmit Gemini spacecraft and Agena Target Vehicle PCM telemetry via high-speed digital data to Houston Mission Control Center in computer format. Grand Bahama Island, Grand Turk Island, and Antigua will remote Gemini spacecraft and Agena data to the Cape Kennedy Mission Control Center in the same manner.

SPACECRAFT COMMAND SYSTEM (SCS)

The prime ground system in effecting rendezvous is the Digital Command System (DCS) located at key stations throughout the worldwide network. Command control of the mission from launch through recovery will as always be provided by the Flight Director at Houston Mission Control Center. Maximum command coverage is required throughout the mission.

Grand Canary Island, Carnarvon, Australia, Hawaii, and the two ships, USNS Coastal Sentry and USNS Rose Knot, are DCS equipped and manned by flight controllers who will initiate all uplink data command transmissions.

Following astronaut recovery, further commands will be required for the Agena Target Vehicle. Network Digital Command System support will be continued to determine the Agena Target Vehicle lifetime.

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The Texas, Cape Kennedy, Grand Bahama, Grand Turk, Antigua, and Bermuda sites will not be manned by flight controllers. All uplink data command transmissions through these sites will be remoted in real time from Houston Mission Control Center.

In addition to real-time commands and on-board clock update commands, the following digital instructions may be sent:

a. Gemini spacecraft

1. Preretro with maneuver
2. Preretro without maneuver
3. Orbital navigation
4. Maneuver
5. Rendezvous
6. Accelerometer error corrections

b. Agena Target Vehicle

1. Maneuver
2. Ephemeris
3. Engine burn time

SPACECRAFT COMMUNICATIONS

All MSFN stations having both HF and UHF spacecraft communications can be controlled either by the station or by remote (tone) keying from Houston Mission Control Center and Goddard.

The following sites are not scheduled to have a command communicator (CapCom) and will be remoted to Houston Mission Control Center:

Grand Bahama Island; Tananarive, Malagasy Republic; Kano, Nigeria; Bermuda ; Grand Turk Island; Pt. Arguello, Calif.; Antigua Island; Ascension Island; Canton Island; USNS Range Tracker, and the voice relay aircraft.

SPACECRAFT SYSTEMS SUPPORT

The Gemini spacecraft communications systems (antennas, beacons, voice communications, telemetry transmitters, recovery light, and digital command system) allows radar tracking of the spacecraft, two-way voice communications between the ground and the spacecraft and from astronaut to astronaut; ground command of the spacecraft, instrumentation systems data transmission, and postlanding and recovery data transmission. The sole link between the ground and the Gemini spacecraft is provided by these systems.

The Agena Target Vehicle communications system (antennas, beacons, telemetry transmitters, and digital command system) allows radar tracking of the vehicle from both the ground and the Gemini spacecraft. Ground station and Gemini spacecraft command to the Agena also are accomplished through this system.

Agena Target Vehicle On-Board Systems supported by Network Stations

Table #1

Telemetry (Real Time)
Telemetry (Dump)
L-Band Transponder
S-Band Transponder
C-Band Transponder
Command Receiver (Range Safety)
Command Receiver (Command Control)

Gemini Spacecraft On-Board Systems Supported by Network Stations

Table #2

Reentry Module	UHF(voice)xmit-Rcv
Reentry Module	HF(voice)xmit-Rcv
Reentry Module	Telemetry(Real Time)
Reentry Module	Telemetry(Dump)
Reentry Module	Telemetry(Backup)
Adapter Package	L-Band Radar
Reentry Module	C-Band Transponder
Adapter Package	C-Band Transponder
Adapter Package	Acquisition Aid Beacon
Adapter Package	Digital Command System
Reentry Module	UHF Recovery Beacon

GROUND COMMUNICATIONS

The NASA Communications network (NASCOM) used for Gemini 5 will be used for Gemini 6. Shore stations for USNS Rose Knot and USNS Coastal Sentry Ship support will be based upon the mission-designated ship positions and predicted HF radio propagation conditions.

NETWORK RESPONSIBILITY

Manned Spacecraft Center (MSC). 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 responsibility of the MSC.

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Goddard Space Flight Center. The NASA 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 the Goddard Space Flight Center. Technical operation is defined as the operation, maintenance, modification, and augmentation of tracking and data acquisition facilities to function as an instrumentation network in response to mission requirements. About 370 persons directly support the network at Goddard; contractor personnel bring the total network level to some 1500.

Department of Supply, Australia. The Department of Supply, Commonwealth of Australia, is responsible for the maintenance and operation of the NASA station at Carnarvon, Australia. Contractual arrangements and agreements define this cooperative effort.

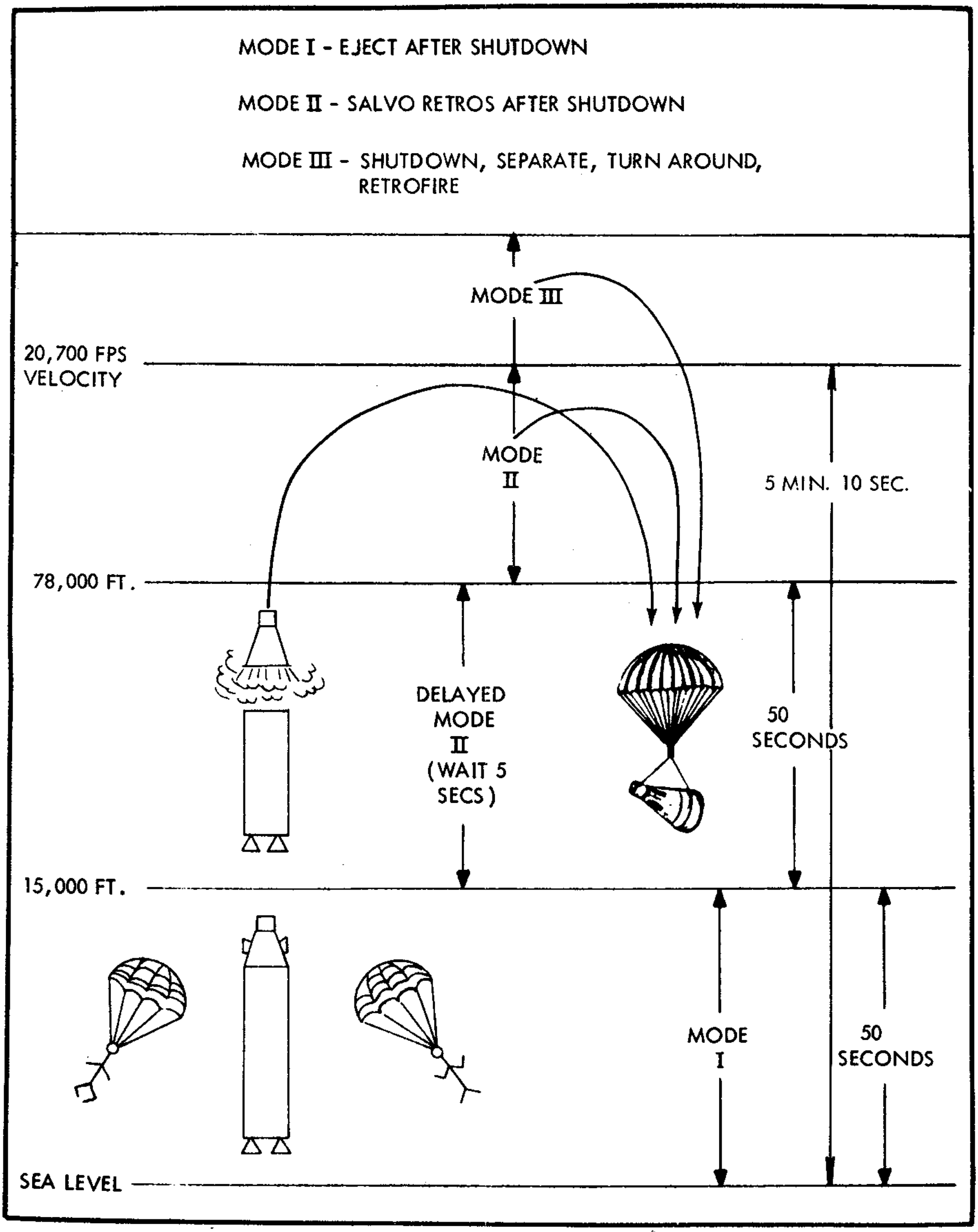
Department of Defense (DOD). The DOD is responsible for the maintenance and operational control of those DOD assets and facilities required to support Project Gemini. These include network stations at the Eastern Test Range, Western Test Range, White Sands Missile Range, the Air Proving Ground Center,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

