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GEMINI 9-A

PRESS KIT ADDENDA

GEMINI 9A PRESS KIT ADDENDA

In the re-scheduled Gemini 9A mission, an alternate rendezvous and docking target vehicle - the Augmented Target Docking Adapter -- (ATDA) will be used. The target vehicle was developed as an alternate for the Gemini 8 mission or subsequent missions in which an Agena would not be available

Since the ATDA has no self-propulsive capabilities, the mission plan has been adjusted to accomplish the maximum number of objectives which were scheduled for the original Gemini 9 - Agena flight.

The Gemini 9 press kit (Release #66-97) contains most of the basic information about the flight which will still apply to the Gemini 9A flight. The following changes from the 9 press kit are contained in this Addenda and are as follows:

1. General release is replaced by General release in the Addenda

2. Section I, pp. 6-7, is replaced by a revised sequence of events to launch and launch vehicle countdown in the Addenda, pp. 5-8.

3. Section II, Mission Description, pp. 7-19, is replaced by a revised Mission Description in the Addenda, pp. 9-16

4. Section IV, Crew Provisions and Training, pp. 24-25, has been updated with crew activities and training between launches on p. 17 of the Addenda

5. Section V, Tracking Network, pp. 32-39, has been replaced by a revised Tracking Network plan for the ATDA pp. 18-28 of the Addenda

6. The description of the Agena Target Vehicle on pp. 45-47 has been replaced by a description of the ATDA on pp. 29-30 in the Addenda.

GENERAL RELEASE

The Gemini 9A mission is scheduled for launch no earlier than June 1 from Cape Kennedy, using the Augmented Target Docking Adapter as the rendezvous target for the Gemini 9 spacecraft.

Objectives of the mission are rendezvous and docking of Gemini with the ATDA and extravehicular activity by the pilot. Launch of the ATDA is scheduled for 10 a.m. EST with the Gemini to lift off at 11:38 a.m. EST.

Command pilot for the three day Gemini flight is Astronaut Thomas P. Stafford. Pilot is Eugene A. Cernan. Backup crew is James A. Lovell, Jr., command pilot, and Edwin E. Aldrin, pilot.

Stafford was pilot on the Gemini 6 mission which accomplished the first space rendezvous. Gemini 9 will be Cernan's first space flight.

Lovell was pilot on the 14-day Gemini 7 mission which served as the rendezvous target for Gemini 6. Aldrin has not yet made a space flight.

The ATDA will be launched by an Atlas booster developing 390,000 pounds of thrust with two booster engines, two vernier (guidance) engines, and a sustainer engine. The two stage Gemini launch vehicle is the 530,000 pound thrust modified Titan II rocket.

The ATDA will be inserted into a 185 statute mile circular orbit and the Gemini 9 will be placed in an initial 100 by 170 mile orbit. Rendezvous is scheduled for the third revolution approximately four hours after the Gemini launch.

About 30 minutes after rendezvous Gemini 9 will dock with the ADTA over Hawaii. A re-docking by the pilot will be made before the crew powers down the spacecraft for an eight hour rest period.

Cernan will begin his extravehicular activity near the end of the 13th revolution and he will be out of the spacecraft about two and one half hours.

During the first daylight portion of the extravehicular activity, Cernan will remain on a 25-foot unbilical tether with oxygen supplied from the spacecraft. He will retrieve a meteoroid collection experiment from the Gemini adapter and expose some new surfaces on another meteoroid collection experiment on the ATDA.

He will evaluate tether dynamics of the 25-foot umbilical and evaluate the handrail and handholds on the Gemini adapter section.

During the night pass Cernan will be in the adapter section where he will strap on the Astronaut Maneuvering Unit (AMU), a backpack with a propulsion unit and oxygen supply.

At the next sunrise, Stafford will undock the Gemini from the ATDA and move 120 feet behind the target vehicle. Cernan will move to the front of the Gemini and test the control and translation characteristics of the AMU. Working on a 125-foot tether, Cernan will move to the undocked ATDA and retrieve the ATDA meteoroid collector before reentering the Gemini.

After the space walk and a third docking, the remainder of the flight will include two more re-rendezvous of Gemini with the ATDA.

The first re-rendezvous will begin at 27 hours after launch. It is an "equi-period" rendezvous in which two spacecraft have the same periods but different apogees and perigees. This test, originally planned for the Gemini 8 mission, will be made using only the on-board computer and optical equipment, but not the radar.

