

GEMINI: Rendezvous and Docking Mission

(Third of a Series)

In the Stygian blackness of outer space, a Gemini spacecraft carrying two astronauts in flight will meet with another space vehicle at a pre-conceived time and place. Such a meeting is known as rendezvous. Actual linking of the two craft so they can be operated as one is called docking.

Rendezvous and docking are closely correlated objectives of Project Gemini. Mastery of the two techniques is a necessary step toward lunar landings. Other potential uses include ferrying and transfer of personnel and supplies to orbiting space stations, close observation and actual maintenance of orbiting satellites.

Two Launchings

Experiments in rendezvous and docking will require two launchings about 24 hours apart. First to be launched will be an unmanned Agena D target vehicle, fired aloft by a powerful Atlas rocket. Agena D will be placed in a nearly circular orbit at approximately 160 miles altitude. When desired orbital conditions are obtained, the Agena engine will be shut down by ground command to conserve fuel for later use. Mercury ground tracking stations will determine whether or not the Agena is operational and is in the proper orbit for rendezvous.

About 24 hours later, the Gemini spacecraft, carrying its two astronauts, will be lifted by a Titan II rocket into an elliptical orbit with a perigee (lowest point) of approximately 87 miles and an apogee (highest point) of approximately 160 miles. The Gemini will be launched during a three-and-a-half-hour period, known as the launch "window," when factors to correlate the Gemini's elliptical orbit and the Agena's circular orbit are at the optimum. Within this "window" are two 20-minute "panes" during which Gemini can be launched so as to effect rendezvous with use of only the Gemini's on-board maneuvering propellants. Gemini launch during any other portion of the "window" will require use of both Gemini and Agena propellants to effect a rendezvous.

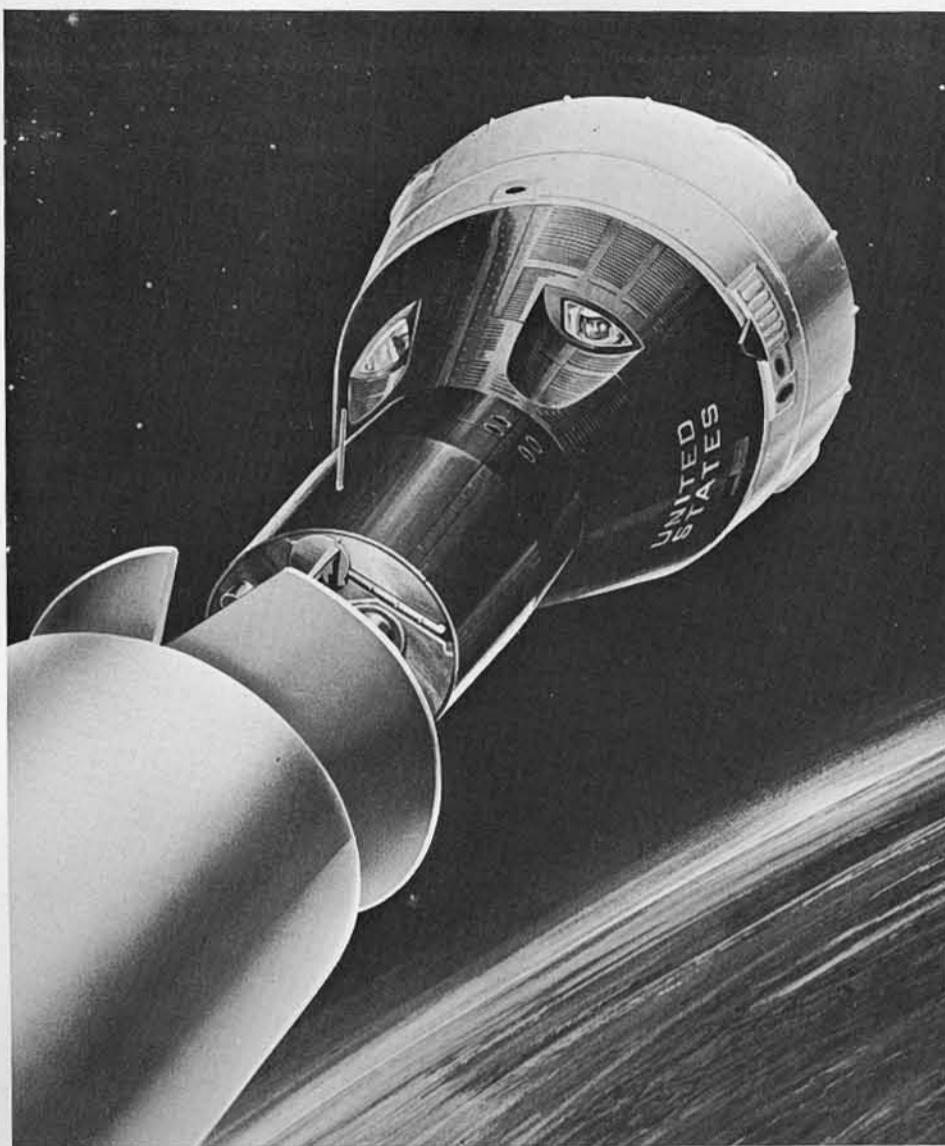
Gemini, after a few laps around the earth, will approach the Agena D target vehicle. To overcome orbital path differences, the astronauts aboard the Gemini craft can make flight directional adjustments through the use of the spacecraft's propulsion units. In addition, ground control can move the Agena D into a corrected position.