NETWORK CONFIGURATION

Systems \ Stations	MCC-H	MCC-K	MLA	CNV	PAT	GBI	GTK	BDA	CYI	KNO	TAN	PRE	CRO	CTN	HAW	GYM	CAL	TEX	WHS	EGL	ANT	ASC	CSQ	RKV	RTK or WHE	A/C WLP
C-band Radar			X	X	X	X	X	X	X			X	X		X		X		X	X	X	X			X	
S-band Radar				X		X	X	X	X				X		X	X	X	X								
Telemetry Receive & Record		X		X		X	X	X	X	X	X		X		X	X	X	X			X	X	X	X	X	X
Telemetry Real Time Display	X								X				X		X	X							X	X		
Telemetry Data Transmission	X	X				X	X		X				X		X	X		X			X		X	X		
High Speed Data Transmission		X				X	X	X										X			X					
On Site Data Process & Summary	X								X				X		X	X							X	X		
Gemini Launch Vehicle Telemetry		X		X																						
Gemini Launch Vehicle Command		X		X																						
Digital Command System	X	X							X				X		X			X					X	X		
Radio Frequency Command System				X		X	X	X	X				X		X			X			X		X	X		
Voice - Transmit & Receive	X	X						X	X	X	X		X	X	X	X	X	X	X	X			X	X		
Teletype-Transmit & Receive	X	X						X	X	X	X		X	X	X	X	X	X	X	X			X	X		
Flight Control Team Manned	X								X				X		X	X							X	X		
Spacecraft Acquisition Antenna System		X				X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Flight Controller Air & Group Voice	X								X				X		X	X							X	X		
MCC-H-Air to Ground Remote Voice	X					X	X	X		X	X			X			X				X	X			X	X

(X) Master DCS

ABORT PROCEDURES



CREW SAFETY

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

There are three modes of escape:

MODE I	Ejection seats, and personal parachutes, used at ground level and during first 50 seconds of powered flight, or during descent after reentry.
MODE II (Delayed)	Retrorockets used between 50 and 100 seconds, allowing crew to salvo fire all four solid retrorockets five seconds after engine shutdown is commanded.
MODE III	Normal separation from launch vehicle, using OAMS thrusters, then making normal reentry, using computer.

Except for Mode I, spacecraft separates from Gemini Launch Vehicle, turns blunt-end forward, then completes reentry and landing with crew aboard.

Survival package

Survival gear, mounted on each ejection seat and attached to the astronaut's parachute harnesses by nylon line, weighs 23 pounds.

Each astronaut has:

3.5 pounds of drinking water

Machete

One-man life raft, 5½ by 3 feet, with CO_2 bottle for inflation, sea anchor, dye markers, nylon sun bonnet.

Survival light (strobe), with flashlight, signal mirror, compass, sewing kit, 14 feet of nylon line, cotton balls and striker, halazone tablets, a whistle, and batteries for power.

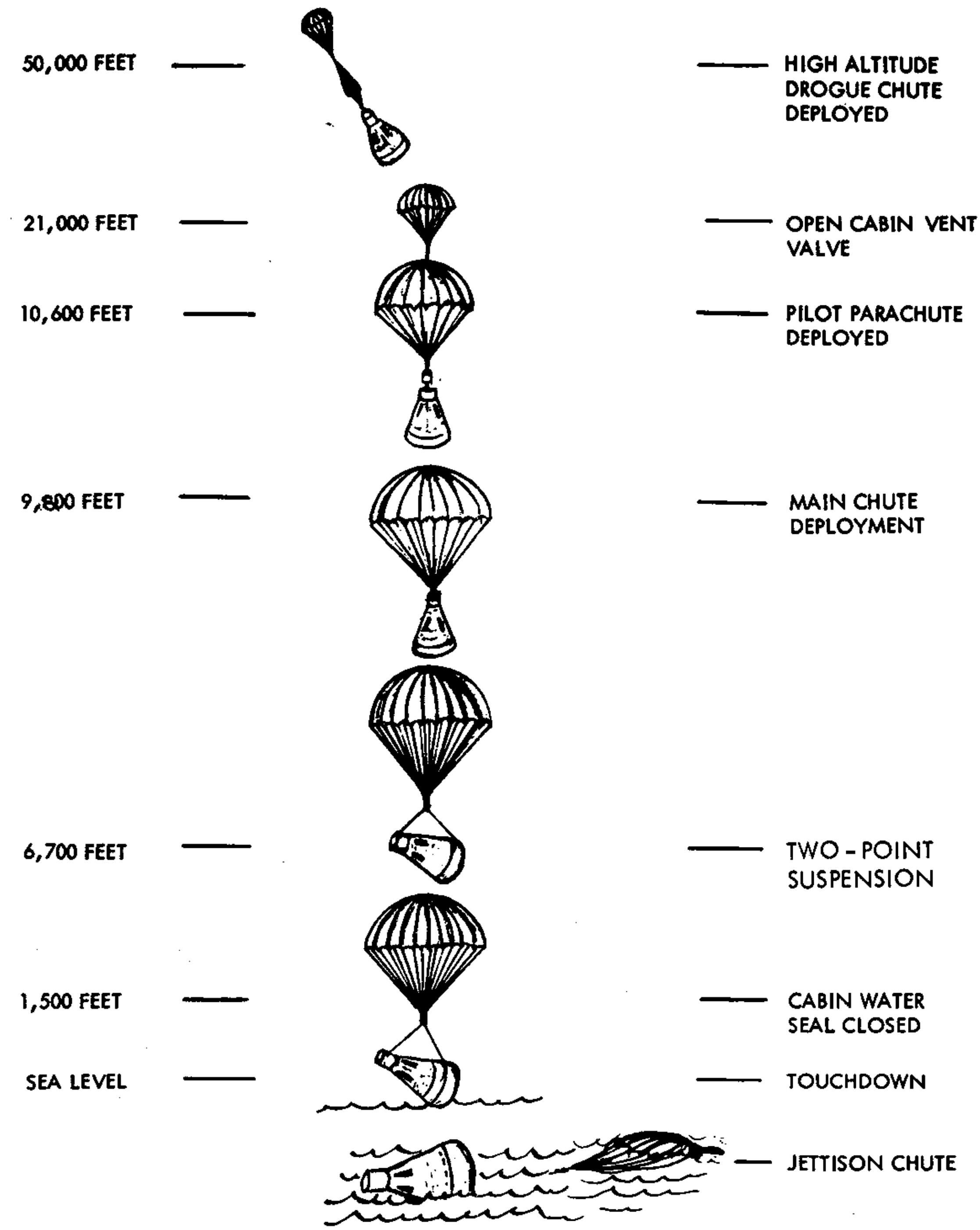
Survival radio, with homing beacon and voice reception.

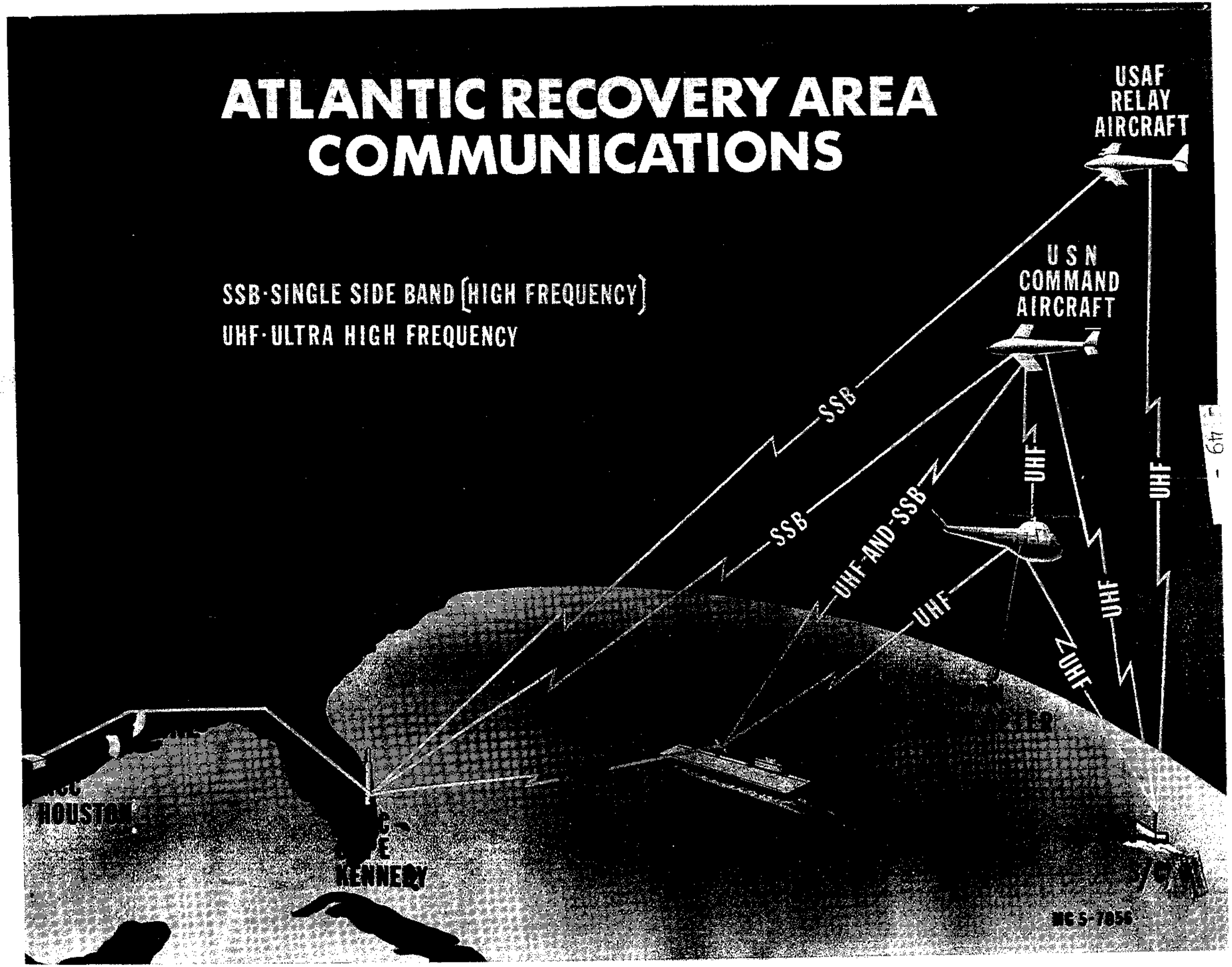
Sunglasses.