After the second re-rendezvous, the Gemini will not re-dock, but will make a small burn retrograde. The burn will put the Gemini in a slightly lower orbit and allow it to pull ahead of the ATDA to set up the conditions for the third re-rendezvous on the following day.

In the Simulated Lunar Module abort rendezvous, the Gemini will maneuver to a co-elliptical orbit approximately 8.5 miles above the ATDA. The terminal phase of the re-rendezvous will begin with the Gemini above and ahead of the ATDA.

Seven experiments are scheduled for the mission. Scientific experiments include zodiacal light photography, two meteoroid collection experiments, and airglow horizon photography. Technological experiments are the UHF/VHF polarization and the Astronaut Maneuvering Unit. The medical experiment is the bioassays of body fluids.

Gemini 9 is scheduled to land in the West Atlantic Ocean about 480 miles east of Cape Kennedy at the beginning of the 45th revolution after 70 hours 50 minutes of flight.

In the event the effort to orbit the augmented target docking adapter is unsuccessful, an alternate mission designated 9-B, will be flown. The Gemini 9-B mission will have only one primary mission objective: to conduct and evaluate the extravehicular activities for this mission.

Since rendezvous and docking would not be conducted in the alternate Gemini 9-B mission, more time would be available to carrying out experiments.

9A TURNAROUND CHRONOLOGY

The following sequence of events for turnaround for the Gemini 9A mission was scheduled at Cape Kennedy.

May 18 --- Modifications on the Atlas SLV III were started to enable the booster to launch the Augmented Target Docking Adapter -- (ATDA) directly into orbit. Since the Atlas being used for 9A was originally programmed to launch the Agena for Gemini 10, modifications were necessary to permit it to launch a lighter vehicle with no self-propulsion capability. The ATDA was taken out of storage in preparation for its checkout. At Pad 19, the Gemini spacecraft was mechanically demated from its Gemini Launch Vehicle.

May 19 --- The ATDA stabilization system is serviced. The Gemini fuel cell is replaced.

May 20 --- The rendezvous and recovery section of the Gemini spacecraft is taken to the hangar and mated with the ATDA to check the docking interface of the two vehicles. The modifications to the Atlas are completed.

May 21 --- The Atlas is erected on Pad 14. The ATDA is brought to Pad 14. The Gemini spacecraft goes into systems tests.

May 22 --- The Atlas begins systems tests and the ATDA begins premate systems tests.

May 23 --- The ATDA completes premate tests and the Gemini completes systems tests.

May 24 --- The ATDA is mated with the Atlas and the ATDA nose shroud is mated.

May 25 --- The ATDA undergoes post-mate systems tests.

May 26 --- A simulated flight is conducted, with the crews.

May 27 --- An L-band radar test between the Gemini on Pad 19 and the ATDA on Pad 14.

May 28 --- A mission profile test is conducted with the ATDA and Atlas. A simulated countdown, liftoff and insertion is performed to check the interface between the two vehicles. Atlas systems tests are completed.

May 30 --- The ATDA pyrotechnics are activated.

The Gemini 9A count actually is a combination of nine different countdowns, mostly running simultaneously. The different counts are associated with the two launch vehicles, the two spacecraft, crew, Houston Mission Control and the worldwide tracking network, the Eastern Test Range and the Radio-Command Guidance System.

Timing is critical in this count to complete the rendezvous. In the final countdown on launch day, the Atlas-ATDA count starts at T-440 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 98 minutes later, depending on the exact location and performance of the orbiting ATDA. A built-in hold is scheduled at T-3 minutes to adjust the Gemini liftoff time to coincide with the ATDA's first pass over the Cape. After the launch sequence adjustments are computed, the count will resume.

LAUNCH VEHICLE COUNTDOWN

Time	Gemini	Atlas-ATDA
F-3 days	Start pre-count	
F-1 day	Start mid-count	
T-720 minutes	GLV propellant loading	
T-440 minutes		Begin Terminal count
T-390 minutes	Complete propellant loading	
T-360 minutes	Systems power up	
T-300 minutes	Back-up flight crew reports to the 100-foot level of the White Room to participate in final flight preparation. Begin terminal countdown Pilots' ready room, 100-foot level of White Room and crew quarters manned and made ready for prime crew.	

