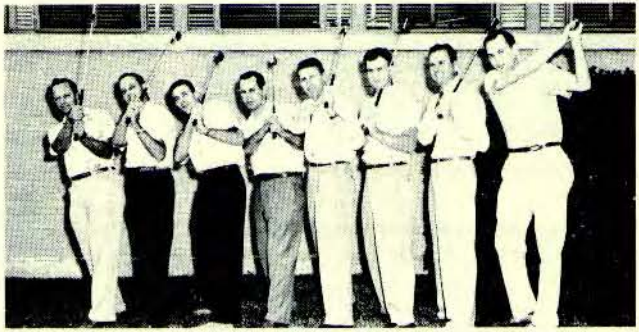
## PAD MEDAL GOLF TOURNAMENT

Orbit: July 17, 1959

Eleven men of the Propulsion Aerodynamics Division have formed their own league, playing a round robin of 10 matches on a handicap basis. The first six will collect prize money at the end of the tournament.

Playing their matches wherever they like, mainly Big Met, the top seven (tie for 2nd) to date are:

| Name | Hdcp. | Pts. won | Pts. lost |
|---|---|---|---|
| Johnsen | 5 | 5 | 0 |
| Steffan | 7 | $4\frac{1}{2}$ | $1\frac{1}{2}$ |
| Simon | 8 | $4\frac{1}{2}$ | $1\frac{1}{2}$ |
| Bowditch | 13 | 3 | 2 |
| Seashore | 5 | 3 | 3 |
| Stofan | 10 | 3 | 3 |
| Godman | 3 | 2 | 2 |



One point is given for a win, $\frac{1}{2}$ pt, for a tie. Shown in their follow-thru form the golfers are ( l to r): Al Ross, Ferris Seashore, Andy Stofan, Dan Peters, Paul Simon, Nick Samanich, Bob Godman, Don Grosbeck. Absent were Fred Steffan, Dave Bowditch and Roy Johnsen.

# Summer Faculty Fellows Arrive

Photo by Al Lukas

*FACULTY FELLOWS, from Dr. Silverstein, Dr. Olson, Mr. Manganiello, clockwise around the table are: Dr. Randolph B. Renda, Dr. Walter Lowen, John W. Williamson, Dr. Robert Pfeffer, Dr. John M. Boyd, Jerry L. Hal, Dr. Don J. Wood, Milton L. Vogel, Francis R. Toline, Dr. George M. Hoerner, Victor A. Richley, Dr. Dan L. Taylor; and Dr. Isaac Greber of Case. Missing: Gary G. Paulson.*

The 12 college professors who received NASA Summer Faculty Fellowships arrived at Lewis last Monday to begin the 10-week program.

The Fellows were welcomed by Dr. Walter T. Olson, Assistant Director for Public Affairs, whose office is directing the program, and by Dr. Abe Silverstein and Mr. Eugene J. Manganiello.

The professors, who represent schools in states from New York to South Dakota, will be working on research projects in many Lewis Divisions.

They will also take a special course in Chemical Rocket Technology at Case. Lewis staff members who will serve as instructors for that course are: William H. Roudebush, Irving E. Sumner, Andrew J. Stofan, William Lewis, Edward W. Otto, Frank J. Zeleznik, Richard S. Brokaw, Frank E. Belles, and Richard J. Priem.

**WINNING SQUAD MEMBERS are (left to right, front row): Misichko, Colli, captain, and Stofan; (back row) Getz, Grey, Billy and Cieslewicz. Photos by Marty Brown.**

# Boosters Are Champions Of Centaur Golf League

For the second consecutive year, Bill C lli's Centaur Booster Team players are the "team champions" of the Centaur Golf League.

In a playoff with George Michalson's Agena team, the Centaur Boosters, first-half winners, squeaked to victory by the margin of one point.

Members of the winning team are: Bob Billy, Gene Cieslewicz, Bill Colli, Peter Getz, Rudy Grey, Bill Misichko and Andy Stofan.

The Boosters rode to victory on the strength of the spectacular play of Cieslewicz, who copped 20 points to the opposition's 4, and Getz's 87, which was his low for the season and netted the champs another 16 points.

Both Bill Burwell and Carl Carrillo of the Agena squad grossed 78's in the October 3 playoffs at the wind-swept Riverside Country Club. The temperature was below 50 degrees that day.

Individual honors and trophies went to Harold Groth for the seasons' low net of 34.3; and Colli, who received trophies for season's low gross of 39.1 and most points won by an individual -- 115½.

**TROPHY WINNERS were Harold Groth (right) and Bill Colli.**

# Names in the News

The 1966 LeSAC workers, with **JIM MODARELLI** as chairman, completed the year with two very successful events. The Winter Formal on December 10 at the Cleveland Convention Center drew approximately 1200 adults. The Children's Christmas party on December 18 entertained almost 2000 children and 1500 parents.

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The Mechanical Systems Branch is the new designation for the Propulsion and Flow Systems Branch in the Centaur Project organization. The Centaur Structures and Materials Branch has been abolished. Branch supervisors include: **Rinaldo J. Brun,** chief; **Andrew J. Stofan,** head of the Propellant Systems Section; and **Martin J. Braun,** head of Pneumatics and Hydraulics Section.

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**Naomi Miller** thanks her friends for their many get well cards and flowers sent to her during her recent stay at the hospital. She has now returned to work in the Office of the Assistant Director for Administration.

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**Murray B. Gordon,** employee-management cooperation officer and program chairman of the Cleveland Chapter of the Federal Bar Association, was program chairman for the recent FBA Labor-Management Relations Institute. On December 7 at the Hotel Pick-Carter, approximately 150 participants heard a five-part program climaxed by a National Labor Relations Board member who spoke on "The Future of collective bargaining."

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Climax of the Lewis Ski Club meeting on December 7 was the ski fashion show when five attractive employees — **Marilyn Edwards, Dorothy Davidson, Johanne Debesis, Janet Lucas,** and **Linda Peterson** — appeared as models.

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**Arthur Prior** of the Facilities Operations Division and his family express their sincere appreciation to their friends who sent cards of sympathy at the time of the death of his wife, Mary Frances. They also appreciated the many contributions made to the American Cancer Society and to Roswell Park Memorial Institute in Buffalo, N. Y.

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**Bernard J. Blaha** of the Advanced Systems Division and his family also express their appreciation to friends at Lewis for their kind sympathy and flowers sent at the time of the death of their father.

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**Alan Studnicka** of the Test Installations Division and his bride wish to thank his fellow workers in the Fuels and Rockets Section and other friends throughout the center for their wedding gift — an AM-FM clock radio.

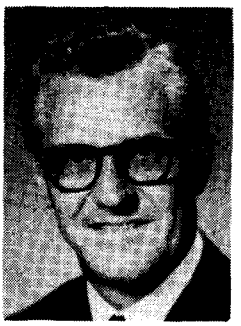
LEWIS RESEARCH CENTER
CLEVELAND OHIO

NASA

November 6, 1970

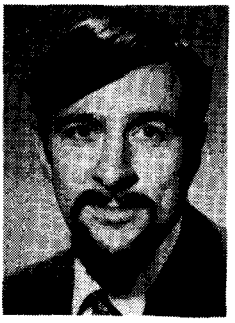
Barber

Dunbar



Guzik

Shramo



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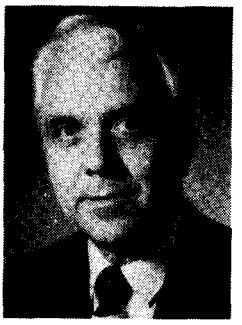


Tiede

# *Six promoted in latest reshuffle*

Recent retirements and transfers of personnel have resulted in new organizational appointments.

In the Launch Vehicles Division, the Agena organization has been phased out, and the Division has been grouped under the Atlas/Centaur and Titan/Centaur Project Offices, with the Business Management and Program Resources Office, the Structures Branch and the Systems Analysis Branch serving both Offices. W. Russell Dunbar has been appointed Associate Chief to Edmund Jonash, Charles Tiede has become Chief of the Business Management and Program Resources Office. Daniel Shramo heads up the Atlas/Centaur Project Office, and Andrew Stofan is Acting Manager of the Titan/Centaur Project Office. Martin Braun is now Acting Chief of the Mechanical Systems Branch of the Atlas/Centaur Project Office.

George Barber, a Finance and Accounting Officer retiring with a rank of Major from the U.S. Army after 22 years service, was appointed Chief of the Payroll Branch, succeeding Rita Roach Kohl, who retired recently.

Ted Guzik, Assistant to the Chief of the Fabrication Division for the past three years, has been appointed Chief of the Sheetmetal Branch. Guzik succeeds John Aurebach, who retired recently.

# Lewis News

LEWIS RESEARCH CENTER
CLEVELAND OHIO

15th Anniversary NASA 1958-1973

Vol. 10 No. 28

January 11, 1974


# *Preparation for Titan flight nearly complete*

The culmination of the hopes and hard work of hundreds of Lewis employees and thousands of contractor employees at General Dynamics/Convair, Martin Marietta and dozens of subcontractors across the country will occur January 24 with the launch of the first Titan III/Centaur from Kennedy Space Center.

Titan/Centaur Project Manager Andrew J. Stofan says the objectives of the proof flight are to demonstrate the capability to support missions such as Viking and three-burn Centaur synchronous orbit missions. The vehicle will carry a 3402 kilogram (7,500 pound) dynamic model of the Viking spacecraft and lander and a 113.4 kilogram (250 pound) Lewis-developed SPHINX spacecraft. The total mission will cover a period of more than 7 hours and call for four separate burns of the Centaur engines. A typical Viking launch trajectory will be flown during the initial phase of the proof flight. The second Centaur burn will be 51 seconds in duration, instead of the 316 seconds required for Viking, to limit the vehicle to a relatively low Earth orbit. The shortened burn durations, however, will be sufficient to provide an adequate exercise of the guidance system, both hardware and software, to estimate the injection accuracy of a Viking type mission; the propellents left will permit subsequent propellant management experiments.

The second Centaur coast period will be 80 minutes to simulate a mission with a long duration parking orbit. The SPHINX spacecraft will be separated following third burn of the Centaur engines. The mission will be completed following a fourth burn demonstrating a capability of the vehicle to perform many varied missions.