Desalter kit, with brickettes enough to desalt eight pints of seawater.

Medical kit, containing stimulant, pain, motion sickness and antibiotic tablets and aspirin, plus injectors for pain and motion sickness.

GEMINI PARACHUTE LANDING SEQUENCE




ATLANTIC RECOVERY AREA
COMMUNICATIONS
SSB-SINGLE SIDE BAND [HIGH FREQUENCY]
UHF-ULTRA HIGH FREQUENCY
USAF
RELAY
AIRCRAFT
U S N
COMMAND
AIRCRAFT
SSB
SSB
UHF-AND-SSB
UHF
UHF
UHF
UHF
UHF
HOUSTON
KENNEDY
MC 5-7056

PLANNED AND CONTINGENCY LANDING AREAS

There are two types of landing areas for Gemini 6, planned and contingency. Planned areas are those where recovery forces are pre-positioned to recover spacecraft and crew within a short time. All other areas under the orbital track are contingency areas, requiring special search and rescue techniques and a longer recovery period.

Planned Landing Areas

PRIMARY	Landing in the West Atlantic (30-1) where the primary recovery vessel, an aircraft carrier, is pre-positioned.
SECONDARY	Landing in East Atlantic, West Pacific and Mid-Pacific areas where ships are deployed.
LAUNCH SITE	Landing in the event of off-the-pad abort or abort during early phase of flight, includes an area about 41 miles seaward from Cape Kennedy, 3 miles toward Banana River from Complex 19.
LAUNCH ABORT	Landing in the event of abort during powered flight, extending from 41 miles at sea from Cape Kennedy to west coast of Africa.

Contingency Landing Areas

All the area beneath the spacecraft's ground track except those designated Planned Landing Areas are Contingency Landing Areas, requiring aircraft and pararescue support for recovery within a period of 18 hours from splashdown.

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.

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WEATHER REQUIREMENTS

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

Flight director will make decision based upon conditions at the time.

Pararescue

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.

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MEDICAL CHECKS

At least one medical check a day will be made by each crew member. Performed over a convenient ground station, a check will consist of: Oral temperature, blood pressure measurement, food and water intake evaluation.

BODY WASTE DISPOSAL

Solid Wastes -- Plastic bag with adhesive lip to provide secure attachment to body. Contains germicide which prevents formation of bacteria and gas. Adhesive lip also used to form seal for bag after use and bag is stowed in empty food container and brought back for analysis.

Urine -- Secreted into fitted receptacle connected by hose to either a collection device or overboard dump.

GEMINI 6 SUIT

The pressure suit worn by the crew of Gemini 6 is identical to that worn by the Gemini 5 crew. It is not suitable for extravehicular activity.

It has five layers:

1. White cotton constant wear undergarment with pockets to hold biomedical instrumentation equipment.

2. Blue nylon comfort layer.

3. Black neoprene-coated nylon pressure garment.

4. Restraint layer of dacron and teflon link net to restrain pressure garment and maintain its shape.

5. White HT-1 nylon outer layer to protect against wear and solar reflectance.

The suit is a full pressure garment, including a helmet with mechanically sealed visor. Oxygen is furnished by the environmental control system. Gaseous oxygen is provided to the suit through a "suit loop" to cool the astronaut and provide him with a breatheable atmosphere of 100 percent oxygen. Oxygen in cabin maintains five pounds per square inch pressure. The suit, if cabin pressure fails, is pressurized to 3.7 psia.

FOOD

Number of Meals -- Three per day per astronaut for two days.

Type -- Bite sized and rehydratable. Water is placed in rehydratables with special gun. Bite-sized items need no rehydration.

Storage -- Meals individually wrapped in aluminum foil and polyethelene, polyamide laminate. First day meals stored in compartments beside knees of each crewman. Second day meals in right aft food compartment.

WATER MEASURING SYSTEM

A mechanical measuring system has been added to water gun. It consists of a neoprene bellows housed in a small metal cylinder mounted at base of gun. The bellows holds one-half ounce of water. When plunger of gun is depressed, a spring pushes water out of bellows and through gun. A counter in right side of gun registers number of times bellows is activated. Each crewman will record how much he drinks by noting numbers at beginning and end of each use of gun.

Day #1	MEAL "A"	CALORIES
Bacon Square		90
Potato Soup (Rehydratable)		252
Gingerbread		183
Peanut Cubes		297
Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	905
	MEAL "B"	
Chicken and Gravy (Rehydratable)		92
Cheese Sandwiches		324
Strawberry Cereal Cubes		171
Pineapple Fruitcake		253
Orange-Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	923
	MEAL "C"	
Salmon Salad (Rehydratable)		246
Cinnamon Toast		99
Butterscotch Pudding (Rehydratable)		117
Brownies		241
Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	786
	FIRST DAY - TOTAL	2,614

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Day #2	MEAL "A"	CALORIES
Chicken Sandwich		196
Shrimp Cocktail (Rehydratable)		119
Date Fruitcake		262
Coconut Cubes		310
Orange-Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	970

MEAL "B"

Tuna Salad (Rehydratable)		214
Apricot Cereal Cubes		171
Strawberry Cubes		283
Peaches (Rehydratable)		98
Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	849

MEAL "C"

Bacon and Egg Bites		178
Meat & Spaghetti (Rehydratable)		70
Toasted Bread Cubes		161
Chocolate Pudding (Rehydratable)		307
Grapefruit Drink (Rehydratable)		83
	TOTAL CALORIES	799

SECOND DAY TOTAL 2,618

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GEMINI SPACECRAFT

The Gemini spacecraft is conical, 18 feet, 5 inches long, 10 feet in diameter at its base and 39 inches in diameter at the top. Its two major sections are the reentry module and the adapter section.

Reentry Module

The reentry module is 11 feet high and 7½ feet in diameter at its base. It has three main sections: (1) rendezvous and recovery (R&R), (2) reentry control (RCS), and (3) cabin.

Rendezvous and recovery section is the forward (small) end of the spacecraft, containing drogue, pilot and main parachutes and radar.

Reentry control section between R&R and cabin sections contains fuel and oxidizer tanks, valves, tubing and two rings of eight attitude control thrusters each for control during reentry. A parachute adapter assembly is included for main parachute attachment.

Cabin section between RCS and adapter section, houses the crew seated side-by-side, their instruments and controls. Above each seat is a hatch. Crew compartment is pressurized titanium hull. Equipment not requiring pressurized environment is located between pressure hull and outer beryllium shell which is corrugated and shingled to provide aerodynamic and heat protection.