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T-285 minutes	Primary crew awakened	
T-255 minutes	Medical examination	
T-240 minutes	GLV terminal count begins	
T-235 minutes	Breakfast	
T-195 minutes	Crew leaves quarters	
T-185 minutes	Crew arrives at ready room on Pad 16	Start tower removal
T-140 minutes		Start Atlas liquid oxygen tanking
T-135 minutes	Purging of suit begins	
T-124 minutes	Crew leaves ready room	
T-120 minutes	Flight crew to Complex 19	
T-119 minutes	Crew arrives at 100-foot level	
T-115 minutes	Crew enters spacecraft	
T-100 minutes	Close spacecraft hatches	
T-95 minutes		Lift off
T-86 minutes		Insertion into orbit
T-70 minutes	White Room evacuation	
T-55 minutes	Begin erector lowering	
T-20 minutes	Spacecraft OAMS static firing	
T-3 minutes	Built-in hold	
T-03 seconds	GLV ignition	
T-0 seconds	Lift off	
T+2 minutes 36 seconds	Booster engine cutoff (BECO)	
T+5:36	Second stage engine cutoff (SECO)	
T+6:06	Spacecraft-launch vehicle separation	
T+6:14	Insertion into orbit	

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REENTRY

(Elapsed Time from Gemini Lift-Off)

70:14	Retrofire
70:16	Jettison retrograde section
70:35	400,000 feet altitude
70:38	Communications blackout
70:41	Initiate guidance
70:43	Blackout ended
70:44	Drogue chute deployed (50,000 feet)
70:46	Main chute fully deployed (9,800 feet)
70:50	Spacecraft landing

LAUNCH

Launch Times -- Atlas ATDA - 10 a.m. EST, Launch Complex 14. Gemini 9A - 11:38:22 a.m. EST, Launch Complex 19.

Launch Window -- Begins approximately 99 minutes after the ATDA launch and lasts for five minutes, 47 seconds on the first day. If the Gemini is not launched during this window on the first day, rendezvous may be achieved by launching during varying windows on successive days. The windows on these days vary according to the ATDA orbit but, under planned conditions, they last for approximately 35 minutes.

Azimuth -- ATDA launch is on azimuth of 83.8 degrees. Gemini launch vehicle launch azimuth will be 97.7 degrees, but will be biased from 96.3 degrees so that a small amount of yaw steering during the second-stage burn will place the spacecraft in the plane of ATDA.

Out-of-Plane Capability -- Fuel budget allows spacecraft to maneuver one-half of one degree out-of-plane if the booster yaw steering does not place Gemini in the correct plane.

Inclination -- 28.87 degrees for both ATDA and Gemini spacecraft.

RENDEZVOUS

(All times are approximate)

Orbits -- ATDA at near-circular 185 miles. Gemini initially in elliptical 100-170 miles. Gemini trails ATDA by 640 miles at insertion.

Incremental Velocity Adjustment Routine (IVAR) -- At spacecraft insertion a burn may be made if the insertion parameters do not match the desired velocity. The maneuver will be made only if the spacecraft underspeed increment is no more than 30-feet-per-second. If the spacecraft is overspeed or if the underspeed velocity difference is more than 30-feet-per-second (fps), the IVAR will not be performed but a separation maneuver of at least five fps will be made. Aft firing thrusters are used throughout.

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Phase Adjustment -- Near spacecraft first apogee, at a ground elapsed time (GET) of 51 minutes (00:51), a posigrade horizontal burn (normally 56 fps) will raise the perigee to about 136 miles. This will reduce the catch-up rate from about 6.5 degrees to 4.2 degrees per orbit and provide necessary phase relation at second apogee. Gemini trails ATDA at this point by 428 miles.

Combination Correction Maneuver -- This is designed to adjust spacecraft catch-up rate, altitude and to bring Gemini closer to the ATDA orbit plane. Executed at 1 hour 57 minutes GET (01:57) at the beginning of the second revolution over Ascension, it is a normal 1.2 fps burn, but can vary according to dispersions. In Gemini 9A the altitude between Gemini and ATDA will be allowed to vary 4 miles plus-or-minus from the normal 14-mile difference in altitude to give control over the exact rendezvous point. Gemini trails ATDA by 169 miles.

Co-elliptical Maneuver -- Near the second spacecraft apogee at 2 hours 20 minutes (02:20) GET, the crew will circularize the orbit to 170 miles. It will be a posigrade maneuver of 54 fps with spacecraft. At this time, the spacecraft trails the ATDA by 123 miles and should have onboard radar lock-on.