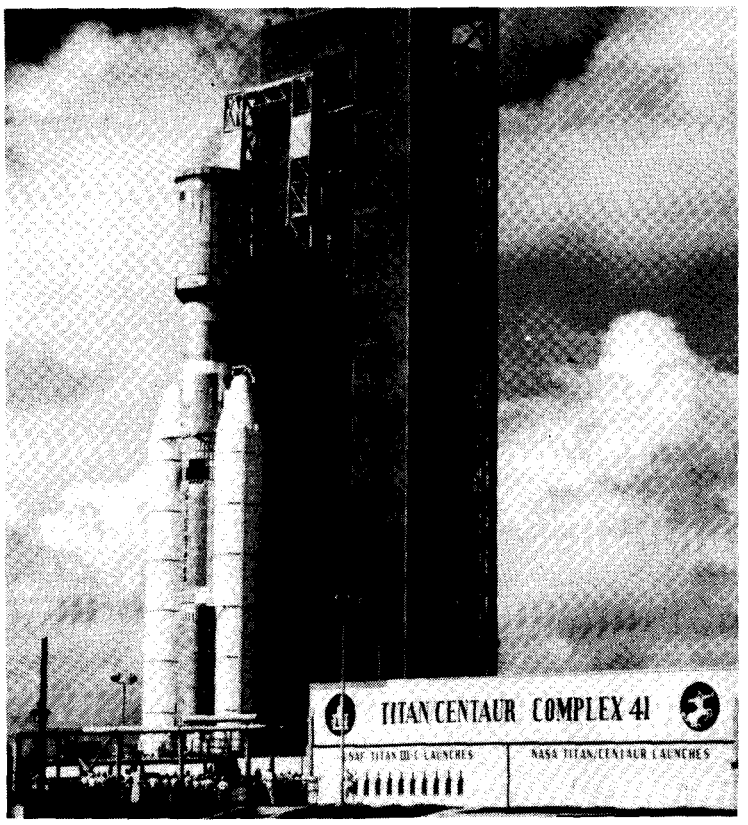
SPHINX STORY ON PAGE 3

With a successful proof flight of Titan III/Centaur the vehicle will share with Atlas/Centaur the job of boosting this country's medium and heavy spacecraft into Earth orbit or onto interplanetary trajectories until the Space Shuttle becomes operational near the end of this decade.

The new launch vehicle can place up to 15,876 kilograms (35,000 pounds) in low Earth orbit, 6804 kilograms (15,000 pounds) in a transfer orbit, 3175 kilograms (7,000 pounds) in a synchronous orbit and accelerate an 3928.8 kilograms (8,000 pounds) payload to Earth escape velocity.

Lewis, which has management responsibility for Titan III/Centaur, began the effort to integrate the two vehicles in the mid-1960's. The development was undertaken because NASA recognized the need to fill a per-

*(Continued on page 3)*




*The Titan-Centaur vehicle scheduled for flight this month is being moved from the Vertical Intergation Building to the Solid Motor Assembly Building at Kennedy.*

## TV talk host emcees Lewis ALERT program

Fred Griffith, host of the popular "Morning Exchange" program on WEWS-TV, Channel 5, will serve as moderator for the Lewis ALERT forum's January 31, program, "The Future of Cleveland."

The program will feature a panel of five community leaders who will offer projections of Cleveland's progress in industry, finance, labor, education and overall community growth. The five panelists are Paul A. Miller, President, Eaton Corporation; M. Brock Weir, President and Chief Executive Officer, Cleveland Trust Company; Frank J. Valenta, President, AFL-CIO Cleveland Federation of Labor; Dr. Walter C. Waeti, President, Cleveland State University; and James C. Davis, Chairman, Greater Cleveland Growth Association. The program will take place at 4:30 p.m. in DEB Auditorium.

Griffith will provide connecting commentary and present a summary of the panel predictions. Questions from the audience will follow the panel program. The panelists' projections will be made to about 1985 and should give Lewis staff an interesting and provocative view of what Cleveland will be like at the end of the next decade.

Griffith began his career in 1951 and joined WDOK, Medina, in 1959 as a newscaster, interviewer and news director.

More details on the program will appear in the next issue of the *Lewis News*.

## Manganiello retires

Eugene J. Manganiello, Director of Center Development, announced his retirement this month. Manganiello was recognized for his many technical and management contributions in 1970 when he received NASA's Exceptional Service Medal for Leadership. He served as Deputy Director of Lewis for 11 years beginning in December 1961 and served as Acting Director during most of 1961.

He joined the staff of the NACA at the Langley Research Center in September 1936 as an aircraft powerplant research engineer. In December 1942, Manganiello transferred to Lewis as Head of the Heat Transfer Section, and in 1945 was named Chief, Thermodynamics Branch. He was appointed Assistant Chief of Research at Lewis in 1949.

Manganiello spent more than 30 years with the Society of Automotive Engineers serving in more than 15 top-level national posts and a number of local ones. His outstanding service and leadership to the Society and engineering discipline it represent were recognized with his election to serve as

*(Continued on page 3)*

## Friedman,

# SPHINX 'in perfect health' for launch

Lewis' SPHINX spacecraft, coupled to the Viking Dynamic Simulator and encapsulated in a new shroud, was to be transported today (January 11) out to complex 41 at Kennedy Space Center.

An acronym for Space Plasma High Voltage Interaction Experiment, SPHINX is to show how high voltage solar cells and components are affected by the charged particles in space. High voltage arrays on communication and other advanced satellites are expected to improve the efficiencies of spacecraft electrical systems and eliminate the need for heavy power conditioning equipment.

Robert Lovell, SPHINX Project Manager, reported earlier as the *Lewis News* went to press, that "the spacecraft is in perfect health and we're exactly where we planned to be." Tomorrow the 250-pound satellite is to be hoisted up to the top of Lewis' Titan/Centaur to keep its January 24 launch date.

For the past month, a team of 13 Lewis engineers and technicians have been at KSC readying SPHINX for launch. Lovell said the spacecraft will be "exceptionally clean" once in orbit.

It was loaded on its launcher substructure, armed with pyrotechniques, and mated to the Viking Dynamic simulator in a special clean room that will be used for the Viking Mars-lander spacecraft. The spacecraft was to be transported in an air conditioned van to the pad today.

The de-contamination procedures set up for Viking also profited SPHINX. "Data we get back," says Lovell, "will not be subject to any questions about contamination. We're putting up a very clean spacecraft." Dirty surfaces might cause electrical leakage, or even arcing.

Once in orbit, SPHINX is to operate for at least a year and investigate the interaction of numerous high voltage surfaces with the plasma—charged particles—of space. It will be inserted into a 34,320 kilometer by 905 kilometer (560 by 21,300 statute miles) high orbit, exposing it to a range of plasma densities.

Experiments with solar cell insulators, conductors, and solar array segments are aimed at determining what problems may be encountered with high voltage components in space. As spacecraft become larger and operate at higher power levels in the future, high voltages will be required. However, not much is known about how high voltage systems may operate in space. For instance, micrometeorites puncturing the insulation of/high voltage solar cells may cause a severe power drain through space plasma.

Three experiments to investigate new types of solar cells also will be carried on SPHINX. Edge-illuminated solar cells, and cells covered with a flexible plastic, both advances pioneered at Lewis, will be flown. Additional information on the SPHINX experiments will appear in the next issue of the *Lewis News*.

Project manager Lovell credits a fine team effort, both at Lewis in developing the spacecraft and at KSC in readying it for launch. Lewis personnel at KSC include: David Culpt, spacecraft manager;

John Stevens, principal investigator; Thomas Riely, MINX experiment manager; Robert Masters, FEPSA experiment manager; Frank Berkopec, violet cell experiment manager; G. R. Sharp, mechanical system; R. Karwczyk, electrical system; James Roche, attitude control; James Cake, mission analysis; Joseph Maloi, thermal system; R. Zakrajsek, Telemetry and Data Acquisition; and Frank Barber, Reliability and Quality Assurance.

## Many to witness Titan

*Lewis managers and engineers who will be at Kennedy Space Center for the Titan III/Centaur proof flight include: Bruce T. Lundin, Director;*

Edmund R. Jonash, Director, Launch Vehicles; W. Russell Dunbar, Deputy Director, Launch Vehicles; Daniel J. Shramo, Chief, Atlas/Centaur Project Office; Andrew J. Stofan, Chief, Titan/Centaur Project Office; Walter F. Dankhoff, Chief, Office of Reliability & Quality Assurance; Joseph A. Ziemianski, Lawrence J. Ross, Steven V. Szabo, Rinaldo J. Brun, James E. Patterson, Paul C. Winslow, Richard A. Flage, Thomas P. Cahill, Richard E. Orzechowski, Ralph P. Kuivenen, Maynard L. Weston, Hugh E. Timmons, Floyd Z. Smith, Thomas L. Seeholzer, Theodore F. Gerus, William E. Goette, William K. Tabata, Kenneth W. Baud, William A. Groesbeck, Raymond F. Lacovic, James L. Swavely, John M. Bulloch, Paul W. Kuebeler, John B. Nechvatal, Edwin R. Procasky, Richard C. Kalo, Richard C. Dillon, Reino J. Salmi, Robert J. Schroeder, Jerome A. Johnson, Edwin S. Jeris, Baxter L. Beaton, Andrew L. Gordan, J. Elmo Farmer and Alvin C. Hahn.

### Major Titan III/Centaur missions

**(Through mid-1970s)**

**September 1974** — *Helios, the joint U.S.-West German solar probe. The 740-pound spacecraft will make a two year orbit around the Sun for a series of scientific observations.*

**August 1975** — *Two Viking-Mars orbiter-lander spacecraft to be launched 10 days apart. The orbiters will map Mars surface and the landers will search for life forms and analyze the Martian soils and atmosphere in operations lasting more than three months.*

**December 1975** — *A second Helios spacecraft.*

**August 1977** — *Two Mariner spacecraft for flyby missions past the planets Jupiter and Saturn.*

Friedman

Wharton

## Fill vacancies...

*(Continued from page 1)*

He was promoted to supervisor in 1956 and moved through the ranks to the position of Chief of the Facilities Engineering Division, the position held at the time of his latest appointment.