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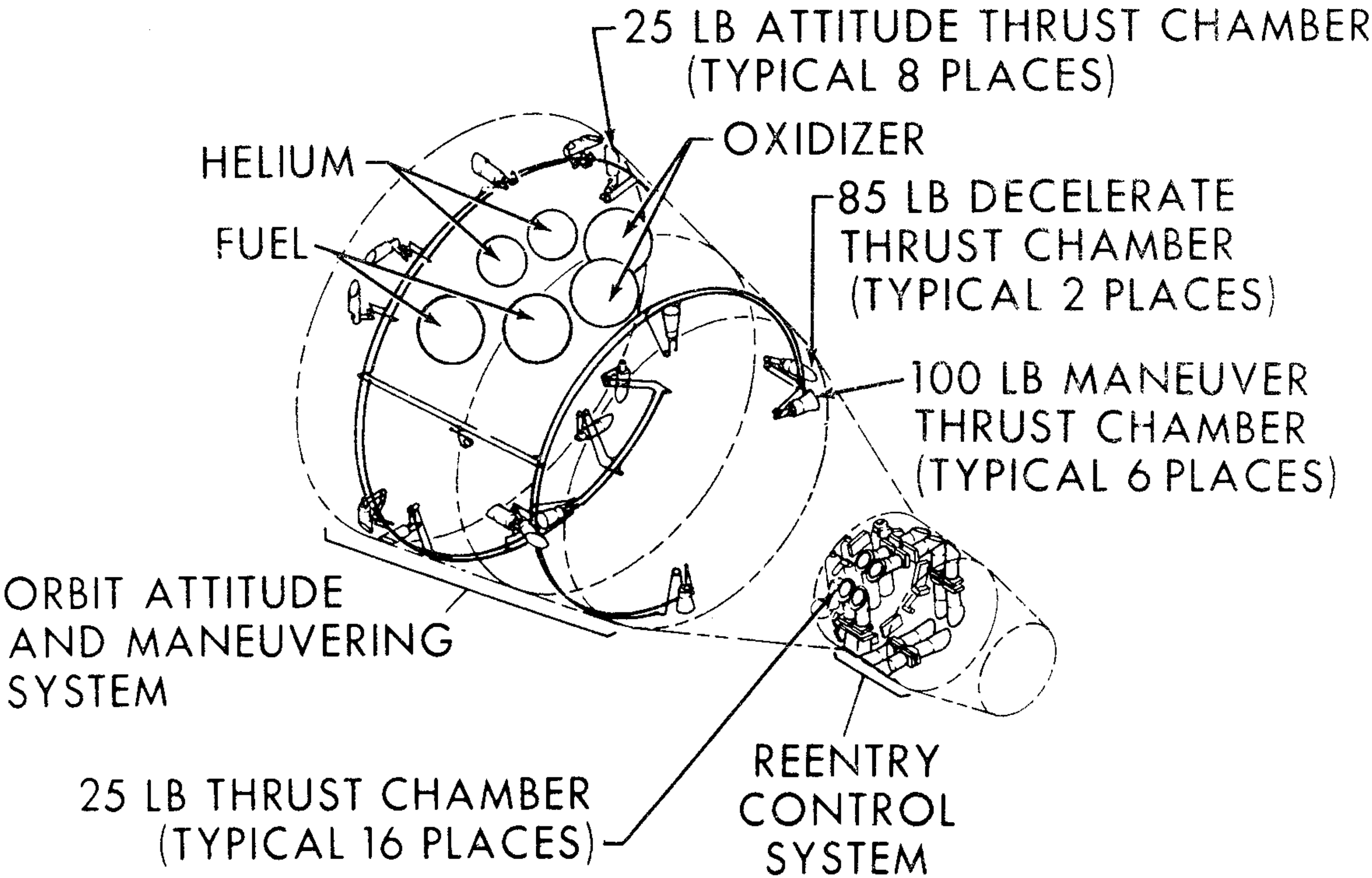
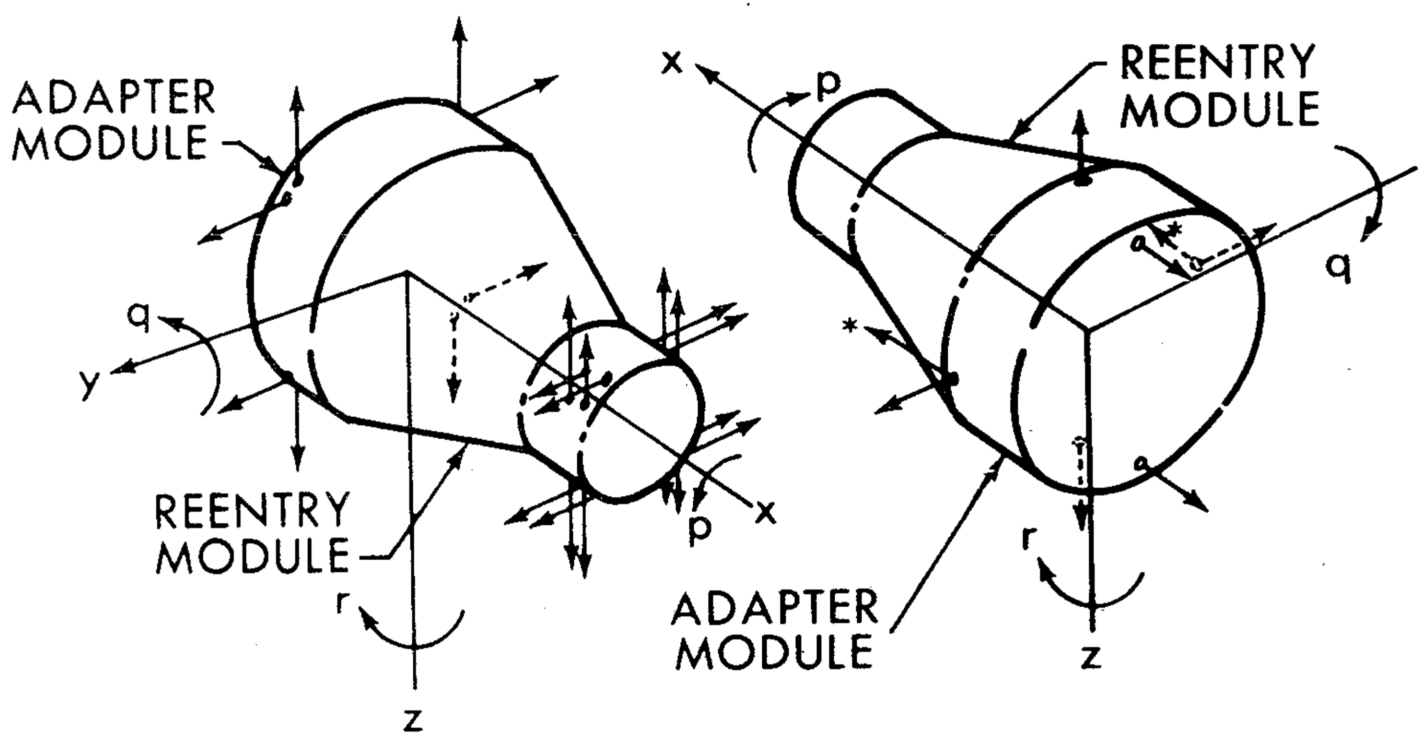
LIQUID ROCKET SYSTEMS GENERAL ARRANGEMENT