Terminal Phase Maneuver -- At 2 hours 24 minutes (02:24) GET the crew will switch the computer to rendezvous mode and begin terminal phase system checkout and procedures. At 3 hours 27 minutes (03:27) GET, about three minutes prior to entering darkness, the crew will perform a burn of 27 fps along line of sight to the ATDA. Distance from the ATDA will be about 31 miles and spacecraft will be 130 degrees of angular orbit travel from the point of rendezvous. The spacecraft will be pitched up 27 degrees for this posigrade maneuver using aft thrusters.

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Intermediate Corrections -- Twelve minutes after initial impulse, the computer displays the first correction to be applied by the crew. It is a 3 fps maneuver performed at 03:39 GET. Twelve minutes later, at 3 hours 51 minutes, (03:51) GET another correction is applied. Range is about 4.5 miles and the crew begins a semi-optical approach to the ATDA. 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 3 hours 59 minutes (03:59) GET is about 34 fps. However, since the command pilot will be controlling final approach by semi-optical techniques, he will make real-time decisions. Rendezvous should occur over the Indian Ocean northwest of Australia.

DOCKING OPERATIONS

When the spacecraft comes within 50 feet of the ATDA it will stop its relative motion and fly formation with the target vehicle for approximately 30 minutes before the first docking over Hawaii. The Gemini will undock from the ATDA at approximately 5 hours 10 minutes (05:10) GET and the pilot will perform a docking operation. After an eat period, the crew will power down the spacecraft for an eight-hour rest period.

EXTRAVEHICULAR ACTIVITY

At the 17th hour after liftoff, the crew will prepare for the pilot's extravehicular activity. The extravehicular life support system (ELSS) chest pack (see Crew Provisions section for details) will be unstowed, along with the 25-foot umbilical tether and "Y" connectors. The pilot makes the connections between the 25-foot umbilical and the chest pack and his Extra-Vehicular Activity (EVA) suit. The command pilot will lower cabin pressure to 3.5 pounds per-square-inch for a systems check and them completely depressurize the cabin. The pilot is scheduled to open the hatch at 20 hours 41 minutes GET, at the end of the 13th revolution and leave the spacecraft.

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On the first daylight pass over the United States, the pilot will perform the following tasks:

While standing on the seat he will mount the extravehicular motion picture camera facing forward, then retrieve the S-12 micrometeroid experiment on the retro adapter directly behind his seat. He will then move to the target docking adapter and open the S-10 micrometeroid experiment mounted there. He will evaluate tether dynamics using the 25-foot umbilical and then move to the adapter section to evaluate the handrail and Velcro (tape) handholds for surface transit. He goes to the rear of the adapter section to inspect the D-12 Astronaut Maneuvering Unit (AMU) and will cut away any debris which may be attached to the adapter section. Prior to sunset he moves into position on the adapter foot and hand bars in the adapter to begin putting on the AMU.

During the night pass the pilot will stay in the adapter section, putting on the AMU. Immediately before the second day pass, the command pilot will undock the Gemini from the ATDA and fly 120 feet in plane behind the ATDA. He will then fire the pyrotechnics to free the AMU from the adapter section and the pilot will move to the nose of the spacecraft. Using the 125-foot mechanical tether, he will move approximately 40 feet from the nose of the spacecraft. He will evaluate the AMU attitude control system by making small movements in pitch and yaw. He will then make small translations, no more than one-half-foot-per-second. Both maneuvers will be made with and without the automatic stabilization feature of the AMU.

When these maneuvers have been completed, the command pilot will maneuver the spacecraft to simulate a pickup of the EVA pilot. The EVA crewman then uses the AMU to translate to the ATDA, maneuver in the vicinity of the ATDA and retreive the meteoroid collector. He moves back to the spacecraft, reconnects to the spacecraft 25-foot umbilical and jettisons the AMU.

The EVA pilot will not reenter the spacecraft until after the beginning of the second night pass. After sunset, the pilot will take dimlight photo-

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graphy for the S-1 experiment while standing in the seat. He will make final ingress and close the hatch at approximately 23 hours 17 minutes, a total of 2 hours, 30 minutes outside the spacecraft.

EQUIPERIOD RE-RENDEZVOUS

At 27 hours into the flight, the crew will begin preparation for the first of two planned re-rendezvous maneuvers. The equiperiod re-rendezvous is the same type of maneuver which had been planned for Gemini 8. It will be a completely onboard operation using the computer and a hand-held sextant to obtain guidance information. The purpose of this re-rendezvous is to simulate the terminal phase of a passive target rendezvous which will be performed on a later Gemini mission. The radar will not be used except as a backup if visual contact is lost with the target.

