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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 6595TH AEROSPACE TEST WING (AFSC)
VANDENBERG AIR FORCE BASE, CALIFORNIA 93437



REPLY TO
ATTN OF: VWZAC

26 APR 1967

SUBJECT: Commander's Summary

DOWNGRADED AT 3-YEAR INTERVALS

DECLASSIFIED AFTER 12 YEARS

TO: VWOO

DOD DIR 5200.10

1. Operation: Busy Tournament
2. Range Operations Number: 7845
3. Launch Time: 1735:01.32 PST from SLV-3E, Vandenberg AFB, Calif.
4. Countdown History: The first countdown (18 April) was aborted because of an SLV-3 vernier engine # 1 hydraulic leak. The second countdown was initiated at 0800 PST, 19 April. Four holds were imposed for the following reasons:
1) GD/C completion of work on vernier engine replacement and subsequent checks;
2) adjustment of the countdown clock; 3) recalibration of Mark II radar angle bias; and 4) excessive upper air winds in the launch area. Total hold time was 185 minutes.
5. Flight Performance: SLV-3 performance was satisfactory. The SV-5D successfully demonstrated maximum crossrange (700 n.m.) maneuverable flight and was successfully air recovered by a JC-130 at 1825 PST. Boarding time was 23 minutes. The range tracker (T-AGM) and two of the four range telemetry aircraft reported acquisition of useable telemetry and/or tracking data. All acquisition aids in the terminal area acquired the SV-5D and provided the TRADEX radar at Roi Namur with pointing data; however, TRADEX failed to acquire in time to transmit ground guidance commands. Nevertheless, the on-board guidance system enabled the SV-5D to fly a near-nominal trajectory, and all recovery sequence items were properly performed. Predicted and actual event times were as follows:

<u>Event</u>	<u>Predicted</u>	<u>Actual</u>
Lift-off	1400-2110 PST	1735:01.32 PST
BECO Command	T + 128.74	T + 128.80
Staging	T + 131.74	T + 131.91
SECO Command	T + 301.72	T + 300.94
Shroud Jettison Command	T + 307.72	T + 306.95
VECO Command	T + 314.72	T + 313.94
Separation Command	T + 317.72	T + 316.91
Retrofire Command	T + 318.02	T + 317.25
SV-5D Terminal Guidance Initiate	T + 1380.	Not Achieved
SV-5D Ballute Deploy	T + 1653.7	T + 1686.5
SV-5D Main Chute Sequence Initiate	T + 1737.	T + 1738.7
SV-5D Air Recovery	T + 2760.	T + 3000 (approx.)

Richard W Palmer
RICHARD W PALMER, Lt Colonel, USAF Cy to: SSD (SPO)
Chief, SLV-III Boosted Systems Office

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McDonnell and Douglas Holders Approve Merger

holders of Douglas Aircraft Co., and McDonnell Co. overwhelmingly approved a plan at concurrent meetings last week to merge their companies under a new name, McDonnell Douglas Corp.

The merger, expected to be completed by Apr. 28, is still pending the approval of the Justice Dept. (AW&ST Mar. 30, p. 33).

W. Douglas, Jr., Douglas president, told stockholders at a meeting in Hills, Calif., session that the company has not "indicated one way or the other" whether the proposal is approved. "It will be plenty sure we don't give us a positive answer," he said.

At the meeting, a stockholder asked the company about the \$1-million expenses up to \$50,000, which Freres & Co., New York, financial consultant to

McDonnell Douglas, Douglas Aircraft Co. chief executive officer, advised in November by leading banks that we should withdraw from our

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New York, which acted as financial consultant to McDonnell during January, had a simple task compared to Douglas.

At St. Louis, McDonnell stockholders were told the combined company may produce sales of about \$3 billion for 1967, but it is expected to show a net loss for the year. An improvement is seen for 1968, management said.

McDonnell's after-tax earnings in 1966 were about \$48 million on sales of \$1.199 billion. Douglas showed a net loss of \$27,560,000 for the past fiscal year.