He holds a Bachelor's degree in mechanical engineering from the University of Michigan.

Wharton began at Lewis in 1958, two years after graduating from Kent State with a Bachelor's degree in Business Administration. Highlights of his Lewis tenure include work in the Procurement Division; serving as assistant to the assistant director for Administration, and as secretary-treasurer of the Cleveland Federal Executive Board in FY-68.

He was chief of the Equipment and Instrument Utilization Branch just prior to being named as acting Division Chief.

## Titan flight...

*(Continued from page 1)*

formance and cost gap between the Atlas/Centaur and Saturn launch vehicles.

In the late 1960's a contract was awarded to GD/C to develop an improved Centaur that would be compatible with both Atlas and Titan III boosters. The new Centaur was first used in combination with an Atlas in April of last year to launch Pioneer II to Jupiter. The modernized version of Centaur has an advanced integrated electronic system controlled by a 60-pound digital computer. The new "astrionics" system performs a major role in checking itself and other vehicle systems prior to launch and also maintains control of major events after lift-off.

During the time the improved Centaur was being developed, Martin Marietta's Denver Division conducted studies for NASA on integration of Titan III with the improved Centaur and modifications needed to the Titan facility at the Eastern Test Range.

In 1969, NASA decided to proceed with the Viking mission to land a spacecraft on Mars and selected Titan III/Centaur as the launch vehicle. At that time, overall management responsibility for development and operation of the new vehicle was assigned to Lewis.

A third major contractor, Lockheed Missiles and Space Company was awarded a contract in 1970 to develop the Centaur standard shroud.

In looking back, Stofan says, "The development effort is a classic demonstration of cooperative and supportive efforts between a government agency and its contractors. Hundreds of Lewis employees have been or are now involved in testing, development and problem-solving projects." Lewis employees and groups who worked on the program will be recognized in the next issue of the *Lewis News*.

The Titan III/Centaur has an overall height of 48.8 meters (160 feet) and a total liftoff weight of 640,000 kilograms (1.4 million pounds). The Titan III booster consists of a two-stage core vehicle and two solid rocket motors, each 10 feet in diameter and 85 feet long. The two solids provide a thrust of 10.6 million newtons (2.4 million pounds) at liftoff.

Both stages of the Titan core vehicle burn a combination of nitrogen tetroxide and a 50/50 combination of hydrazine and unsymmetrical dimethylhydrazine. The first stage, measuring 3 meters (10 feet) in diameter by 19.2 meters (63 feet) long, produces a thrust of 2.3 million newtons (52,000 pounds) at altitude. The second stage, which is 3 meters (10 feet) in diameter by 7 meters (23 feet) long, produces 445,000 newtons thrust (100,000 pounds).

A 3 meter (10-foot) diameter, 2.8 meter (9.5-foot) long interstage adapter connects the Centaur to the Titan III.

## Manganiello retires...

*(Continued from page 1)*

President of SAE during 1972. He is also a Fellow and past Director of the American Institute of Aeronautics and Astronautics, a Fellow of the American Association for Advancement of Science, Honorary Member of Pi Tau Sigma, and a registered Professional Engineer, State of Ohio. In 1966, he received the annual award of the Cleveland District Council Order of the Italian Sons and Daughters of America. In 1969 he received the Gold Medal for outstanding Government service from the City College of New York. In 1970 he was recipient of NASA's Exceptional Service Medal for Leadership.

## See Orient, Mexico

The NASA Headquarters Employees Club will sponsor two overseas trips for the coming year—one, an eight-day tour of Mexico, the other a 17-day tour of the Orient.

The Mexican tour, May 4-11, will include Mexico City, Taxco and Acapulco. The 17-day tour to the Orient, August 8-24, will include Tokyo, Hong Kong and Bangkok.

Detailed information can be obtained from Bernard Maggin, Code RK, NASA Headquarters.

# Knowledge, team work, hard work equal Titan Centaur success

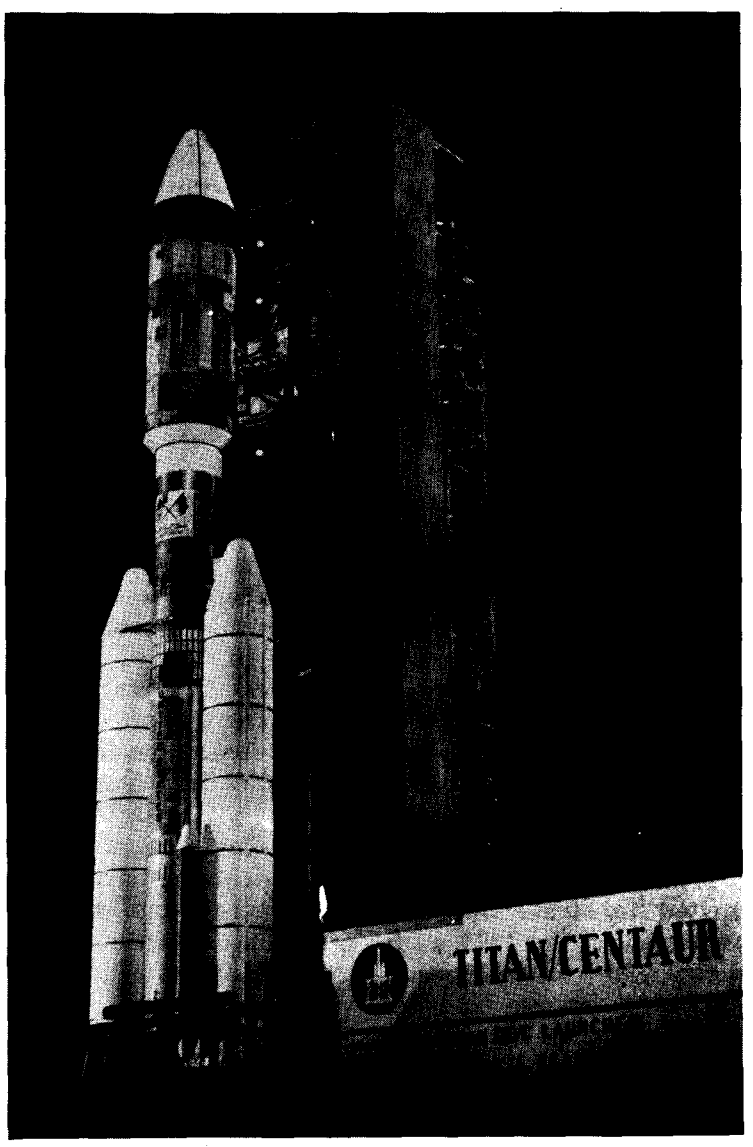
*Harold Zweigbaum, KSC, Andrew J. Stofan, Paul C. Winslow, Kenneth A. Adams, William R. Dunbar, and Dr. Seymour C. Himmel.*

The flawless flight of the first operational Titan Centaur launch vehicle was the reward for scores of Lewis engineers, technicians and administrative support people who have been preparing for the launch for more than a year.

The nation's newest and largest unmanned launch vehicle hurled the International spacecraft Helios I into an elliptical orbit around the Sun. It will penetrate the outer corona of the Sun coming to within 28 million miles, closer than Mercury or any man-made object has ever gone.

The Helios portion of the mission with two burns of the Centaur engines also showed the Titan Centaur's readiness to launch the two Viking spacecraft to Mars next summer. After the Helios separation sufficient propellants remained in the Centaur to perform engine start experiments to verify theory and small model test results showing that a cryogenic rocket stage can be restarted after a zero gravity coast.

The first experiment demonstrated the Centaur engine restart capability after a one hour zero gravity coast for application to the Mariner Jupiter Saturn mission scheduled for 1977. The second experiment was designed to obtain Centaur thermal control and propellant management data for long duration zero gravity coasts. During the three-hour coast period the propellants were again permitted to move freely in the tank and the vehicle was programmed to perform a roll maneuver approximately every half hour. This maneuver provided uniform space heating of the Centaur components. At the end of the coast the propellants were again positioned at the engine inlets by firing small hydrogen peroxide thrusters. An engine start was obtained with only about 50 per cent of the liquid hydrogen pressure normally used.




In commenting on the flight, Andrew J. Stofan, Director of Launch Vehicles for Lewis said, "With the successful flight of Helios and the post Helios experiments performed by Centaur, the Titan Centaur and its associated launch support equipment has shown its operational versatility to support a variety of unmanned spacecraft programs."

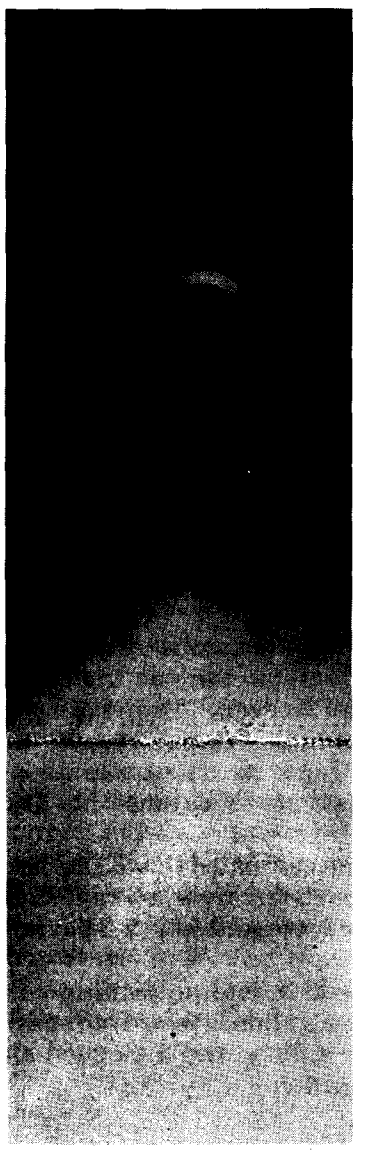
The development of a new rocket combination and the operation of it for a variety of missions requires the best efforts of thousands of people. Lewis, in having management responsibility for Atlas Centaur and Titan Centaur has a unique role which requires orchestrating the efforts of many organizations. Although ultimate responsibility for what happens rests with Lewis, NASA centers and private industry have equally vital roles.