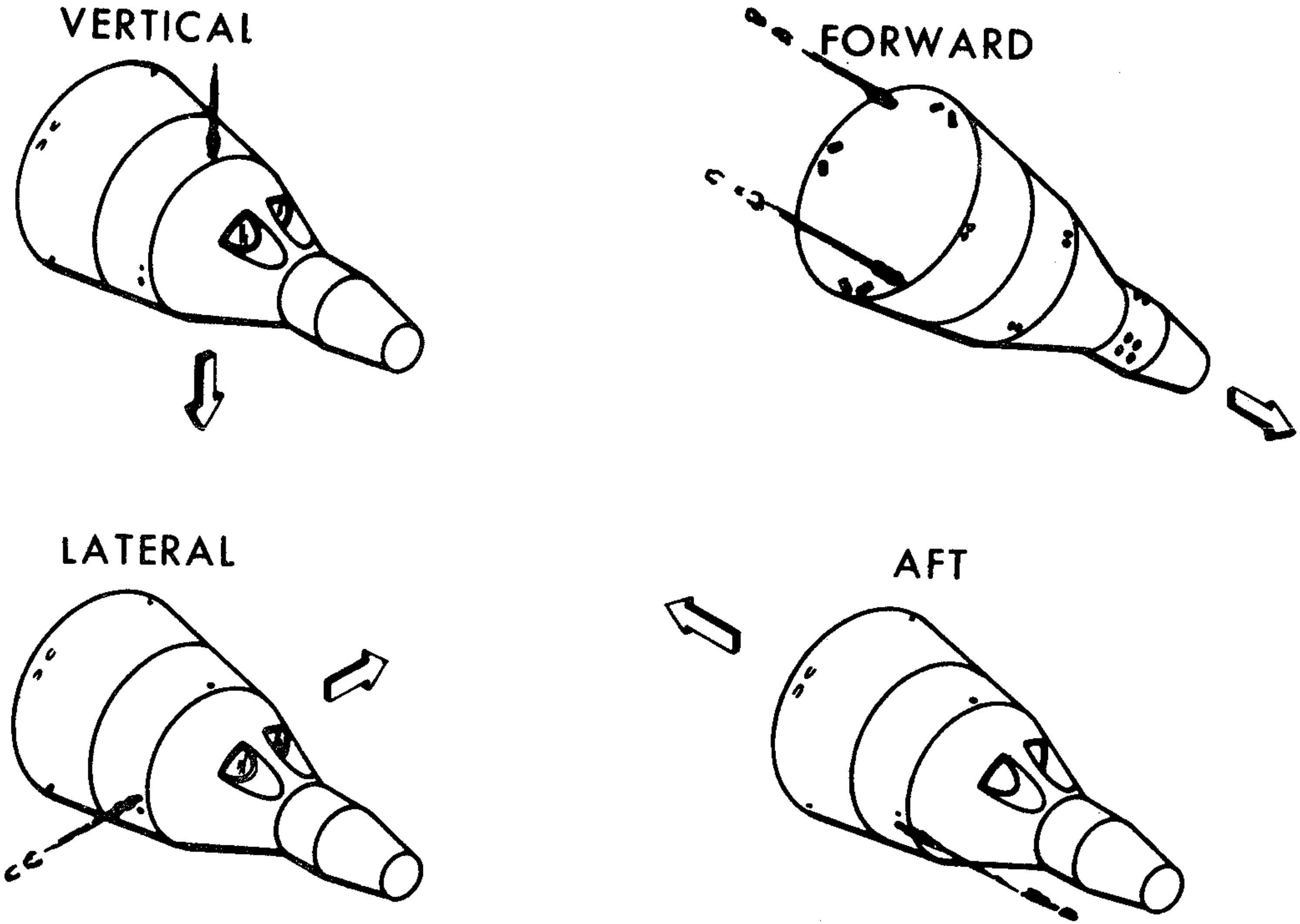
THRUST CHAMBER ARRANGEMENT

ATTITUDE CONTROL
25 LBS. THRUST PER UNIT

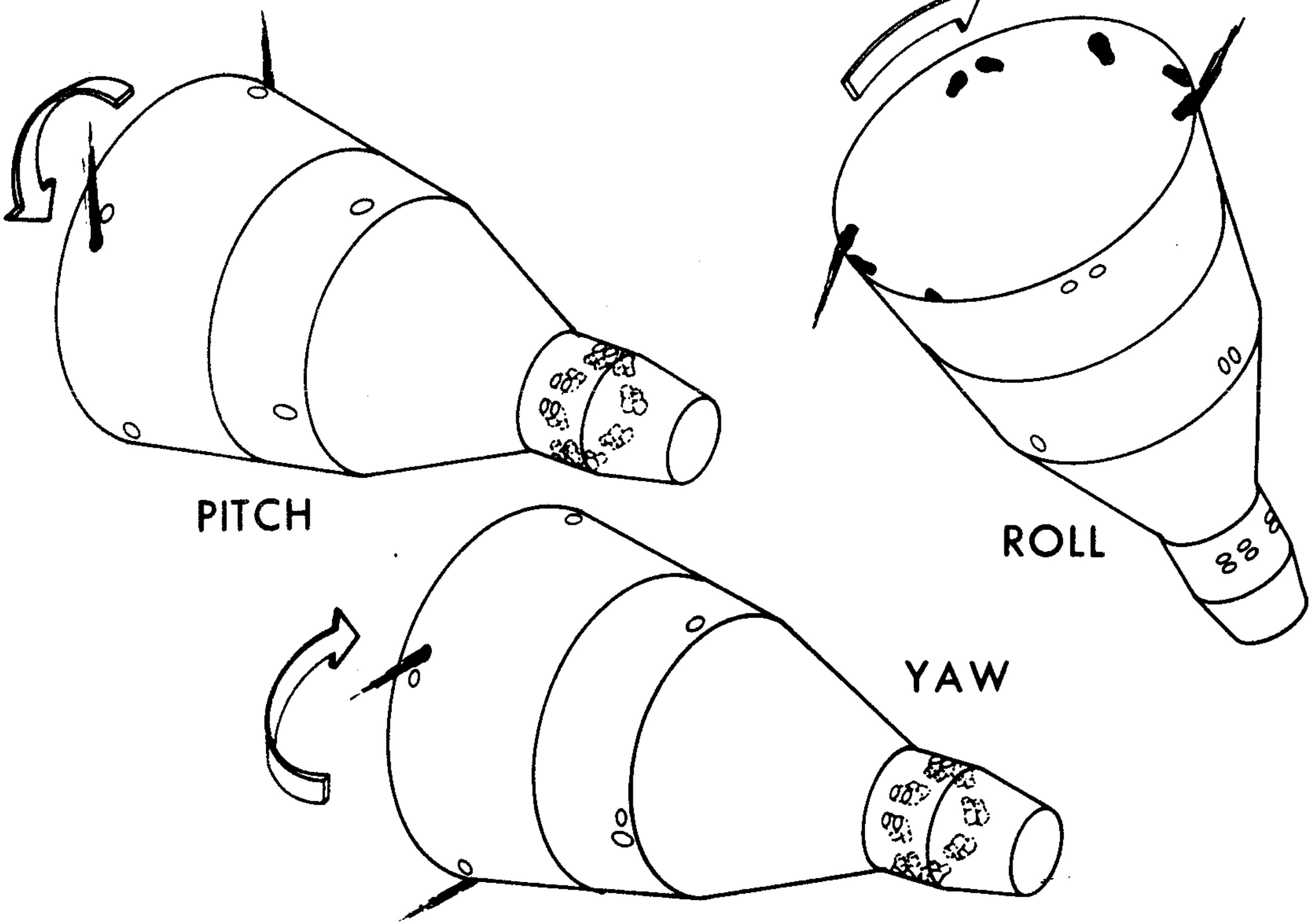
MANEUVER CONTROL
100 LBS. THRUST PER UNIT
* 85 LBS. THRUST PER UNIT AFT



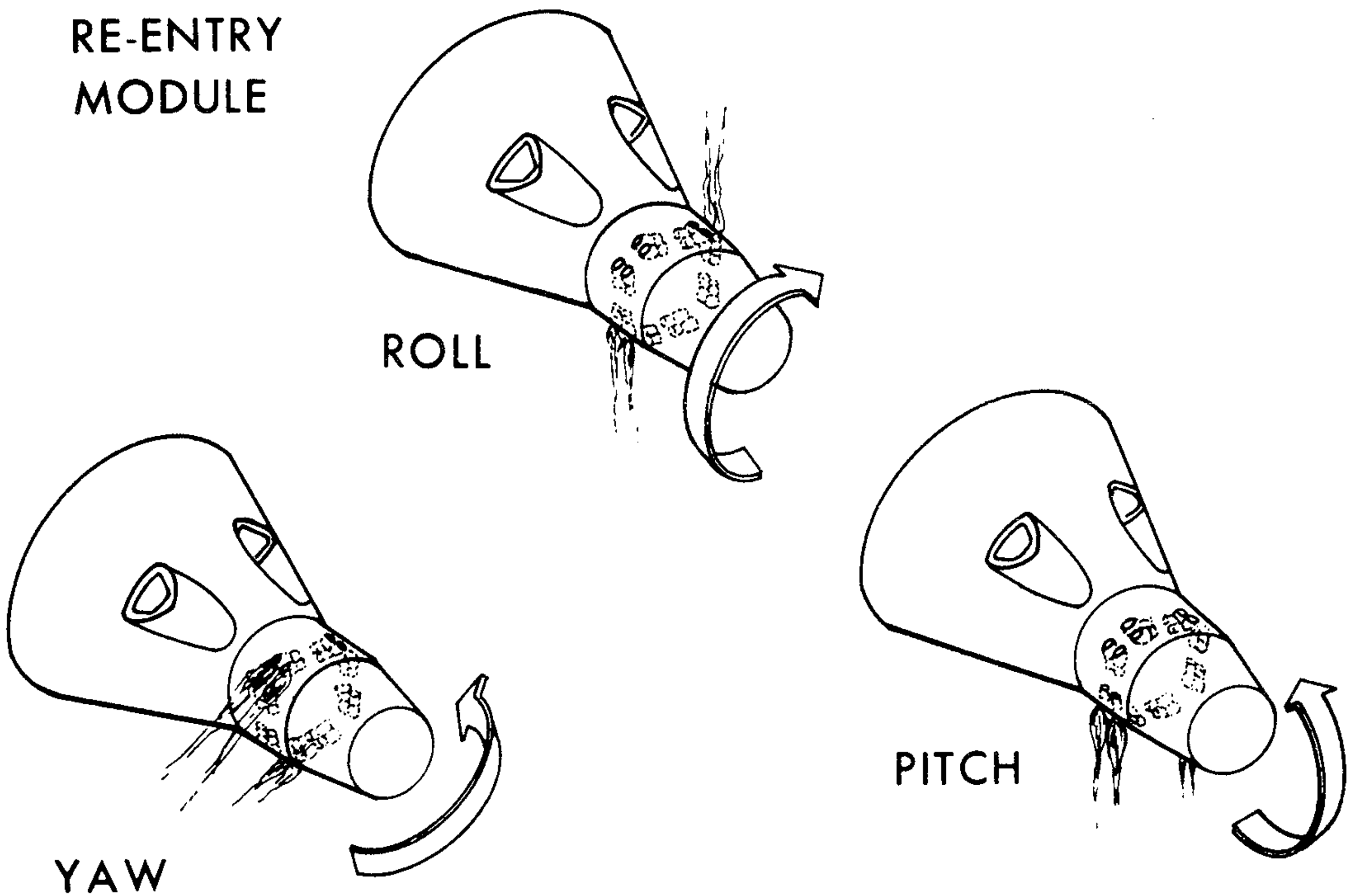
MANEUVERING CONTROL



SPACECRAFT RESPONSES TO ORBIT ATTITUDE CONTROL THRUST



RCS FUNCTION



Dish-shaped heat shield forms the large end of cabin section.

Adapter Section

The adapter is $7\frac{1}{2}$ feet high and 10 feet in diameter at its base, containing retrograde and equipment sections.

Retrograde section contains four solid retrograde rockets and part of the radiator for the cooling system.

Equipment section contains batteries for electrical power, fuel for the orbit attitude and maneuver system (OAMS), primary oxygen for the environmental control system (ECS). It also serves as a radiator for the cooling system, also contained in the equipment section.

NOTE: The equipment section is jettisoned immediately before retrorockets are fired for reentry. The retrograde section is jettisoned after retros are fired.

ELECTRICAL POWER SYSTEM

Gemini 6 carries 10 batteries. Future Gemini flights will use fuel cells, identical to those used on the Gemini 5 flight.

The batteries for this flight include:

Adapter Batteries	three 400-amp/hour units, housed in the adapter section. Primary power source.
Main Batteries	four 45-amp/hour units in the reentry section for power prior to and during reentry.
Squib Batteries	three 15-amp/hour units in the reentry section, used to trigger explosive squibs.

PROPELLANT

Total Available -- 669 pounds

Mission Propellant budget with No Dispersions -- 485 pounds

RENDEZVOUS RADAR

Purpose -- Enables crew to measure range, range rate, and bearing angle to Agena. Supplied data to Inertial Guidance System computer so crew can determine maneuvers necessary for rendezvous.

Operation -- Transponder on Agena receives radar impulses and returns them to spacecraft at a specific frequency and pulse width. Radar accepts only signals processed by transponder.