McDonnell, it was noted, had achieved its goal of attaining a 50-50 ratio in government and commercial business by merging the two companies. Prior to the merger, holders were told, McDonnell was not strong enough to draw the largest units of either military or commercial business.

News Digest

Vladimir Gloukov, Aeroflot representative in the Netherlands for two years, last week was expelled from that country after being accused by the Dutch of engaging in espionage activities. Gloukov previously had been Aeroflot representative in the United Kingdom.

United Air Lines has joined Inflight Motion Pictures in opposing a proposed change in Civil Aeronautics Board rules that would require a minimum \$2 charge for full length motion pictures on domestic passenger flights. United was one of the 12 airlines party to an earlier agreement to set such a \$2 fee for movies on which action was deferred by the Board (AW&ST Mar. 20, p. 48).

Industry team to bid on the Air Force all-weather aerial delivery system (AWADS) includes Autonetics Div. of North American Aviation, as prime contractor; Lockheed Aircraft Service Co., aircraft instrumentation; General Precision, computer; and Sierra Research, Inc., stationkeeping equipment. In addition, Ling-Temco-Vought and Lockheed-Georgia Co. may be forming a team to bid on AWADS (see p. 59).

Lockheed SR-71 of the Strategic Air Command's Ninth Strategic Reconnaissance Wing crashed in northeastern New Mexico Apr. 13 after refueling in flight.

Prime Flight

Maximum cross-range maneuvering of the USAF/Martin Marietta Prime lifting body was evaluated in the third flight, launched Apr. 19 on a General Dynamics Atlas SLV-3 from Vandenberg AFB, Calif.

The Prime vehicle was recovered near Kawajalein island. Two previous lifting bodies were lost after their flights.

Martin Marietta's Baltimore Div., meanwhile, is completing fabrication of another lifting body vehicle in the Air Force's test program (see p. 27). This will be a piloted version to be dropped from a USAF/Boeing B-52 after evaluation in the Ames Research Center's wind tunnel this summer. The piloted version will be powered by an X-15 rocket engine.

Both crewmen parachuted to safety.

Bristol Britannia 313 owned by Globe Air AG, a Swiss charter carrier, crashed Apr. 20 with about 130 persons on board during a storm in Nicosia, Cyprus. The four-engine turboprop aircraft, on a charter flight from Bombay to Cairo, had been diverted to Nicosia because of bad weather. Early reports indicated the aircraft struck the top of a low hill on its approach.

Bell Helicopter Co. has formed a special engineering team for an intensive design effort on its Model 266 tilt-rotor, composite VTOL aircraft. Work is being done under a \$1.9-million Army contract.

Crash of a Beech King Air turboprop business aircraft belonging to the Link Group of General Precision, Inc., killed Arthur F. Carl, vice president of manufacturing, Clarence E. Dougherty, company chief pilot, and Herbert Chamberlain, copilot on the flight. Two others were injured. The aircraft was attempting to land in poor weather at Tri-Cities Airport, Endicott, N.Y.

Fifth Environmental Survey Satellite (ESSA 5) was placed into polar orbit Apr. 20 by an improved NASA/Douglas Delta DSV-3E booster launched from Vandenberg AFB. ESSA 5 was launched by NASA for the Weather Bureau and will become part of the Tiros operational system.

Ryan Aeronautical Co. has developed a deployable solar panel array that can be retracted during high-stress spacecraft course corrections or periods of extreme solar activity or meteorite showers. Ryan did the work for Jet Propulsion Laboratory, National Aeronautics and Space Administration's Marshall Space Flight Center is evaluating proposals for a similar array.

Consortium

The government last week announced a consortium in the design and purchase of the

which follows a letter

by the Belgians last

no details as to

partnerships will

it is under-

construction will be

by Canada. Number of

also is undecided.

pressing for a total of

USAF Nears Manned Lifting Body Tests

By B. K. Thomas, Jr.

Washington—Air Force is shifting into the manned flight phase of its expanding lifting body research program following the successful performance of the advanced Prime vehicle tests. First manned SV-5J lifting body will be rolled out July 11.