At 27 hours 27 minutes (27:27) GET in the 18th revolution over RKV, the Gemini spacecraft will perform an upward radial translation of 20 fps. The new orbit will be equiperiod with the ATDA orbit, i.e.: the perigee and apogee points of the two orbits do not coincide, but the orbital period is the same. Gemini will have a perigee of 182 miles and an apogee of 188 miles.

The spacecraft will travel above and behind the ATDA into sunset. The maximum separation distance will be 13 miles behind the ATDA. A mid-course correction may be made if necessary

At 28 hours and 40 minutes (28:40) GET, the terminal phase initiation will begin. A 1.9 fps burn retrograde will be made to put the spacecraft on an 80-degree intercept, i.e.: rendezvous will occur 80 degrees around the Earth from that point. The pilots will be in a heads-down attitude to shield the spacecraft windows from direct sunlight. The target must be visually acquired to perform terminal phase maneuvers. Line of sight elevation and sun-angle time histories will be scaled for a passive rendezvous, so that the side of the ATDA toward the spacecraft is illuminated. Range and range rate will be scaled at 40 per cent.

At 29 hours (29:00) GET, the velocity match maneuver of 16 fps is made to bring the spacecraft back to a 185 mile orbit. Gemini will not dock with ATDA after the second re-rendezvous.

SIMULATED LUNAR MODULE RENDEZVOUS

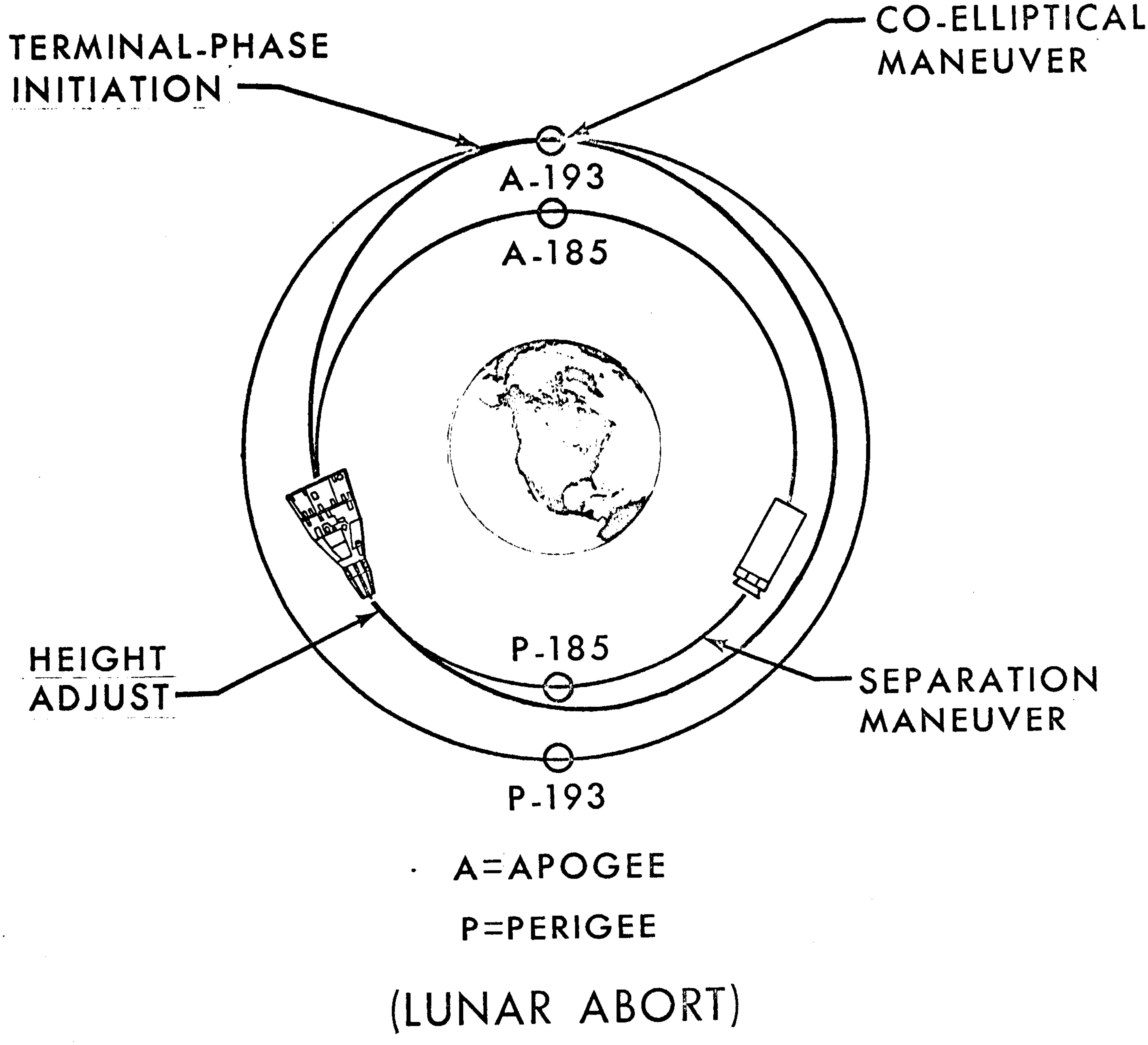
Commonly known as rendezvous from above, this re-rendezvous is designed to simulate a lunar rendezvous which could take place if the lunar module had descended to the 50,000 foot level above the Moon's surface and a decision not to continue for a landing was made. The LM's highly elliptical orbit would carry it above the Command and Service Module before the two orbits could be matched. In the Gemini maneuver, the spacecraft will make a small retrograde maneuver on the second day to allow the Gemini to pull approximately 86 miles ahead of the ATDA during the astronaut rest period. On the following day, the crew will perform maneuvers which will put the spacecraft in a circular orbit approximately eight miles above the ATDA. The rendezvous from above will begin from this position. The sequence of maneuvers is:

Separation maneuver -- At 29:45 GET in the 19th revolution, the spacecraft will perform a 2.5 fps retrograde burn. The perigee will be approximately one and a half miles below the perigee of the ATDA and the apogee will be the same as the ATDA. With the lower perigee, Gemini will gain approximately 7.8 miles on the ATDA every revolution. When the closing maneuver is performed in the 30th revolution, Gemini should be approximately 86 miles ahead of the ATDA.

Closing maneuver -- Also called the height adjustment maneuver, performed at 47:05 GET in the 30th revolution over Africa. It is a 13.2 fps posigrade maneuver which raises the apogee of the Gemini spacecraft to 193 miles.

Co-elliptical maneuver -- Performed over Hawaii on the 30th revolution, the co-elliptical maneuver executed at 47:50 GET is a 15.7 fps burn posigrade which circularizes the Gemini orbit at 193 miles.

Terminal phase initiation -- Prior to Canarvon on the 31st revolution, the terminal phase maneuver of 16 fps retrograde is performed at 48:52 minutes. The resulting orbit is 194 by 183 miles.



A=APOGEE

P=PERIGEE

(LUNAR ABORT)

GEMINI IX-A RE-RENDEZVOUS

Gemini Intermediate Corrections -- Two small burns will be made similar to the intermediate corrections applied for earlier rendezvous. They will occur at 12 minute intervals after the TPI burn.

Velocity Match Maneuver -- At 49:25 GET on the 31st revolution over the Pacific Ocean near Hawaii, a braking maneuver of 23 fps retrograde will be performed. At approximately 49:45 GET over the U.S., the command pilot will perform the final docking maneuver with the ATDA.

FINAL SEPARATION

The Gemini spacecraft will perform a 3 fps retrograde maneuver at 50:30 GET as the final separation maneuver from the Agena. The new orbit of the Gemini will be 182 by 185 miles.

RETROFIRE

Retrofire will occur at 70:14 GET during the spacecraft's 44th revolution. Splashdown will occur in the west Atlantic recovery area (27N75W) at 70:59 GET.

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 altitude 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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GEMINI 9A CREW TRAINING

(For original training see Gemini 9 press kit)

After the postponement of the Gemini 9 mission the crew returned to the Manned Spacecraft Center on the following day. They remained in Houston until May 23, participating in flight planning meetings and other briefings in preparation for the second attempt to launch Gemini 9. During this period they received a three hour briefing on the ATDA from McDonnell Aircraft Co. and Gemini Program Office Personnel. They also performed another walk-through of the EVA procedures using the Crew Procedures Trainer in Building #5.

Upon returning to Cape Kennedy, the crew examined the ATDA on Pad 14 and received two more briefings on its systems and functions. They began simulations in the Gemini Mission Simulator at the Cape to specifically practice the new type of second re-rendezvous (lunar abort) which was required when the passive ATDA was substituted for the Agena.

They also performed another walk through of the EVA procedures and attended flight readiness review and other briefings leading up to the flight. The back-up crew participated in the launch simulation conducted on May 26 and assisted the prime crew in training during the turn around period.