One partner in the effort is the Unmanned Launch Operations Directorate (ULO) of the John F. Kennedy Space Center. Director John J. Neilon and Manager, Centaur Operations, John Gossett and their staffs are assigned responsibility for checkout and launch operations once the vehicle reaches the Cape

Contractors such as Martin Marietta, United Technology Corporation, Aerojet General, General Dynamics, Honeywell, Teledyne and others perform the actual manufacturing, integration, testing and launch activities according to the specifications of their contracts.

Paul C. Winslow, Manager of the Titan Centaur Office, stresses, "Every single person is important — administrative, technician, engineering, and management personnel."

Overall, Lewis launch vehicle activities fall under the direction of Dr. Seymour C. Himmel, Associate Director, Flight Programs. One of Dr. Himmel's responsibilities is coordinating the lab-wide support received by the Launch Vehicle's Directorate. William R. Dunbar is Chief Engineer for Flight Programs.



Stofan provides overall management of the three offices and one division within his directorate.

Both Winslow, Titan Centaur Office Manager, and Henry O. Slone, Atlas Centaur Office Manager, are responsible for integration of the mission and launch vehicle from design through production, checkout and launch.

A mission engineer is assigned to each mission. Kenneth A. Adams was mission engineer for the Helios launch. His job was to be the interface between spacecraft and launch vehicle systems teams. He represented Winslow in activities involving the mission managers, Gilbert W. Ousley from Goddard, and Ants Kutzer, GFW, West Germany. Adams was assisted by Lawrence J. Ross, who had started out as mission engineer for Helios but was promoted to Assistant Division Chief of the Vehicles Engineering Division in the recent reorganization

Richard A. Flage, Launch Operations Project Engineer, coordinates activities with the Kennedy Space Center in scheduling day to day activities associated with check out and launch. He is responsible for organizing Lewis launch team activities and insuring that everyone has the necessary communications channels and data they need.

Vehicle Engineers, in this case John L. Collins for the Titan booster, and Richard C. Kalo for the Centaur stage and shroud, are responsible to coordinate all activities associated with acceptance and checkout of their stage. They track the day-by-day progress, problems and resolutions from the time of factory acceptance, testing, through checkout at the Cape and launch.

Systems engineers are technically responsible for the design, production and flight readiness of their system such as guidance, hydraulics, and propulsion. They follow each system through those stages and gather the operational results for use on succeeding vehicles.

Systems analysts are

*Left to right, Carl B. Wentworth, John Neilon, KSC, Raymond J. Rulis, and Lawrence J. Ross.*

responsible for calculating the effects of various loads on the launch vehicle such as wind velocity and direction. They operate the wind monitoring system, define the vehicle's capability and performance, and provide the range safety officers with trajectories and information so that they will know what to expect.

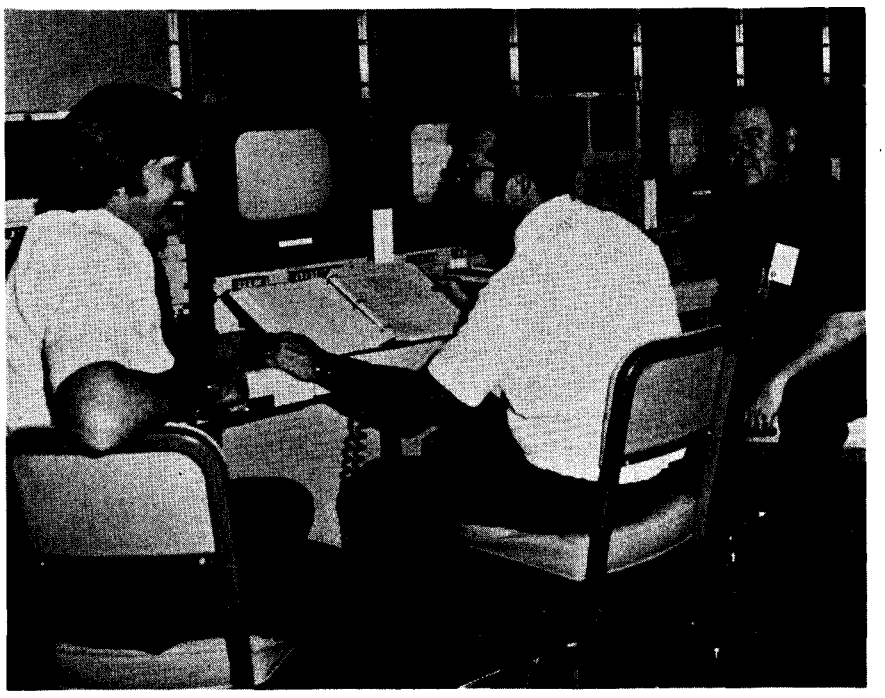
In addition to the specific mission managers, the various supervisors in the Launch Vehicle Directorate provide day-to-day guidance to the personnel in their areas. Raymond J. Rulis, Chief of the Vehicles Engineering Division manages the systems engineers. His supervisory staff includes James E. Patterson, Chief of the Computer Guidance Branch; William J. Middendorf, Chief, Electronics and Flight Control Branch; Maynard I. Weston, Chief, Ground Systems Branch; William E. Goette, Chief, Mechanical Systems Branch; Floyd Z. Smith, Chief, Structures Branch; and Teledyne Resident Office head James L. Swavely. Section heads in this division include Roger S. Palmer, Donald F. Garman, Jerome A. Johnson, Edwin R. Procasky, Richard C. Dillon and William A. Groesbeck.

Others on hand to apply their knowledge to speeding the Titan Center on its way included: John L. Feagon, DCU Software; J. Robert J. Schroeder, Titan Liquid Propulsion; Kenneth W. Baud, Boost Pumps/$H_2O_2$/ ECS; Merle Jones, Centaur Pneumatics/ Air Conditioning; Raymond F. Lacovic, Thermo/Insl. Systems; Thomas W. Godwin, Hydraulics; Konstanty Semenchuk, Propellant Utilization; John B. Nechvatal, Centaur Electrical; Charles W. Eastwood, Structures; Thomas L. Seeholzer, CSS Bolt-ons; Baxter L. Beaton, Titan Electrical; Edwin S. Jeris, Titan Flight Control; Thomas P. Cahill, CSS Systems; Reino J. Salmi, Solid Rocket Motors; Hugh tin J. Braun and the General Dynamics Corporation Resident Office headed by Richard E. Jumont.

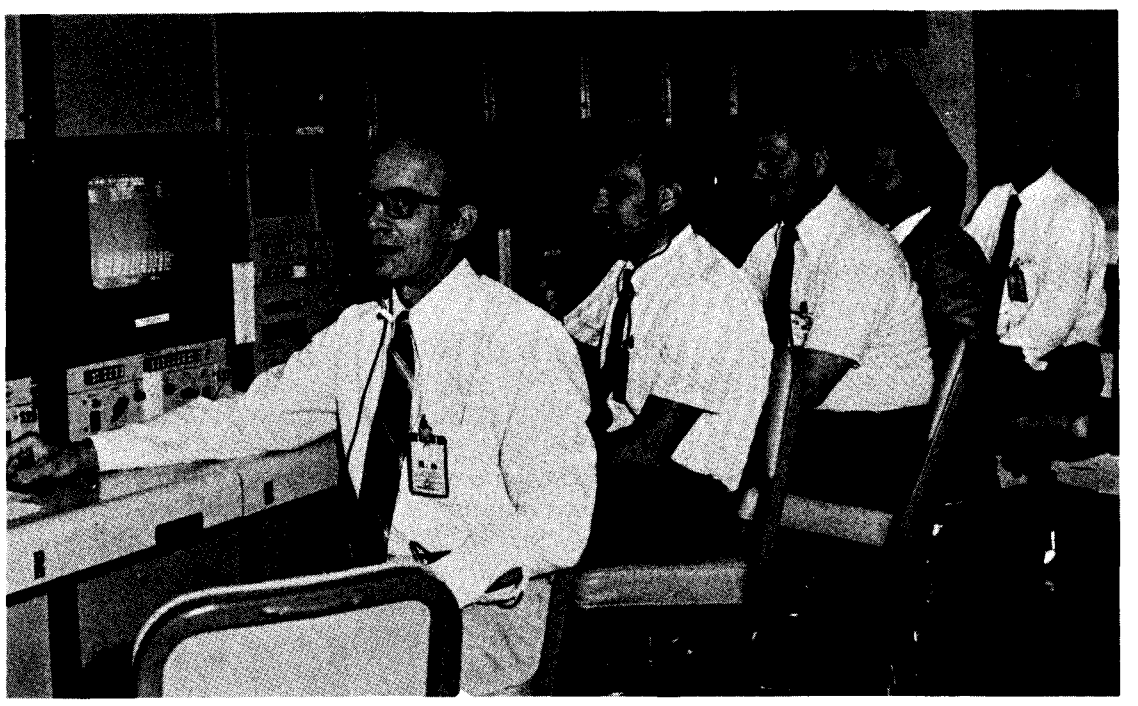
Reliability and Quality Assurance is essential throughout. Walter F. Dankhoff, Director of that office, Robert M. Jabo, and Stephen Szpatura were on hand at the Cape.

In addition to the many engineers working in each discipline, both in the launch team going to the Cape and those remaining at Lewis to provide back up, hundreds of other Lewis employees helped make Titan Centaur's first mission a success. The Space Power Facility personnel at Plum Brook helped analyze boost pump problems which occurred on TC-1, zero gravity facility personnel and engineers from Spacecraft Technology Divison provided much data concerning behavior and design of propellant handling systems for zero gravity mission, and the list goes back to early firings of hydrogen-oxygen engines in the 1950's.

"It can only be summed up as a team effort," Stofan says. "That is what has brought success to Lewis and the nation's space program and that is the way it will remain strong."