Location -- small end of spacecraft on forward face of rendezvous and recovery section.

Size -- less than two cubic feet.

Weight -- less than 70 pounds.

Power Requirement -- less than 80 watts.

STATIC CHARGE DEVICE

Experiments on Gemini 4 and 5 indicated there is no problem of a static charge between the spacecraft and the Agena during docking, but these experiments cannot be considered conclusive. Therefore, three protruding flexible copper fingers are installed on the Agena docking cone to make first contact with the spacecraft. Any charge will be carried to a ground in the Agena and dissipated at a controlled rate.

GEMINI LAUNCH VEHICLE

The Gemini Launch Vehicle (GLV-6) is a modified U.S. Air Force Titan II intercontinental ballistic missile consisting of two stages, identical to the launch vehicles used in previous Gemini flights.

	FIRST STAGE	SECOND STAGE
HEIGHT	63 feet	27 feet
DIAMETER	10 feet	10 feet
THRUST	430,000 Pounds (two engines)	100,000 Pounds (one engine)

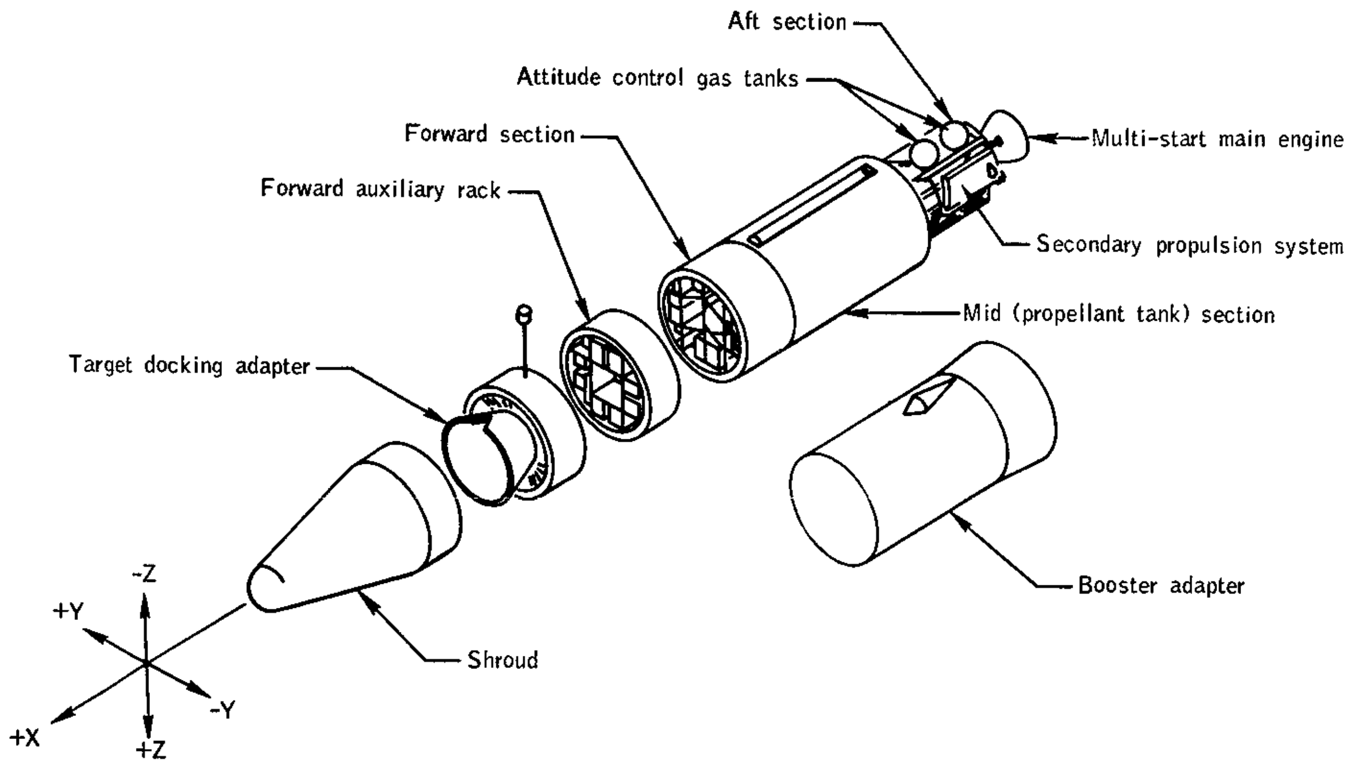
FUEL	50-50 blend of monomethyl hydrazine and unsymmetrical-dimethyl hydrazine
OXIDIZER	Nitrogen tetroxide (Fuel is hypergolic, ignites spontaneously upon contact with oxidizer.)

Overall height of launch vehicle and spacecraft is 109 feet. Combined weight is about 340,000 pounds.

Modifications to Titan II for use as the Gemini Launch Vehicle include: (NOTE: GLV 6 same as GLV 1 through 5)

1. Malfunction detection system added to detect and transmit booster performance information to the crew.
2. Back-up flight control system added to provide a secondary system if primary system fails.
3. Radio guidance substituted for inertial guidance.
4. Retro and vernier rockets deleted.
5. New second stage equipment truss added.
6. New second stage forward oxidizer skirt assembly added.
7. Trajectory tracking requirements simplified.
8. Electrical, hydraulic and instrument systems modified.

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



AGENA TARGET VEHICLE

AGENA TARGET VEHICLE

The Agena target vehicle for Gemini 6 is a modification of the U. S. Air Force Agena D upper stage, similar to the space vehicles which helped propel Ranger and Mariner spacecraft to the Moon and planets.

It acts as a separate stage of the Atlas/Agena launch vehicle, placing itself into orbit with its main propulsion, and can be maneuvered either by ground control or the Gemini 6 crew, using two propulsion systems.

HEIGHT (liftoff)	36.3 feet	Including shroud
LENGTH (orbit)	26 feet	Minus shroud and adapter
DIAMETER	5 feet	
WEIGHT	7,000 pounds	In orbit, fueled
THRUST	16,000 pounds 400 pounds	Primary Propulsion Secondary Engines
FUEL	UDMH (Unsymmetrical Dimethyl Hydrazine)	
OXIDIZER	IRFNA (Inhibited Red Fuming Nitric Acid) in primary propulsion system MON (Mixed Oxides of Nitrogen) in secondary propulsion system	
COMBUSTION	IRFNA and UDMH are hypergolic, ignite on contact	

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Primary and secondary propulsion systems are restartable. Main engine places Agena into orbit and is used for large orbital changes. Secondary system, two 200-pound-thrust, aft-firing engines, are for small phase changes. Two 16-pound-thrust, aft-firing thrusters are for ullage and vernier adjustments. Attitude control (roll, pitch, yaw) is accomplished by gimballing main engine, or by six nitrogen jets mounted on Agena aft end.

Modifications to Agena for use as Gemini rendezvous spacecraft include:

1. Docking collar and equipment to permit mechanical connection with Gemini during flight.
2. Radar transponder compatible with Gemini radar.
3. Displays and instrumentation, plus strobe lights for visually locating and inspecting Agena before docking.
4. Secondary propulsion system for small orbital changes.
5. Auxiliary equipment rack for special rendezvous equipment and telemetry.
6. Command control equipment to allow control by Gemini 6 crew or ground controllers.

Agena program management for NASA is under the direction of the Space Systems Division of the Air Force Systems Command.

ATLAS LAUNCH VEHICLE

The Atlas Standard Launch Vehicle (SLV-3) is a refinement of the modified U.S. Air Force Atlas intercontinental ballistic missile, similar to the launch vehicle which placed Project Mercury Astronauts into orbit.

Atlas is a one-and-a-half stage vehicle, igniting all three main engines on the pad, then dropping off the outboard booster engines at staging, allowing the single sustainer engine to continue thrusting at altitude, aided by two small vernier engines.

HEIGHT	66 Feet	Minus Agena Payload
DIAMETER	16 Feet 10 Feet 5 Feet, 10 inches	Lower Booster Section Tank Sections Tapered Upper End
WEIGHT	260,000 pounds	Fully fueled, minus Agena payload
THRUST	390,000 pounds 330,000 pounds	Total at liftoff Two booster (outer engines)
	57,000 pounds	One Sustainer (center) engine
	Balance	Two small vernier engines for trajectory and final velocity control
FUEL	RP-1, a hydrocarbon resembling kerosene	
OXIDIZER	Liquid Oxygen at -297 degrees F.	

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COMBUSTION — Unlike Titan's hypergolic, spontaneous ignition, Atlas combustion is achieved by forcing propellants to chambers under pressure, burning them in gas generators which drive propellant pump turbines.