At T-2 days, the crew received another physical as a prelude to the beginning of countdown activities.

MANNED SPACE FLIGHT TRACKING NETWORK
GEMINI 9A 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 9A the network will provide flight controllers:

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

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

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 the Air Force Eastern Test Range (AFETR) radars via the Cape Kennedy CDC-3600 computing complex, and from BDA radar via high speed data line .

TRACKING

The Gemini mission will require separate tracking of four space vehicles: the Gemini spacecraft, the ATDA, Titan II which is the Gemini Launch Vehicle (GLV), and as required, the Atlas Booster called SLV-3. The Gemini spacecraft will carry two C-band tracking beacons. The ATDA will also carry two C-band beacons. Skin tracking (radar signal bounce) of the Atlas (which will be inserted into orbit) and Gemini launch vehicle throughout orbital lifetime for impact prediction is a mission requirement. Selected sites will skin track the S/C and the ATDA. 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 the spacecraft during the launch or rendezvous phase.

For Gemini 9A, various combination of spacecraft tracking assignments will be carried out according to individual station capability. All C-Band radar sites have radar systems capable of providing space position information on either the Gemini or ATDA vehicles but not simultaneously. Data transmission links have only a single system capability, therefore, priority will be established by the Mission Director or Flight Dynamics Officer according to their needs.

Other Computer Support

The Goddard Space Flight Center realtime computing support for Gemini 9A includes the processing of realtime tracking information obtained from the Titan II and Atlas.

Goddard's computer also will certify the worldwide network's readiness to support Gemini 9A 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 or the test is completed.

Control of the entire Gemini 9A mission will be exercised by the Mission Control Center in Houston, Texas. As it did on earlier Gemini flights, Houston's Realtime Computer Complex will serve as the prime computer center.

Gemini Spacecraft

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

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

*Contractor nomenclature

During and after Titan II launch, the spacecraft will be the prime target for C-band tracking. After insertion, however, selected C-band stations will track the ATDA, GLV and Atlas.

Stations Capable of C-Band Tracking are:

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

Stations Capable of Skin (radar signal bounce) Tracking the Gemini Launch Vehicle, Spacecraft, and the ATDA 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.

ATDA

The ATDA will contain 2 C-band beacons. Each beacon will use three circularly polarized antennas. The C-band beacons utilize different pulse spacings than those used by the spacecraft C-band beacons which assures positive vehicle identification by the ground tracking radar.

ACQUISITION SYSTEMS

Sites with acquisition aid systems capable of acquiring the ATDA and Gemini spacecraft simultaneously will provide radio frequency (RF) inputs to their associated telemetry receivers and pointing data to selected steerable antennas. Sites which do not have simultaneous acquisition capability may acquire either vehicle dependent upon the priority established. All stations will track the ATDA until orbital insertion of the Gemini spacecraft.

MISSION MESSAGE REQUIREMENTS

Low speed telemetry data (on-site teletype summaries) will be sent to the Houston Mission Control Center from flight controller manned stations.

Bermuda and Corpus Christi will transmit Gemini spacecraft PCM telemetry via high-speed digital data lines. An option is available to transmit Gemini spacecraft and ADTA telemetry data via low speed telemetry teletype summaries to Houston Mission Control Center. MCC-K/TEL III Grand Bahama Island, Grand

Turk Island, and Antigua will remote Gemini spacecraft wide-band data to the Houston Mission Control Center. Only MCC-K/TEL III will remote ATDA wide-band data to the Houston Mission Control Center.

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 uplink data command transmissions. Commands may be sent to either the spacecraft or the ATDA. Types of commands available for transmission to the vehicles are listed on the next page.

The 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. Real-time commands also can be transmitted from Corpus Christi, Tex., which will be Flight Controller Manned.

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. ATDA

1. Real time commands only

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.

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

Cape Kennedy; Grand Bahama Island; Tananarive, Malagasy Republic; Kano, Nigeria; Bermuda; Grand Turk Island; Pt. Arguello, Calif.; Antigua Island; Ascension Island; Canton Island; USNS Range Tracker, Guaymas, Mexico, 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 links between the ground and the Gemini spacecraft are provided by these systems.

The ATDA communications system(antennas, beacons, telemetry transmitters, rendezvous radar, and digital command system) allows radar tracking of the vehicle from both the ground and the Gemini spacecraft. Ground station and Gemini spacecraft commands to the ATDA also are accomplished through these systems.