Planned low-speed tests are scheduled to begin in August when the Martin SV-5J lifting body research program, following the successful performance of the powered SV-5P will begin next year, after wind tunnel tests.

The unmanned vehicle flights were so successful that the fourth and last test flights were canceled. The third launch of the SV-5D by a USAF-General Dynamics Atlas SLV-3 vehicle was made from Vandenberg AFB in April (A&ST Cover June 19). The 860-lb. payload reached an altitude of 600,000 ft and a velocity of 26,000 fps. It demonstrated crossrange maneuverability of approximately 800 naut. mi. on either side of its initial trajectory.

Deceleration of the Martin vehicle to speeds below Mach 3 and stabilization during descent was accomplished with a Goodyear Aerospace 4-ft.-dia. chute. For the first time, a large parachute with an erectable cone was used to enable mid-air retrieval (A&ST June 12, p. 107).

The SV-5J, displayed at the Paris show (A&ST June 5, p. 17), will be evaluated as a trainer and will allow pilots to take off and land under their own power in a lifting body vehicle.

The SV-5J will be powered by a Pratt & Whitney J-60 axial flow jet engine producing 3,300 lb. thrust.

The SV-5D vehicles, as part of the Prime project, were designed to simulate re-entry from low-earth orbit with a lift/drag ratio of 1.2 to 1.4 (A&ST May 16, 1966, p. 67). The project objectives included:

- Acquiring heat shield and aerodynamic data.
- Demonstrating accurate guidance of the vehicle to the recovery point.
- Demonstrating crossrange maneuvering of 700-800 naut. mi. in either direction from the re-entry footprint center, or a total available ranging parameter of as much as 1,600 naut. mi.
- Demonstrating successful recovery of the test vehicles.

On the first Prime flight in December, 1966, only in-plane (pitch-roll) maneuvers were performed. Limited crossrange maneuvering was conducted during the second flight last March. On both these flights, the test vehicles entered the recovery zone but were not recovered due to malfunctions in recovery subsystems, according to Col. C. L. Saville, Spacecraft Technology and

spect to developing a satisfactory maneuvering re-entry vehicle was the performance of the Martin-developed ablative heat shield used for the Prime flights.

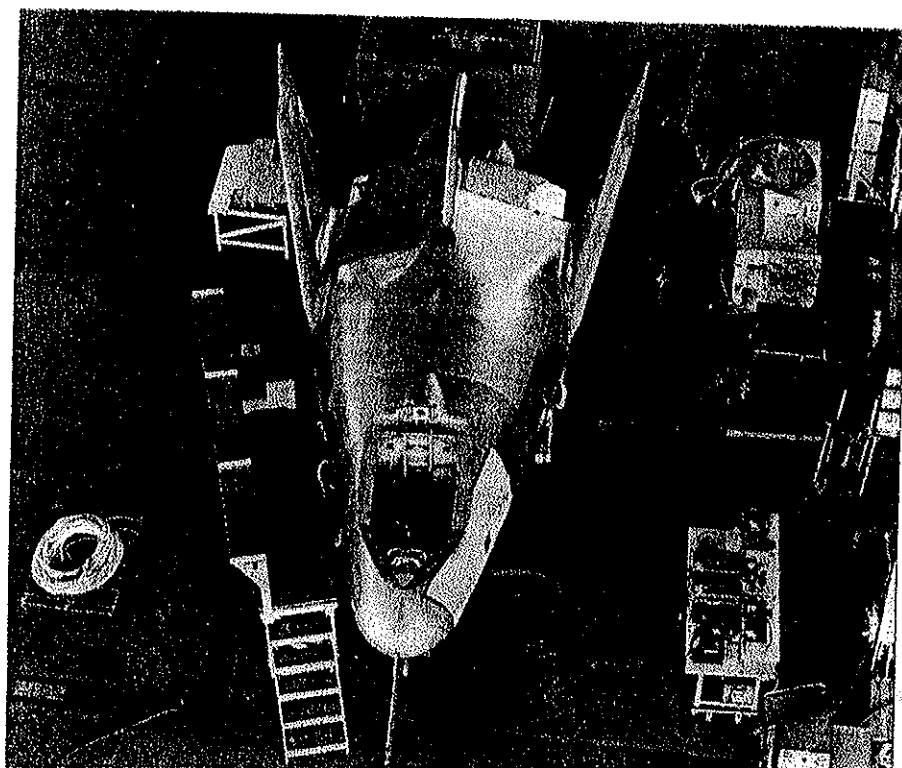
Post-flight inspection of the vehicle and performance during the flights confirmed that the highly flexible honeycomb structure, combined with an elastomeric silicone filler, performed as it was designed to. Charring and flaking