Modifications to the Atlas Standard Launch Vehicle for the Gemini 6 mission include:

1. Special autopilot system for rendezvous mission.

2. Improved propellant utilization system to assure simultaneous depletion of both fuel and oxidizer.

3. Increased thickness of Atlas structure for support of Agena upper stage.

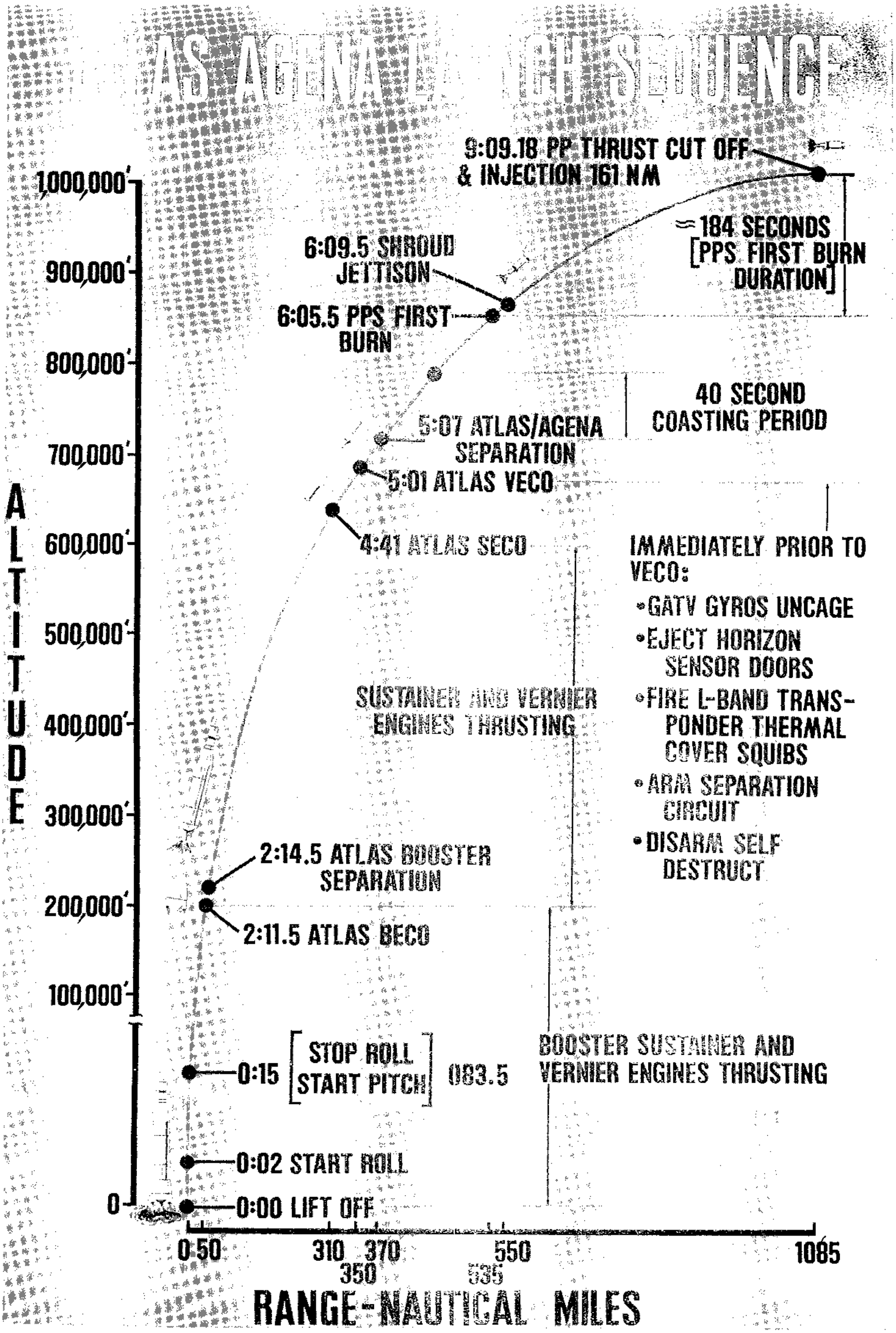
4. Simplified pneumatic system.

5. Retrorockets moved from exterior equipment pods to upper interstage adapter section.

6. Uprated MA-5 propulsion system (used on late Mercury flights.)

7. Modular telemetry kit tailored for each mission.

Atlas Standard Launch Vehicle program management for NASA is under the direction of the Space Systems Division of the Air Force Systems Command.


AGENA SEQUENCE
9:09.18 PP THRUST CUT OFF & INJECTION 161 NM
≈184 SECONDS [PPS FIRST BURN DURATION]
6:09.5 SHROUD JETTISON
6:05.5 PPS FIRST BURN
40 SECOND COASTING PERIOD
5:07 ATLAS/AGENA SEPARATION
5:01 ATLAS VECO
4:41 ATLAS SECO
IMMEDIATELY PRIOR TO VECO:
•GATV GYROS UNCAGE
•EJECT HORIZON SENSOR DOORS
•FIRE L-BAND TRANS-PONDER THERMAL COVER SQUIBS
•ARM SEPARATION CIRCUIT
•DISARM SELF DESTRUCT
SUSTAINER AND VERNIER ENGINES THRUSTING
2:14.5 ATLAS BOOSTER SEPARATION
2:11.5 ATLAS BECO
0:15 [STOP ROLL START PITCH] 083.5
BOOSTER SUSTAINER AND VERNIER ENGINES THRUSTING
0:02 START ROLL
0:00 LIFT OFF
ALTITUDE
1,000,000′
900,000′
800,000′
700,000′
600,000′
500,000′
400,000′
300,000′
200,000′
100,000′
0
0 50 310 350 370 535 550 1085
RANGE-NAUTICAL MILES

CREW BIOGRAPHIES

Walter M. (for Marty) Schirra, Jr., Gemini 6 command pilot

BORN: Hackensack, N. J., Mar. 12, 1923

HEIGHT: 5 feet, 10 inches WEIGHT: 170 lbs. Brown hair, brown eyes

EDUCATION: Bachelor of Science degree, United States Naval Academy, 1945

MARITAL STATUS: Married to the former Josephine Fraser of Seattle, Wash.

CHILDREN: Walter M. III, June 23, 1950; Suzanne, Sept. 29, 1957

EXPERIENCE: Schirra, a Navy Captain, received flight training at Pensacola Naval Air Station, Fla. As an exchange pilot with the United States Air Force, 154th Fighter Bomber Squadron, he flew 90 combat missions in F-84E aircraft in Korea and downed one MIG with another probable. He received the Distinguished Flying Cross and two Air Medals for his Korean service.

He took part in the development of the Sidewinder missile at the Naval Ordnance Training Station, China Lake, Calif. Schirra was project pilot for the F7U3 Cutlass and instructor pilot for the Cutlass and the FJ3 Fury.

Schirra flew F3H-2N Demons as operations officer of the 124th Fighter Squadron onboard the Carrier Lexington in the Pacific.

He attended the Naval Air Safety Officer School at the University of Southern California, and completed test pilot training at the Naval Air Center, Patuxent River, Md. He was later assigned at Patuxent in suitability development work on the F4H.

He has more than 3,800 hours flying time, including more than 2,700 hours in jet aircraft.

Schirra was one of the seven Mercury astronauts named in April 1959.

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On Oct. 3, 1962, Schirra flew a six-orbit mission in his "Sigma 7" spacecraft. The flight lasted nine hours and 13 minutes from liftoff through landing and he attained a velocity of 17,557 miles (28,200 kilometers) per hour, a maximum orbital altitude of 175 statute miles (281 kilometers) and a total range of almost 144,000 statute miles (231,700 kilometers). The impact point was in the Pacific Ocean, about 275 miles (443 kilometers) northeast of Midway Island. He was awarded the NASA Distinguished Service Medal for his flight. He was the backup command pilot for the Gemini 3 mission. Schirra is the son of Mr. and Mrs. Walter M. Schirra, Sr., San Diego, Calif.

Thomas P. (for Patten) Stafford, Gemini 6 pilot

BORN: Weatherford, Okla., Sept. 17, 1930

HEIGHT: 6 feet WEIGHT: 175 lbs. Black hair, blue eyes

EDUCATION: Bachelor of Science degree from United States Naval Academy, 1951

MARITAL STATUS: Married to the former Faye L. Shoemaker of Weatherford, Okla.

CHILDREN: Dianne, July 2, 1954; Karin, Aug. 28, 1957

EXPERIENCE: Stafford, an Air Force Major, was commissioned in the United States Air Force upon graduation from the U. S. Naval Academy at Annapolis. Following his flight training, he flew fighter interceptor aircraft in the United States and Germany, and later attended the United States Air Force Experimental Flight Test School at Edwards Air Force Base, Calif.

He served as Chief of the Performance Branch, USAF Aerospace Research Pilot School at Edwards. In this assignment he was responsible for supervision and administration of the flying curriculum for student test pilots. He established basic text books and participated in and directed the writing of flight test manuals for use by the staff and students.

Stafford is co-author of the Pilot's Handbook for Performance Flight Testing and Aerodynamic Handbook for Performance Flight Testing.

He has logged more than 4,300 hours flying time, including more than 3,600 hours in jet aircraft.

Stafford was one of the nine astronauts named by NASA in September 1962. He was the backup pilot for Gemini 3. Stafford is the son of Mrs. Mary E. Stafford and the late Dr. Thomas S. Stafford, Weatherford, Okla.

Virgil I. (for Ivan) "Gus" Grissom, Gemini 6 backup command pilot

BORN: Mitchell, Ind., April 3, 1926

HEIGHT: 5 feet 7 inches WEIGHT: 150 lbs. Brown hair, brown eyes

EDUCATION: Bachelor of Science degree in mechanical engineering from Purdue University

MARITAL STATUS: Married to the former Betty L. Moore of Mitchell, Ind.