ATDA Table #1	Gemini Spacecraft On-Board Systems Supported by Network Stations Table #2	
Telemetry (Real Time)	Reentry Module	UHF(voice)xmit-Rcv
L-Band Transponder	Reentry Module	HF(voice)xmit-Rcv
C-Band Transponders(2)	Reentry Module	Telemetry(Real Time)
Command Receiver (Command Control)	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

Basically the NASA Communications Network (NASCOM) used for past Gemini flights will be used for Gemini 9. Shore stations for USNS Rose Knot and USNS Coastal Sentry Ship support will be based upon the mission-designated ship positions and predicated 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.

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	WLP	A/C	REK	RKV	CSQ	ASC	ANT	EGL	WHS	TEX	CAL	GYM	HAW	CTN	CRO	PRE	TAN	KNO	CYI	BDA	GTK	GBI	PAT	CVN	MLA	MCC-K	MCC-H
C-Band Radar			X			X	X	X	X		X		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
Low Speed (tty) Telemetry Data Transmission				X	X					X		X	X		X				X								
Wide Band Data							X														X	X				X	
High Speed Data Transmission				X	X					X										X							
On Site Data Process & Summary				X	X							X	X		X				X								X
Gemini Launch Vehicle Telemetry							X													X	X	X		X		X	
Gemini Launch Vehicle Command																					X	X		X		X	
Digital Command System				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	X	X				X	X
Teletype-Transmit & Receive			X	X	X	X	X	X	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 Acquisitión Aid System	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			X

X Master DCS

AUGMENTED TARGET DOCKING ADAPTER

The Augmented Target Docking Adapter is a passive rendezvous vehicle which has been designed to be launched by an Atlas SLV III in the event an Agena Target Vehicle assigned to a Gemini mission fails to achieve orbit or is otherwise not available for rendezvous. The ATDA which will be used for Gemini 9A was also designated as a possible back-up for the Gemini 8 mission while the Agena was undergoing a re-evaluation of its propulsion system.

Length:	12 ft.
Length (with nose shroud and Atlas adapter)	28 ft. 4 in.
Diameter	5 ft.
Weight (at launch)	2400 pounds
(in orbit)	1748 pounds
Propulsion (for translation)	None
Target Stabilization System	Gemini attitude control electronics orbit attitude and maneuver electronics rate gyro
Stabilization control	Gemini RCS module, sixteen 25 pound thrusters in two rings of eight each 35 pounds of propellant in each system.
Components (in orbit)	Four sections; target docking adapter, equipment adapter, RCS module and battery module
Power	Three 350 ampere/hour main batteries Two 15 ampere/hour squib batteries

The ATDA has been fabricated mainly from Gemini off-the-shelf equipment. The structure of the vehicle is hardware specially built for the ATDA. The docking equipment is a standard target docking adapter. The C-band beacons and antennas, the digital command system, the L-band radar transponder, telemetry system, stabilization system, shaped charge separators, batteries, wire bundles, relays, and connections which make up the ATDA systems are all standard Gemini parts. The adapter and nose fairing havebeen modified for the ATDA.

The ATDA display panel is similar to the Agena panel. However, only four lights are operative on the ATDA. They are the dock light, which indicates the docking cone is unrigidized and the latches reset; the RIGID light which indicates the docking cone is rigidized: the ARMED light, which indicates that Ring A of the reaction control system is activated; and ATT which indicates that zero degrees per second rate has been selected for all three axes of the ATDA.

Four commands can be sent to the ATDA by the spacecraft. One command is sent by L-band radar. It commands ACQUISITION LIGHTS OFF, ZERO SPIN RATE SELECTION, AND DOCKING CONE UNRIGIDIZE. Four commands are sent by hardline when docked. They are RIGIDIZE, UNDOCK, TARGET STABILIZATION SYSTEM OFF.

In addition to its two L-band antennas, the ATDA carries 9 antennas .

There are two sets of three each of the C-band antennas for tracking; a UHF antenna in the docking cone for ascent telemetry, another at the nose, and a third on the side of the spacecraft for telemetry in-orbit.

The lighting on the ATDA is identical to Agena. There are two acquisition lights on the outer edge of the adapter structure. They produce a flashing light reference of 65 pulses per minute and can be seen for approximately 23 miles. Six running lights, two red, two green, two amber, are installed on the Augmented Target Docking Adapter body and can be turned on and off by DCS commands. Two approach lights are mounted on the lower inside structure of the adapter and can be turned on and off by ground command.

-End-