Advanced Re-entry Test program director.

Probably most significant with re-



Jet-powered SV-5J (above) is powered by a Pratt & Whitney J60 engine producing 3,300 lb. thrust. It is being evaluated as a lifting body trainer. Rocket-powered SV-5P (below) is scheduled to be rolled out this week at Martin's Baltimore plant. Powerplant is a Thiokol Reaction Motors XLR-11. The SV-5P will be used in manned lifting body tests up to 100,000 ft. altitude starting next year.





Heat transfer Automatic control

Energy is being expended right now—the heat exchanger or pneumatic valve, yet off the drawing boards. Engineers, heat transfer and thermal output is our country's leading aerospace manufacturer—and can expect again on their next job. This reach extends from new development, testing and performance manufacturing in production quantities. Heat exchangers, heaters, duct joints, controls or regulators see Janitrol. We will enjoy talking with us. We talk the

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dynamic characteristics of the erectable cone, permitted limited heat shield weight lost due to volume within the SV-5D to 1.1 lb. Nebiker said. In this process, the bag containing the parachute was heated to 180F while 90 lb. of nitrogen gas was maintained on the cone. The sequence opening the recovery parachute commenced at approximately 12,000 ft. altitude. The ballute was re-inflating the package containing the recovery parachute and cone. The plastic bag was pulled free of the parachute by the line attached to the ballute, the canopy remained in a condition for approximately 5 minutes before opening. The cone inflated later. Air retrieval of the test vehicle was completed at about 12,000 ft.

Booster Separation

Separation of the booster from the SV-5D on the third flight did not show any discernible perturbation of the test vehicle, and the stable re-entry orientation were performed as programmed, according to project officials.

Roll, pitch and yaw control for stabilization and maneuvering side the atmosphere were provided by six nitrogen cold gas reaction jet nozzles—three on each side of the airhead of the SV-5D.

Vehicle guidance for the crossrange maneuvering was provided by a board pulse-balanced strapped-down inertial guidance system. Performance of this system placed the vehicle in the recovery window, subsequent to crossrange maneuvers, without loss of altitude from the terminal, ground radar which was to have provided steering commands to the vehicle area, project officials said.

During crossrange maneuvering the SV-5D gradually descended from its maximum altitude and arrived at 100,000 ft. with a velocity of 100 ft./sec. when the ballute was deployed. Further deceleration prior to deployment of the main recovery parachute was constructed with three different weights of nylon: 2.25 oz./sq. yd. in the apex, or top-center; 1.1 oz./sq. yd. in the center; and 0.8 oz./sq. yd. in the canopy.

Successfully demonstrated during flight for the first time was the use of an erectable sombrero-shaped canopy above the main parachute canopy to facilitate mid-air retrieval, according to F. R. Nebiker, manager of Recovery Systems Engineering for General Aerospace Corp.

Low Porosity Nylon

The 15-ft. high cone, with a 12-ft. diameter at the top and a 12-ft. diameter at the bottom, was constructed of a low porosity nylon weighing 0.8 oz./sq. yd., he said.

Within the cone were two loops of 9,000-lb. tensile strength nylon. The loops were engaged by the recovery gear extending from the USAF F-4C, which JC-130B recovery aircraft.