CHILDREN: Scott, May 16, 1950; Mark, Dec. 30, 1953

EXPERIENCE: Grissom is a lieutenant colonel in the United States Air Force, and received his wings in March 1951. He flew 100 combat missions in Korea in F-86's with the 334th Fighter-Interceptor Squadron. He left Korea in June 1952 and became a jet instructor at Bryan, Tex.

In August 1955, he entered the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio, to study aeronautical engineering. In October 1956, he attended the Test Pilot School at Edwards Air Force Base, Calif., and returned to Wright-Patterson Air Force Base in 1957 as a test pilot assigned to the fighter branch.

Grissom has logged more than 4,000 hours flying time, including more than 3,000 hours in jet aircraft. He was awarded the Distinguished Flying Cross and the Air Medal with Cluster for service in Korea.

Grissom was named in April 1959 as one of the seven Mercury astronauts. He was the pilot of the Mercury-Redstone 4 (Liberty Bell 7) suborbital mission, July 21, 1961 and the command pilot of the Gemini 3 mission.

He is responsible for the Gemini group in the Astronaut Office, one of three organizational units in that office. (The others - Apollo and Operations).

Grissom is the son of Mr. and Mrs. Dennis Grissom, Mitchell, Ind.

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John W. (for Watts) Young, Gemini 6 backup pilot

BORN: San Francisco, Calif., Sept. 24, 1930

HEIGHT: 5 feet 9 inches WEIGHT: 172 lbs. Brown hair, green eyes

EDUCATION: Bachelor of Science degree in aeronautical engineering from Georgia Institute of Technology

MARITAL STATUS: Married to the former Barbara V. White of Savannah, Ga.

CHILDREN: Sandy, Apr. 30, 1957; John, Jan. 17, 1959

EXPERIENCE: Upon graduation from Georgia Tech, Young entered the United States Navy and is now a Commander in that service. From 1959 to 1962 he served as a test pilot, and later program manager of F4H weapons systems project, doing test and evaluation flights and writing technical reports.

He served as maintenance officer for all-weather Fighter Squadron 143 at the Naval Air Station, Miramar, Calif. In 1962, Young set world time-to-climb records in the 3,000 meter and 25,000 meter events in the F4B Navy fighter.

He has logged more than 3,200 hours flying time, including more than 2,700 hours in jet aircraft.

Young was among the group of nine astronauts selected by NASA in September 1962. He was the pilot of Gemini 3.

He is the son of Mr. and Mrs. William H. Young, Orlando, Fla.

PREVIOUS GEMINI FLIGHTS

Gemini 1, Apr. 8, 1964

Unmanned orbital flight, using first production spacecraft, to test Gemini launch vehicle performance and ability of launch vehicle and spacecraft to withstand launch environment. Spacecraft and second stage launch vehicle orbited for about four days. No recovery attempted.

Gemini 2, Jan. 19, 1965

Unmanned ballistic flight to qualify spacecraft reentry heat protection and spacecraft systems. Delayed three times by adverse weather, including hurricanes Cleo and Dora. December launch attempt terminated after malfunction detection system shut engines down because of hydraulic component failure. Spacecraft recovered after ballistic reentry into Atlantic Ocean.

Gemini 3, Mar. 23, 1965

First manned flight, with Astronauts Virgil I. Grissom and John W. Young as crew. Orbited earth three times in four hours, 53 minutes. Landed about 50 miles (81 kilometers) short of planned landing area in Atlantic because spacecraft did not provide expected lift during reentry. First manned spacecraft to maneuver out of plane, after its own orbit. Grissom, who made sub-orbital Mercury flight, is first man to fly into space twice.

Gemini 4, June 3-7, 1965

Second manned Gemini flight completed 62 revolutions and landed in primary Atlantic recovery area after 97 hours, 59 minutes of flight. Astronaut James A. McDivitt was command pilot. Astronaut Edward H. White II was pilot, accomplished 21 minutes of Extravehicular Activity (EVA), using a hand held maneuvering unit for first time in space. Attempt to perform near-rendezvous with GLV second stage failed because of insufficient quantity of maneuvering fuel. Malfunction in Inertial Guidance System required crew to perform zero-lift reentry.

Gemini 5, Aug. 21-29, 1965

Longest space flight on record. Astronauts L. Gordon Cooper and Charles (Pete) Conrad, Jr., circled the earth 120 times in seven days, 22 hours and 59 minutes. Cooper is first to make two orbital space flights; has more time in space than any other human. Conrad, on first space flight, becomes world's second most experienced astronaut. Failure of oxygen heating system in fuel cell supply system threatened mission during first day of flight, but careful use of electrical power, and excellant operational management of fuel cells by both crew and ground personel, permitted crew to complete flight successfully. Spacecraft landed about 100 miles (161 kilometers) from primary Atlantic recovery vessel because of erroneous base-line information programmed into onboard computer, although computer itself performed as planned. Plan to rendezvous with a transponder-bearing pod carried aloft by Gemini 5 was cancelled because of problem with fuel cell oxygen supply.

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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
Gemini 5 (Cooper & Conrad)	190	56	01	381	52	02	641	25	57

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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
G. Merritt Preston	Deputy Mission Director for Launch Operations. JFK Space Center, Fla.
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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SPACECRAFT CONTRACTORS

McDonnell Aircraft Corp., St. Louis, Mo., is prime contractor for the Gemini spacecraft. Others include:

AIResearch Manufacturing Co. Los Angeles, Calif.	Environment Control System
The Eagle Pitcher Co. Joplin, Mo.	Batteries
IBM Corp. New York, N.Y.	Computer, Guidance
Northrop Corp. Newbury Park, Calif.	Parachutes
Rocketdyne Canoga Park, Calif.	OAMS, RCS
Thiokol Chemical Corp. Elkton, Md.	Retrorocket System
Weber Aircraft Corp. Burbank, Calif.	Ejection Seats
Westinghouse Electric Corp. Baltimore, Md.	Rendezvous Radar System

Atlas contractors include:

General Dynamics, Convair Div., San Diego, Calif.	Airframe and Systems Integration
Rocketdyne Div., North American Aviation, Inc., Canoga Park, Calif.	Propulsion Systems
General Electric Co., Syracuse, New York	Guidance

Titan II contractors include:

Martin Co., Baltimore Divisions, Baltimore, Md.	Airframe and Systems Integration
Aerojet-General Corp., Sacramento, Calif.	Propulsion Systems

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Titan II contractors (cont.) include:

General Electric Co., Syracuse, N.Y.	Radio Command Guidance System
Burroughs Corp., Paoli, Pa.	Ground Guidance Computer
Aerospace Corp., El Segundo, Calif.	Systems Engineering and Technical Direction

Agena D contractors include:

Lockheed Missiles and Space Co., Sunnyvale, Calif.	Airframe and Systems Integration
Bell Aerosystems Co., Niagara Falls, N.Y.	Propulsion Systems
McDonnell Aircraft Co., St. Louis, Mo.	Target Docking Adopter

Food contractors:

U. S. Army Laboratories, Natick, Mass.	Food Formulation Concept
Whirlpool Corp., St. Joseph, Mich.	Procurement, Processing, Packaging
Swift and Co., Chicago and Pillsbury Co., Minneapolis	Principal Food Contractors

Suit contractor:

The David R. Clark Co.,
Worcester, Mass.

ABBREVIATIONS AND SYMBOLS FREQUENTLY USED

ASCO	AUXILIARY SUSTAINER CUT OFF
CGLVTC	CHIEF GEMINI LAUNCH VEHICLE TEST CONDUCTOR
GATV	GEMINI AGENA TARGET VEHICLE
ECS	(S/C) ENVIRONMENTAL CONTROL SYSTEM
ETR	EASTERN TEST RANGE
FLT	FLIGHT DIRECTOR (HOUSTON)
GAATV	GEMINI ATLAS AGENA TARGET VEHICLE
GEN	GENERAL INFORMATION
GLV	GEMINI LAUNCH VEHICLE
GN2	GASEOUS NITROGEN
GT	GEMINI TITAN
IMU	INERTIAL MEASURING UNIT
IRFNA	INHIBITED RED FUMING NITRIC ACID
LC (14)	LAUNCH CONDUCTOR - COMPLEX 14
LD (14)	LAUNCH DIRECTOR - COMPLEX 14
LD (19)	LAUNCH DIRECTOR - COMPLEX 19
LMD	LAUNCH MISSION DIRECTOR
LN2	LIQUID NITROGEN
LO2	LIQUID OXYGEN
LTC	LOCKHEED TEST CONDUCTOR
MCC	MISSION CONTROL CENTER (DEFINED WITH THE WORD HOUSTON OR CAPE)
MD	MISSION DIRECTOR (HOUSTON)
OAMS	ORBIT ATTITUDE MANEUVERING SYSTEM
PCM	PULSE CODE MODULATION
S/C	(GEMINI) SPACECRAFT

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SPCFT	CHIEF SPACECRAFT TEST CONDUCTOR
SLD	SIMULTANEOUS LAUNCH DEMONSTRATION
SLV	STANDARD (ATLAS) LAUNCH VEHICLE
STC	SLV TEST CONDUCTOR
SRO	SUPERINTENDENT OF RANGE OPERATIONS
TDA	TARGET DOCKING ADAPTER
UDHM	UNSYMMETRICAL DIMETHLHYDRAZINE
WMSL	WET MOCK SIMULATED LAUNCH

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