Radar Information

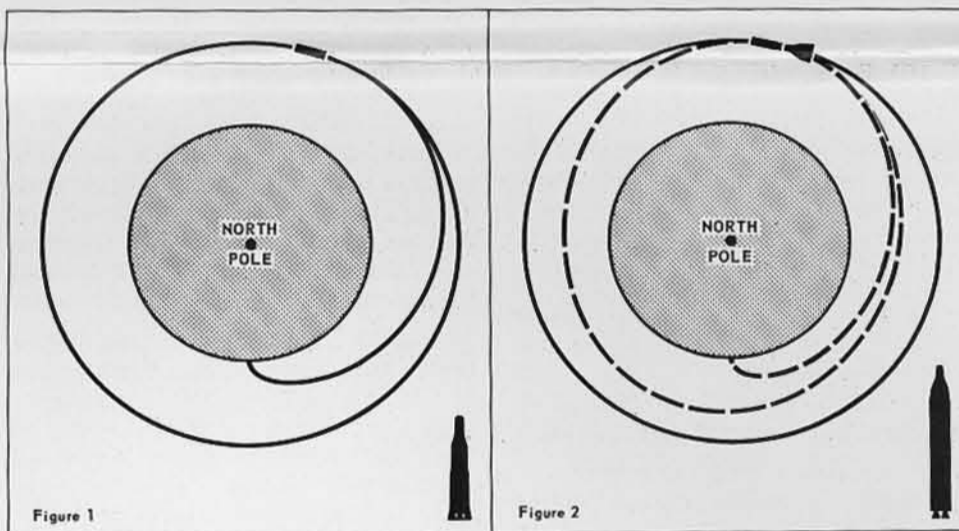
Some 250 miles from the Agena, the astronauts will train Gemini's radar on the target vehicle. The radar, through the digital computer, will provide information, on visual displays, that will instruct the astronauts in the maneuvering required for rendezvous.

Closing within about 20 miles of the Agena D, the astronauts should be able to see the high-intensity, flashing light provided on the target for optical tracking. As the target is approached a braking maneuver is accomplished. At this point the two vehicles will both be rushing through space at some 18,000 miles per hour, with only a gentle difference in speed of one to two miles per hour.

The astronauts will be able to see



GEMINI SPACECRAFT, with its two astronaut passengers peering through windows, is shown in this artist's conception about to dock with Agena D target vehicle. Seconds later the two space vehicles would be locked together, operating as one.



ORBIT PATHS of Agena D target vehicle (solid line) and of Gemini Spacecraft (dotted line) are shown in these diagrams. Atlas rocket will launch Agena D into circular orbit (Fig. 1) at about 160 miles. Some 24 hours later, a Titan II rocket will launch cone-shaped Gemini into elliptical orbit (Fig. 2) that will intersect the Agena orbit prior to rendezvous of the two craft.

the Agena straight ahead of the Gemini through the flat glass of the windows in their hatches. Using pulse jets to give their craft a small kick at a time, the astronauts will finally engage the index bar of the Gemini with the "V" notch or slot in the docking collar on the end of the Agena. Clamps inside the collar will latch firmly around the Gemini cone and lock the two vehicles together.

Single Unit Maneuvers

At that instant, the instrument wires of the two craft will automatically connect. The astronauts, now in control of the Agena D which, until that moment, has obeyed orbit-changing orders only from earth, will be able to check out all instruments aboard the Agena D, its rocket engine and other systems. Once latched the Gemini-Agena combination may be controlled and maneuvered as a single unit for a variety of missions and experiments.

\$951 Million Backlog as Of Sept. 30

Increases in the company's sales, earnings, backlog and employment for the three months ended Sept. 30 were announced by Mr. Mac Oct. 30.

Based on unaudited interim financial statements, earnings after taxes were \$5,065,243 for this quarter of fiscal 1964. This compared with \$3,823,717 earned in the first quarter of fiscal 1963.

Earnings per share were \$1.40 on 3,607,607 shares outstanding as against \$1.07 for 3,574,559 shares outstanding on Sept. 30, 1962 after adjustment for the three per cent stock dividend paid Jan. 1, 1963.

Earnings represented a 2.80 per cent return on sales of \$181,035,694 for the first quarter of fiscal 1964, compared to 3.46 per cent on sales of \$110,545,492 for the first quarter of fiscal 1963.

Backlog on Sept. 30, 1963 was \$951,107,297 as compared to \$294,921,558 a year ago.

Employment on Sept. 30 was 32,548 as against 25,473 a year ago.

Mr. Mac stated that the company's sales and earnings for the entire fiscal 1964 will be higher than in fiscal 1963, barring unforeseen circumstances. The company earned \$17,036,020 on sales of \$565,339,262 in fiscal 1963.

Lewis Named Chairman Of Space Committee

David S. Lewis, President of McDonnell, will be chairman of the space committee for the St. Louis Bicentennial celebration. His appointment was announced by August A. Busch, Jr., president of the St. Louis Bicentennial Corporation. The celebration will officially begin Feb. 14, 1964.

Mr. Lewis will be responsible for developing space-oriented events during the city's observance of its 200th birthday.

Said Mr. Busch in announcing the appointment: "It is very fitting that St. Louis with its long history of important contributions to the world of aviation and space, should develop one or more significant projects or programs to further the general knowledge of space and its uses during the bicentennial period."



NATO OFFICERS chat with Astronaut Gus Grissom (center) in Gemini Mockup during coinciding visits to McDonnell plant on Nov. 7. For most members of the NATO party it was their first opportunity to visit with an American astronaut. The NATO group, comprised of 42 officers of the Military Committee/Standing Group in Washington, spent the day touring McDonnell facilities. It was the third NATO group to visit here in recent months.