An autoclave process used to

erectable cone, permitted limited volume within the SV-5D to 1.1 lb. Nebiker said. In this process, the bag containing the parachute was heated to 180F while 90 lb. of nitrogen gas was maintained on the cone. The sequence opening the recovery parachute commenced at approximately 12,000 ft. altitude. The ballute was re-inflating the package containing the recovery parachute and cone. The plastic bag was pulled free of the parachute by the line attached to the ballute, the canopy remained in a condition for approximately 5 minutes before opening. The cone inflated later. Air retrieval of the test vehicle was completed at about 12,000 ft.

Britain Moving To Reorganize Short Brothers

The British government, which has 5% of Short Brothers and Harland, will push the company into a program of industrial reorganization, with a lesser emphasis on aircraft and missile projects.

A move was made last week by Sir Wedgwood Benn, minister of industry, who said the government is looking for a successor to C. E. Wrangham, present chairman of the Belfast-based firm, "to lead the company in the future that lies ahead."

At the same time, Wedgwood Benn said the government will continue to support the Short Turbo-propeller light transport, now being redeveloped with the Garrett AiResearch Corp. 201 powerplant (AW&ST June 19, 1967) and ordered by Rembert of St. Louis.

An attempt to oust Wrangham, 59, who has been Short Brothers chairman since 1955, is being resisted by the company's directors and by Northern Irish members of Parliament.

Argument being pressed in Wrangham's favor is that during his tenure he already has moved the company into diversification. The firm now produces carpet sweepers, armored vehicles, medical instruments and machine tools or making fence poles.

While the government plans further diversification, it is investigating the company for possible excess profits from the Seacat missile system, which is used by 12 world navies. The program probably will last until next fall. Short Brothers, which employs 6,000

An avionics
when he
that never

Then he
get synch
from the

Discover



- ☐ Brushless
- ☐ Converter
- ☐ Servo
- ☐ Stepper
- ☐ Motor
- ☐ Integrator
- ☐ Size 5

Name _____
Company _____
Address _____

Micro Launch Set

Italian satellite, the first of any to be launched into orbit from a world sea, is scheduled for launch from Formosa Bay off the coast of Kenya, Africa.

The date for the launch was set for April 24, but slippage to April 24 was not ruled out.

The satellite, *San Marco-B*, has been designed and prepared by the Italian Center for Space Research (CRS). The CRS also has been responsible for the launch complex. The launch vehicle will be a four-stage solid-fuel Scout rocket furnished by

Radars Get Backing

Several types of over-the-horizon radars—the forward- and back-scatter types—have received new and increased support from top level DOD

interest in the forward-scatter development is excellent, according to officials. Conversion to operational status and intelligence radars is on a fast track. Officials also say there appears to be an operational schedule for the back-scatter types in the defense nets, principally based on the radar's ability to derive greatly increased data on target course and

PRIME Launched

The Air Force successfully launched the PRIME maneuverable lift-vehicle April 19 from Vandenberg AFB, Calif., and, for the first time, recovered the spacecraft. Two earlier flights of PRIME (Recovery Including Maneuvering Entry) were made on Dec. 21 (ENR, p. 14) and Mar. 5 (TW, p. 12).

Both were highly successful in terms of in-flight data and accomplishment of in-flight maneuvering.

However, in both cases, malfunction of the 500-lb. SV-5D PRIME craft's descent system prevented recovery of the vehicle from the impact at Kwajalein.

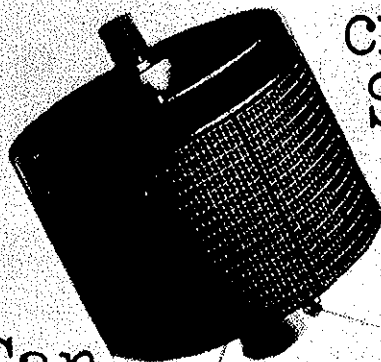
This week's flight was programmed to test both in-plane and cross-plane maneuvers after being carried to altitude by an SLV-3 booster.

Minuteman the Week

Minuteman 3 was launched from Cape Canaveral April 16 toward a soft-landing mission (see p. 19).

Minuteman II was fired April 16 from Vandenberg AFB, Calif., in a test of the usefulness of the silo modification program.

It took Hughes
engineers 3½ years to
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