*Left to right, William J. Midendorf, John Silverstein, KSC, and James E. Patterson.*

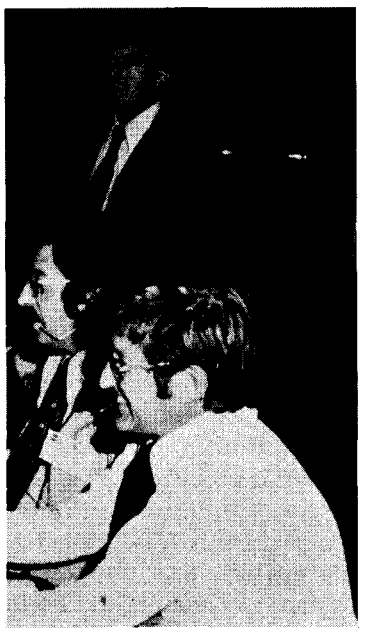


*Left to right, Richard C. Dillon, Baxter L. Beaton, Norm Sitter, Martin-Marietta, Richard Dawson, KSC, and Thomas W. Godwin, Jr.*

*Left to right, William E. Goette and Merle L. Jones.*

Elmo Farmer, Assist. Chief, Ground Systems; Richard E. Orzechowski, Tracking & Data, Titan RF, Instr., RSC; Ralph P. Kuivinen, Performance & Trajectory; Theodore F. Gerus, ADDJUST/Wind; Andrew L. Gordan, CCLS; John M. Bulloch, Centaur Instrumentation, RCS; Dale E. Pope, Guidance /IMG; Dean W. Bitler, Centaur Flight Control; William K. Tabata, Centaur Propulsion/TE-364; E. Timmons, MMC Elec. AGE; Alvin C. Hahn, Mechnical AGE; Mike Crnobrnja, Structural AGE; Thomas J. Hill, Centaur RF Systems.

Carl B. Wentworth, Chief, Program Integration Office provides guidance to the Systems and Mission Integration Branch under Joseph A. Ziemianski, the Systems Analysis Branch headed by Arthur V. Zimmerman, the Program Control Branch under Mar-



*Right to left: Richard A. Flage, Richard C. Kalo, and Edwin S. Jeris, standing.*

# Engineering Services

*(Continued from page 8)*

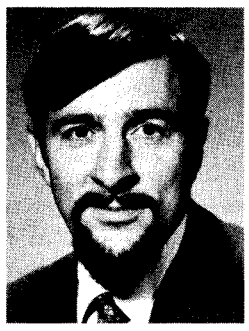
The Solar Collector Test Facility designed to test candidate solar collectors. One outdoor installation provides for unattended operation of up to 10 collector test loops. Another, indoor system simulates the Langley Engineering Building solar energy heating-cooling system;

A Ballistic Impact Test Rig was designed for impact testing of composite materials, for aircraft engine fan blades;

JT8D Engine Installation in PSL-4; and

10 x 10 SWT Tunnel Compressor Controls. The Engineering Design Division provided the design, installation, checkout, and operation of modern automatic controls for both 10 x 10 SWT Facility compressors in 1974.

The directorate's capability to analyze both radial and axial blades was expanded. For radial impellers, the "SHRIMP" program was revised and expanded. It can now be used on the IBM 360 TSS computer. Several new generator and plotting routines are now in use. For axial blade analysis another preprocessor has been developed that converts aerodynamic design data to input data for "NASTRAN." This is used for static and dynamic analysis of metal and composite (anisotropic) materials.



**Andrew J. Stofan, Director**

# Launch Vehicles

The Launch Vehicles Directorate completed a year with many significant events. Culminating over five years of intensive planning, engineering, development, testing, launch site modifications and hardware fabrication, Titan/Centaur-1 (TC-1) Proof Flight was launched on February 11, 1974. This was the first flight of an integrated Titan/Centaur vehicle. All three stages of the Titan vehicles were satisfactory with ignition, burnout, and separation events occurring as planned. The Centaur guidance system provided satisfactory Titan booster steering and issued the commands that resulted in jettison of the newly developed Centaur Standard Shroud and separation of the Centaur from the Titan Stage II vehicle. After the Centaur engine start sequence was initiated, the liquid hydrogen boost pump operated normally. However, the liquid oxygen boost pump failed to operate. The flight was terminated by the Range Safety Officer at approximately 748 seconds into the flight. Regrettably, the injection of the Lewis-developed SPHINX spacecraft was not performed. Several months of intensive effort followed to produce an in-depth failure analysis of all vehicle systems. Extensive testing was performed both at Lewis and at the contractor facilities to isolate the failure and to institute corrective action.

Although the sixth Intelsat IV commercial communications spacecraft was scheduled for launch by an Atlas/Centaur in May, delays were incurred first due to the COMSAT spacecraft problems and later due to difficulties experienced with the Centaur Digital Computer Unit. With these problems solved, AC-32 was successfully launched on November 21. The spacecraft went on station 22,300 miles above the Pacific Ocean, augmenting the five-satellite network already circling the globe from positions above the Pacific and Indian Oceans.

On December 10, 1974, the Titan/Centaur-2 (TC-2) Helios mission was launched successfully. The Helios spacecraft will penetrate the outer corona of the Sun and provide scientific information concerning the Sun. Besides the many technological and scientific firsts that the Helios spacecraft will supply with its study of solar wind, solar and galactic cosmic rays, density and dynamics of cosmic dust. There were many significant accomplishments for this largest and most powerful launch vehicle in NASA's Unmanned Flight Program. These are:

Successful integration by NASA of the most complex unmanned mission.

First operational flight of the Titan/Centaur with its large hammer-head fairing-Centaur Standard Shroud.

Successful integration of the Delta TE-364-4 stage with the Titan/Centaur resulting in Helios being injected at the highest energy attained by any spacecraft.

The two planned major post-mission experiments were performed successfully. The first demonstrated Centaur engine start capability after a one hour zero gravity coast for application to the Mars/-Jupiter/Saturn (MJS) 1977 mission. The second obtained Centaur thermal control and propellant management data for long duration (three hour) zero gravity coasts for applicability to synchronous orbit and Space Shuttle Cryogenic Tug missions. A fourth engine start was accomplished with about 50 percent of the liquid hydrogen pressure level normally provided for engine start.

With the successful Helios flight and post-mission experiments performed, the Titan/Centaur and its associated launch support equipment demonstrated its use for a multiplicity of missions.

# Launch Vehicles

Andrew J. Stofan,
Director

At the start of 1975, the Launch Vehicles Directorate faced a very busy year with seven scheduled launches. These launches consisted of four with Atlas/Centaur and three with Titan/Centaur. Subsequently, one Atlas/Centaur and one Titan/Centaur launch slipped into early 1976. Overall 1975 was highly rewarding. Four of the five launch attempts were totally successful, resulting in attainment of all flight objectives.

An attempted launch of an Intelsat IV communications satellite on February 20 ended in failure due to a malfunction in the Atlas booster staging electrical disconnect system. An intensive failure investigation resulted in a number of design changes. These changes were incorporated and the last of the series of eight Intelsat IV's was successfully launched by Atlas/Centaur (AC-35) on May 22. Seven of the eight reimbursable Atlas/Centaur launches for COMSAT Corporation on behalf of the International Telecommunications Satellite (INTELSAT) consortium of over 90 countries were successful. All seven satellites are now operational in geostationary orbit providing telephone and television service in the Atlantic, Pacific and Indian Ocean regions.

On August 20 and September 9, 1975, two Titan/Centaur's, TC-4 and TC-3 successfully launched the Viking I and Viking II spacecraft into their correct Mars transfer orbits. The original scheduled launch data was delayed from August 11 to August 20, first due to a faulty valve in one of the solid rocket motors on the Titan and secondly due to a depleted battery on the Viking orbiter. The isolation and successful resolution of these problems necessitated that the launch team literally work around the clock to support the August 20 and September 9 launches of the two Vikings.

Viking I will arrive at Mars on June 19, 1976, and Viking II will arrive at Mars on August 7, 1976, after traveling in excess of 400 million miles.

Each of the two Viking spacecraft includes an orbiter and lander system. The Viking I lander system will be placed on the surface of Mars by approximately July 4, 1976, and a planned 60 day landed mission will be accomplished. The Viking II lander will be placed on the surface of Mars no earlier than September 4, 1976, for a similar 60 day landed mission.


*Titan Centaur*

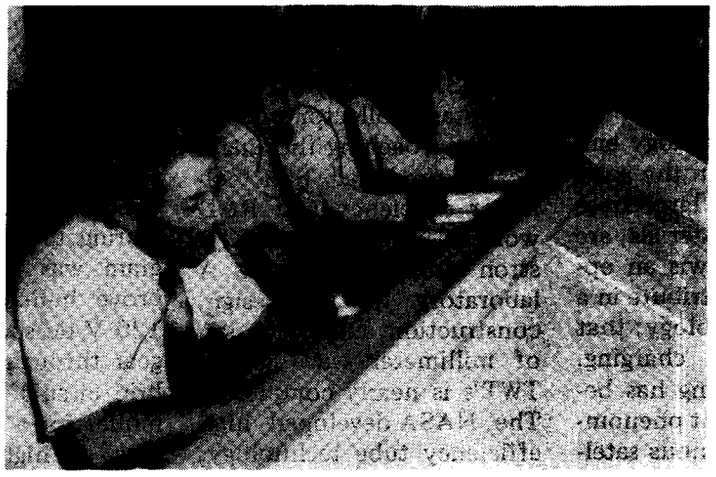
Of the eight science investigations to be conducted on the surface of Mars, the most significant is the biology investigation to determine if life exists on Mars.

The first in a series of six next generation Intelsat IVA spacecraft was successfully launched by the AC-36 vehicle on September 25. Each Intelsat IVA spacecraft has a capacity which is nearly double that of the earlier Intelsat IV satellites. The Intelsat IVA system will become operational in the Atlantic Ocean region in spring of 1976 following launch of the second spacecraft in January. The AC-36 launch was also the first of the modified Centaur D-1AR series. The D-1AR Centaur incorporates reliability improvements and additional redundancy features.

The successful launch of Viking I and II and the subsequent launch of Intelsat IVA within a time frame of 37 days was a first for the Lewis Launch Vehicles Directorate.

Four Directorate personnel received the NASA Headquarters Exceptional Service Medal. In addition NASA Headquarters issued a Titan/Centaur Group Award for the major contributions the Titan/Centaur team made towards the success of the Viking mission.

The year 1976 is scheduled to include four Atlas/Centaur launches; two for Comstar and two for Intelsat. Titan/Centaur will launch another Helios probe in mid-January for the exploration of interplanetary space in proximity of the Sun. (.29 AU)

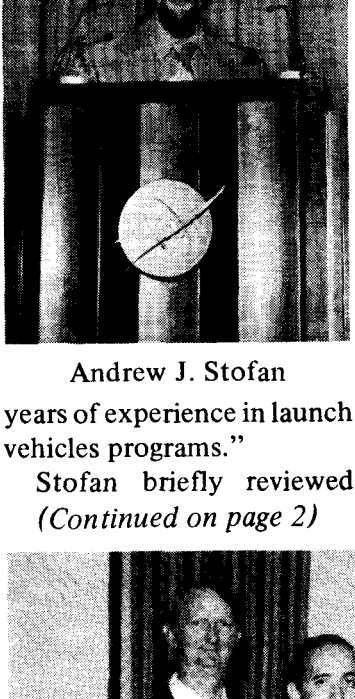


# *Launch vehicle director highlights Centaur work*

Andrew J. Stofan, Director of Launch Vehicles, delivered his annual message on the "State of the Directorate" on September 9, in the DEB Auditorium, to an audience consisting of the Directorate's staff and supporting personnel from the Office of Reliability and Quality Assurance Directorate and the Vehicles Procurement Branch.

He began the presentation by stating that a similar presentation was given several months ago to John F. Yardley, Associate Administrator, Office of Space Flight at NASA Headquarters and to the Senior Management of Lewis during the morning of September 9.

Stofan stated that the two main functions of the Directorate are to provide Launch Vehicle Systems Management, (launch vehicle adaptation and launch operations for a specific mission) and Project Management (overall vehicle design, integration, systems engineering, and business management). "The Directorate has produced eight successful flights, three Titan/Centaur and five Atlas/Centaur in the past 14 months. Overall, the Centaur program has had 27 successful Atlas/Centaur operational flights for 31 launches. All four Titan/Centaur operational flights launched have been successful. Contributing in a major way to this success record is the dedicated, experienced staff which is comprised of 66 percent of the technical personnel having over 10



Andrew J. Stofan

years of experience in launch vehicles programs."

Stofan briefly reviewed

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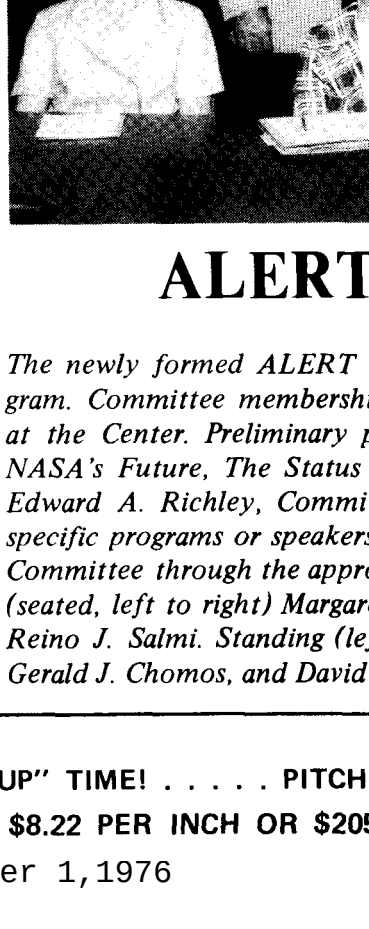

# ALERT

*The newly formed ALERT gram. Committee membersh at the Center. Preliminary NASA's Future, The Status Edward A. Richley, Commi specific programs or speaker Committee through the appr (seated, left to right) Margar Reino J. Salmi. Standing (le Gerald J. Chomos, and David*

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# Launch vehicles...

*(Continued from page 1)*

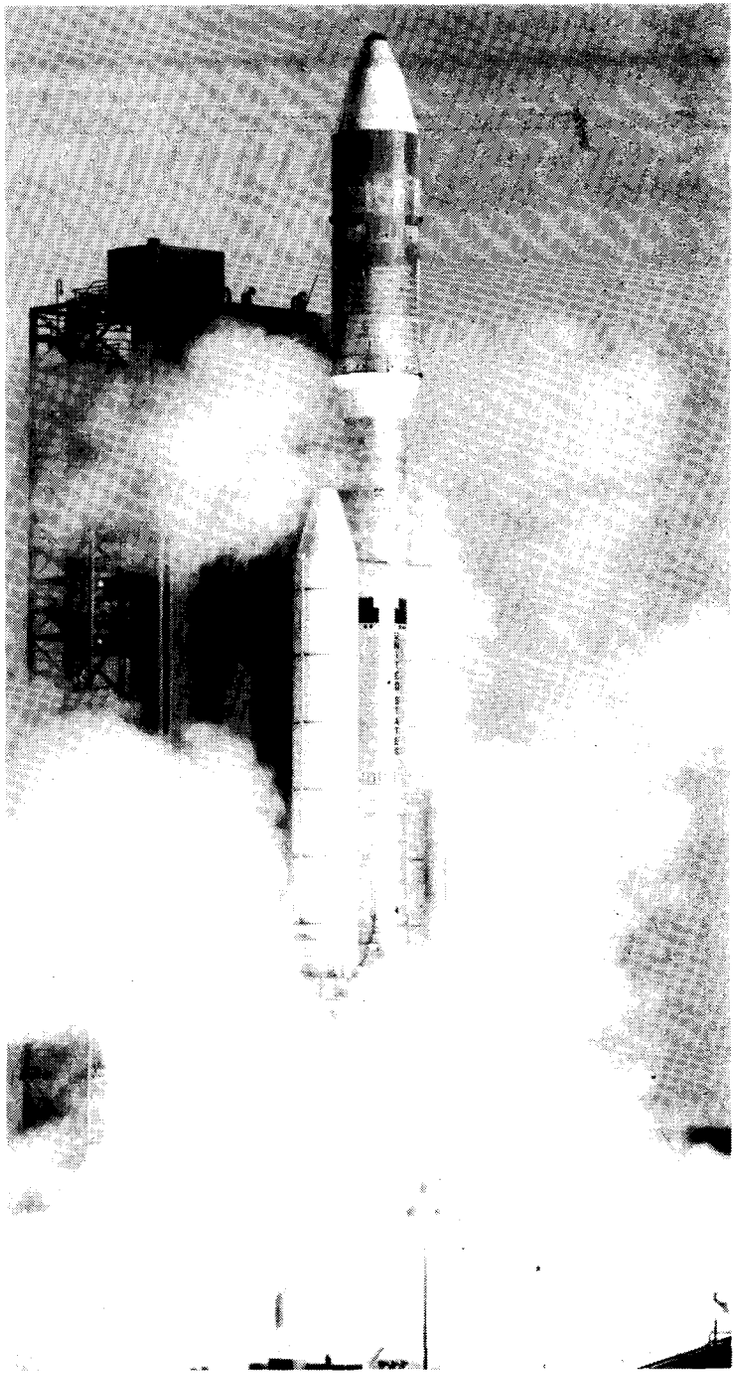
the complex Government-Industry interfaces that the launch vehicles program works with to assure effective launch vehicles systems and missions. These comprise a multitude of Government agencies (NASA Headquarters, U.S.A.F., other NASA Centers), and major contractors (General Dynamics Convair Division, Teledyne Systems Company, Honeywell, Martin Marietta Corporation, Pratt and Whitney Aircraft, Rocketdyne) working harmoniously toward a common goal.

"Supportive Center resources have contributed in a major manner to the successful development of the Atlas/Centaur and Titan/Centaur launch vehicles and continue in this role during the operational phase of the program. Some of the key facilities used during the development program were the 8x6 and 10x10 SWT, Space Power Chamber, Propulsion Science Laboratory, Zero Gravity, Engine Research, Central Computers, Dynamics Laboratories, Plum Brook's E, B-2, and B-3 Stands and the Space Power Facility," Stofan said.

He pointed out that the Directorate provides management and technical direction for 35 active contracts totaling approximately $619 million. FY-76 was a particularly active year and in addition to the heavy launch schedule approximately $243 million of contract value was negotiated.

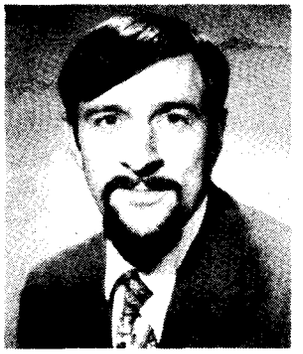
Stofan stated that the Launch Vehicle Program is firm thru 1981. In addition there is a possibility that two Titan/Centaur launches will be added in 1981 to support a follow-on to the two Viking launches which occurred in 1975. "The success of the Centaur Program can be attributed to personnel experience in complex project management, supportive Center resources and implementation of effective management systems." Stofan added that Lewis will have an expanding role in Aeronautics and that the potential also is high for Lewis to assume a major role in energy research and development. He also described the PAR management program that is being implemented by the Center and explained the Directorate promotion policy.

A brief coffee social under sponsorship of the Awareness Committee concluded the informative hour.



*Viking 1 was launched by a Lewis Titan/Centaur rocket from Complex 41 at Cape Canaveral.*

# Launch Vehicles



**ANDREW J. STOFAN, DIRECTOR**

The year 1976 has been another productive and eventful year for the Launch Vehicles Directorate in fulfilling this current year commitments and in preparing for the coming years demanding launch schedule.

All four missions launched during the year were successful, resulting in attainment of all flight objectives.

On January 15, 1976, the Titan/Centaur (TC-5)launch vehicle completed its fourth operational mission by placing the Helios B solar probe into an elliptical orbit around the Sun. After achievement of this primary objective, Centaur continued into an experimental flight phase to demonstrate its capability to sustain long zero gravity coasts and multiple engine starts. Approximately 4000 pounds of propellants remained in the Centaur vehicle at separation of the Helios spacecraft. Centaur used these propellants to demonstrate its capability for synchronous orbit injection, multiple coast/restart during extended flight, thermal control techniques, tank pressure control and main engine restart with low tank pressurization levels and low propellant residuals. During the experimental phase Centaur successfully demonstrated 5 main engine burns separated by coasts varying from 5 to 315 minutes.

The TC-5 flight was the most complex unmanned mission ever untaken. Including the primary mission, a total of seven Centaur main engine burns were performed, clearly establishing that Centaur is capable of performing complex advanced missions.

On January 29, 1976, just 14 days after the launch of TC-5, another in the series of Intelsat global communications spacecraft was successfully launched on AC-37. In addition, on May 13, 1976, and July 22, 1976, AC-38 and AC-40 launched 2 COMSTAR spacecraft into geosynchronous orbits which will be operated by American Telephone and Telegraph Corporation for domestic communications.

Titan/Centaur launch vehicle systems activities in support of the two Mariner-Jupiter-Saturn 1977 (MJS) launches scheduled for late August of next year have continued at an intensive level throughout this year. The objectives of the mission are to conduct exploratory investigations of the Jupiter and Saturn planetary systems and the interplanetary medium between Earth and Saturn. The spacecraft/launch vehicle hardware integration task has been completed. The major element of this task resulted from the environmental control requirements imposed by the Multi-Hundred Watt (MHW) – Radioisotope Thermoelectric Generator power source used on the spacecraft, together with critical temperature and relative humidity requirements of specific spacecraft elements. Fabrication and ac-

*(Continued on page 7)*

# Launch Vehicles... (Continued from page 6)

ceptance of the Titan III boosters, Centaurs, and Shrouds for the TC-6 and TC-7 (MJS launch vehicles) were also completed this year. All hardware, except for the second Centaur, have been delivered to Kennedy Space Center and launch vehicle preparation activities for next August's launches have commenced.

A major engineering effort started 2½ years ago was recently completed and provides significant improvements to the factory and launch site computer controlled launch and checkout equipment. The hardware modification consisted of replacing the out-dated failure prone Xerox 930 computers with current state-of-the-art Harris computers. A complete recoding of the entire CCLS software, compatible with the new hardware was developed and demonstrated. The new computer software and hardware provided for a highly reliable system, a significant reduction in physical hardware, faster instruction – execution time and the ability to time share up to six separate vehicle checkout tenant programs simultaneously.

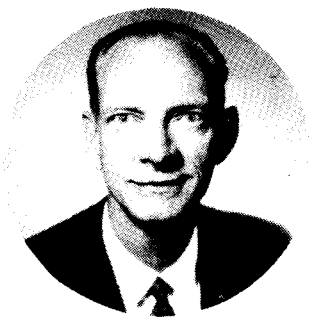
This year also produced significant improvements to the airborne Digital Computer Unit (DCU). A new planar construction memory was designed and incorporated into the unit. The improved design provides for simplicity and producibility and results in ease of component accessability. In addition a new state-of-the-art innovation; parylene passivation of hybrid, microelectronic piece parts was pioneered, developed, tested and phased into production with the first production DCU incorporating this modification undergoing acceptance testing in December. The Centaur DCU is presently the first and only major airborne hardware in the space industry to incorporate this passivation technique.

Additional significant tasks completed this year were an extensive review of quality and workmanship of hardware and the qualification levels for airborne hardware to assure that acceptable reliability levels are maintained. An in depth review of vehicle testing at the launch site was conducted which has resulted in a shorter period for this effort.

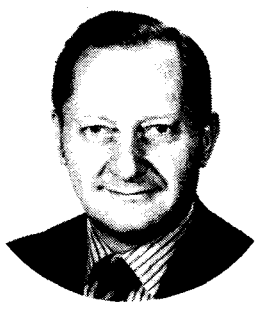
In November, launch vehicle systems management for the SEASAT-A Mission was assigned to the Directorate. The SEASAT-A spacecraft is an ocean dynamics surveillance satellite scheduled for launch from the Western Test Range in May 1978. It will provide information on ice fields, wave heights, water temperatures, etc. for use in near real time by the weather service, maritime industry and other interested agencies. The program is being managed by the Jet Propulsion Laboratory for NASA. The launch vehicle consists of a refurbished Atlas-F booster provided by the U.S.A.F. through their contractor General Dynamics, an Agena upper stage provided by JPL through Lockheed and a 10 foot diameter fairing provided by Lewis through Lockheed.

The year 1977 promises to be an eventful year with six launches scheduled within a nine month period. These are AC-45 HEAO-A in April, AC-39 INTELSAT IV-A in June, TC-6 and TC-7 MJS-77 in August, AC-43 INTELSAT IV-A Follow-on in October and AC-44 FLTSATCOM in November. The objective of the HEAO (High Energy Astronomy Observatory) mission is to study some of the most intriguing mysteries of the Universe, such as black holes, pulsars, neutron stars and supernovae. The observatories will scan and map the sky for cosmic, gamma and X-rays emanating from these phenomena. The two Intelsat missions will further supplement the worldwide communications network and the FLTSATCOM Mission will be first in a series to establish a space military communications network.

# Feedback to staff from INFORUM II



Dr. Bruce T. Lundin



Dr. Seymour C. Himmel

William Dey, Jr.

Andrew J. Stofan

*This is the second INFORUM FEEDBACK column which serves as a means of reporting management responses to questions and concerns expressed at the DIRECTORS INFORUMS, part of the Lewis Awareness Program. (INFORUM is a coined word meaning a place where information is exchanged in an informal atmosphere.) Many of these responses contain additional information to that expressed at the INFORUM.*

*Center Director Bruce T. Lundin listened to concerns on the general topic, "What do you see in the future of Lewis and how does it help or hinder your work?" The concerns and responses follow.*

**Staff: Available points for promotions.**

**Dr. Lundin:** We are, of course, operating under a controlled ceiling on the average grade of all Lewis GS schedule employees. At present, our normal attrition and turnover of the staff provides approximately 175 promotion "points" per year. While this is not enough to provide a promotion to everyone who would like one, it is, in my opinion, sufficient for a sound promotion program for the present staff of the center.

**Headquarters view of our efforts to enter new (i.e., other than aerospace) areas of work.**

Very positive, at the Administrator's level, but with some concern by Office of Aeronautics and Space Technology about the availability of staff here at Lewis to support both their programs and ERDA. The Administrator sees the work here for ERDA as (1) an important growth area for the agency, (2) a good utilization of government capabilities in the national interest, and (3) establishing processes that show how the capabilities of one agency can be used to help another agency.

**Why does it seem that the number of approvals required to do anything seems to be always increasing?**

*(Continued on page 7)*

*Associate Director Dr. Seymour C. Himmel solicited thoughts and concerns related to the following question: "What programs would you personally like to see adopted, continued, or dropped?"*

**Staff: Lewis should know more about what future (20-30 years) communications satellites are planned so that we can plan our R&T program.**

**Dr. Himmel:** Lewis is deeply involved in systems studies designed to identify the communications services needed, the market for such services and the technological requirements of these services. As in any applications activity much interaction with the potential user of the service(s) is required and an economic and/or social justification must be established. The process is, understandably, lengthy, iterative and involved. The Applications Division has recently proposed a number of new initiatives in communications that have attracted considerable interest.

**Lewis should know more about the steps being planned to phase out expendable launch vehicles with the phasing in of Space Shuttle.**

It is the Agency's plan to phase out all expendable launch vehicles other than the Scout and sounding rockets by the end of 1980 when the Space Shuttle is scheduled to become operational. In the intervening period, the expendable vehicles will continue to provide transportation into space for NASA, commercial and foreign spacecraft. No performance improvement development work is to be undertaken for the expendable vehicles. Only such developments as are required to maintain the operational reliability of the vehicles is to be authorized. As the work load decreases, personnel will be reassigned to other duties.

**Role Lewis may play in the Space Shuttle.**

*(Continued on page 7)*

*The Director of Administration, William Dey, Jr.'s discussion session focused on concerns related to "What are the obstacles to getting your work done at Lewis?"*

**Staff: The Headquarters role regarding more centralization.**

**Mr. Dey:** The strength of NASA as an Agency has always been the decentralization of its operations and the relative autonomy of the field Centers. There has been no move to centralize operations, but there does seem to be at times a move to limit or at least to control the autonomy of the field centers. For the most part this is evident in the increasing need to account for resources and report our routine activities to Headquarters. To a great extent this change is necessitated by what we might characterize as an environmental change. The glamour of the Apollo Program and the swell of public support that attended it have vanished and NASA now finds itself in a highly competitive quest for the federal R&D dollar. That this results in the need for greater accountability and control at the Agency level should come as no surprise. This quite naturally raises the specter of overall centralization. The trick is to achieve the first without simultaneously resorting to the other. Apart from the obvious need for greater accountability and control there seems to be a general understanding at NASA Headquarters that the field centers represent an important and vital part of the Agency's capability. There is every reason to hope that we will find a workable balance which will protect our capability and sharpen our ability to compete for support.

**Lewis is becoming a "slave" to ERDA.**

While there certainly is no intent to become subservient to ERDA, we must, of course, be responsive to their needs and be sure we fulfill our commitments to

*(Continued on page 7)*

*Andrew J. Stofan, Director of Launch Vehicles, heard staff comments on concerns related to: "How can we utilize skills and talents more effectively at Lewis – including yours?"*

**Staff: Method of creating supervisors.**

**Mr. Stofan:** Supervisors are selected on the basis of a combination of many different factors. To be a supervisor in a highly technical discipline requires a good solid technical background. However, it is not a necessary condition that the individual being selected be the "best scientist or engineer." His ability to organize, plan, motivate, educate and grow are a few of the important factors that are considered in the selection of a supervisor and/or manager.

**Lateral assignments should be publicized and made available to general staff.**

Posting of lateral transfers (i.e., where a merit promotion is not applicable) has been used on an experimental basis recently to fill several vacancies. In applying for a lateral transfer, an individual may make his special talents and interests known to the supervisor where the vacancy exists. In the future, the posting of lateral transfers will be one of the ways in which a position may be filled.

**Aerospace at Lewis is in declining phase. Personnel may be in weak position. Skills and expertise should be properly utilized in other areas. Should carefully plan transition. A method should be developed to rotate individuals to prevent boredom or lack of challenge after 5-6 years in same assignment.**

Aerospace related work at the Center is in a decline. The utilization of the skills of the Center are constantly being evaluated so that they

*(Continued on page 7)*

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# *INFORUM Π...*

## Dr. Lundin

*(Continued from page 2)*

It's called institutional aging. It is something that we must stay alive to and fight at every turn. Your comment encourages me to keep at it.

**We have sold service as our product. How about one large technology program of our own to put us in the limelight again?**

Even if possible, which it is not, such an effort would be counterproductive and a detriment to our future. The places where our country needs advanced technology and where we have an extant capability, such as propulsion, power and energy conversion, must, in the end, be provided by and/or operated by industry. For us to try to compete with this industry would not only fail to be supported by the national administration but would destroy the support we must have from industry. I understand the appeal of the suggested approach, but the bare facts are that there is not another "Apollo situation" in our future. Our future resides more in an expanded NACA" than in "building another Centaur" to go to the moon.

**Downward communications are not working well enough to reach the working level.**

I agree. Recent surveys and studies have shown that this is a problem at all centers and, indeed, in all organizations of our size. Memos to staff and bulletin boards aren't enough. That is why we have State of the Center and State of the Directorate talks, followed by interviews and discussions. Our *Lewis News* is, I believe, the best in NASA. These Inforums are a further effort to improve communications. Any other ideas would be welcome.

**Is there any way to inform the staff about a reorganization before it happens?**

Probably not. A reorganization of the Center must, of course, be approved by Headquarters. In the nature of things, I cannot inform the total staff, and thus make it public, until that approval is obtained. And once that approval, even informal, is obtained the word gets out through the Headquarters system with great speed. I understand and regret that many of you were uncertain about your future assignment for a few weeks. This time was spent, properly, I think, in the effort to find the best possible match between individual interests and the programmatic needs of the Center.

*Once again, I enjoyed this "Inforum" and found the discussion both informative and helpful. I would like to thank all who took the time and effort to participate.*

# Women bowling champs

*The Scramjets emerged as champions of the NASA Ladies Bowling League after a grueling 33 weeks which saw them mow down their opponents in 141 games while losing 89. Winning team members are (left to right, front row) Sadie Kinter, captain, and Lois Geyer. Back row, left to right, Kathy Leffew, Marge Gantner, Kay Lahlbach and Gloria Leiner. Ms. Leiner led the team with a sparkling 162 average and also garnered a 611 three-game high series during the season.*

## William Dey, Jr.

*(Continued from page 2)*

them. Lewis is aggressively pursuing those energy programs in its areas of expertise. Although ERDA is, like NASA, a Government agency, their management styles and processes are in some cases, quite different from those we are used to in dealing with our own Program Offices within the agency. In some instances, this requires us to modify our own methods of operation to foster the flexibility we need to be responsive. ERDA has many sources, both within and without the Government, for obtaining the services that it requires. In essence, we are competing with others for the business we seek. This requires fast reaction to meet ERDA's particular needs of the moment. We are working very hard at selling our ability to ERDA and hoping to influence their programmatic decisions. But, in the end, if we want their business, we must be prepared to meet their needs as they define them.

**The Agency and Lewis are becoming more bureaucratic.**

If the degree of control and level of reporting is taken as the measure of an increasing bureaucracy, we probably are. But, it is important to understand why this is occurring. The previous discussion of centralization offers some insights on this. Also, it is important to understand that a great deal of this occurs in response to pressures from outside organizations such as Congress and the OMB. Changes of this type in response to legitimate pressures upon the Agency are not necessarily bureaucratization in the normal sense of the word. Added to all of this is the natural tendency of a maturing organization to move toward more bureaucratic systems. Still, all in all, NASA remains one of the least bureaucratic of the Government agencies. This tendency is something which must be continually watched lest we lose the flexibility and innovativeness that have made NASA such an effective organization. This is a matter of continuing concern within the Agency and at the Center.

## Andrew J. Stofan

*(Continued from page 2)*

can be applied to the areas of work that are expanding. We are in a highly technological environment where change and adaptation is a constant challenge and a way of life.

**Supervisory positions should be filled within 2 months, not "acting" for a long length of time. Bad for morale. If can't be filled within 90 days – abolish.**

The filling of supervisory positions in a timely manner is the goal of the Center. Occasionally, the search for a particular talent or to insure the best qualified individual is selected takes a longer time than is anticipated.

## Dr. Himmel

*(Continued from page 2)*

Lewis has and continued to play an important consultative role for the Space Shuttle. In particular we are actively involved in supporting the Space Shuttle Main Engine Program in turbomachinery, bearing, seals and materials. Our assistance is much appreciated.

**ERDA should use Lewis for fusion work.**

Lewis is no longer conducting any significant level of effort on fusion although some of our basic plasma physics work may contribute. ERDA already has a

*Center's year i*

# LEWIS N

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# Stofan named deputy, goes to Headquarters

Andrew J. Stofan, Director of Launch Vehicles at Lewis, has been named Deputy Associate Administrator for the Office of Space Sciences at NASA Headquarters effective, January 8.

In his new position, Stofan will be helping direct all of NASA's space flight programs aimed at scientific investigations of the solar system using ground-based, airborne, and space techniques; scientific experiments to be conducted by man in space and development and use of light and medium class launch vehicles.

Stofan began his professional career at the Lewis Center in 1958 as a research engineer and in 1962 was assigned to the propellant systems section of the Centaur Project Office, becoming head of the section in 1966.

In 1967 he was named project manager of the B/1, B2 test programs; assistant project manager, Improved Centaur in 1969 and project manager of the Titan/Centaur vehicle in 1970. In this post, he was responsible for all activities associated with the design and development of the Titan/Centaur launch vehicle, until he was named director of launch vehicles in 1974.

# Launch Vehicles

ANDREW J. STOFAN, DIRECTOR

Continuing the 11-year operational program, the Launch Vehicles Directorate used both Atlas Centaur and Titan Centaur vehicles to place four spacecraft in orbit.

Atlas Centaurs AC-39 and AC-45 were launched in May and August. AC-39 carried an Intelsat IVA, the third of the second generation of Intelsat IV communications satellites intended to expand the global communications network.

AC-45 carried the High Energy Astronomy Observatory (HEAO-A) into a circular earth orbit, using a direct ascent mode. This satellite was the first of three to be launched. Weighing almost three tons, it was one of the heaviest unmanned spacecraft launched to date by the Atlas Centaur.

Following observatory separation from the Centaur, a special boost pump experiment was conducted to demonstrate a reduced engine pre-start sequence for the Centaur RL-10 engines. Use of a shorter pre-start sequence requires less propellant and allows increased performance.

In August and September, Titan Centaurs TC-7 and TC-6 started the Voyager spacecraft on their long journeys to Jupiter and Saturn. The launches concluded the Titan Centaur program which also successfully launched two Helios spacecraft (a joint U.S. – West German effort) and the spectacular Viking missions to Mars in previous years. Lewis is proud to have had a part in these historic missions.

Lewis was assigned launch vehicle system management responsibility for the SEASAT mission because of its experience with the Atlas and Agena vehicles and previous working relationships with the Air Force and other NASA Centers involved.

On September 29, 1977, shortly after lift-off, Atlas Centaur AC-43 carrying an Intelsat IVA payload exploded, failing to accomplish its mission. The Atlas booster spontaneously exploded immediately due to a fire in the Atlas engine section. The Range Safety Officer sent a destruct signal to destroy the Centaur upper stage. A detailed failure investigation established that the cause of the failure was a rupture of a line in the Atlas hot gas generator system, which provides gas at 650 psi and 1250F to drive the turbopumps on the two Atlas outboard booster engines. Recovery of the system by Cape Canaveral divers proved to be the key in determining the failure mode. Further study and analysis of the defective material established that the brazing process specifications required modification to preclude this type of failure from recurring. Corrective action has been implemented.

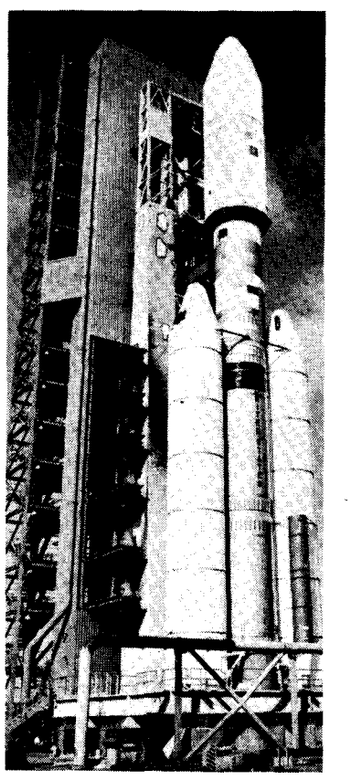
A significant development which was completed last year was a new Computer Controlled Test Set (CCTS) to test the Teledyne Digital Computer Unit (DCU). The DCU is the airborne computer on the Atlas Centaur launch vehicle. The development program for CCTS resulted from NASA/Lewis concern for the existing limitations and reliability of the present test equipment used to evaluate the DCU. The CCTS upgrades the quality of the test equipment and minimizes operator intervention during the test. It also provides additional test capabilities and data visibility to enhance failure identification and isolations. Furthermore, the new test set has the future capability to evaluate the IUS computer to be used on Space Shuttle.

Towards the latter part of last year, NASA Headquarters assigned management responsibility for the integration of the Titan/IUS launch vehicle, which will serve as a back-up for Shuttle flights. In addition, NASA Headquarters is considering the advisability of granting procurement authority for additional Atlas Centaur and Titan Centaur vehicles to serve as back-up vehicles for the Shuttle.

In December, Andrew J. Stofan, Launch Vehicles Director, announced that he has accepted a position at NASA Headquarters as Deputy Associate Administrator for the Office of Space Sciences.

In 1978, seven launches are planned. These are two FLTSATCOM's for the U.S. Navy Satellite Communications Network; one Intelsat IVA which is the last in a series prior to the scheduled launches of the Intelsat V series; two Pioneer Venus planetary probes; HEAO-B, the second in a series of High Energy Astronomical Observatory probes and one COMSTAR to add to the existing Domestic Satellite Communications Network.

During the past year, there was much activity on the Centaur Parts Improvement Program. The Launch Vehicles Directorate, in concert with the Office of Reliability and Quality Assurance, started this program to improve the quality of selected electronic parts used in Atlas and Centaur electronic equipment. This many faceted program included: visiting the semiconductor vendor facilities to investigate facilities, processes, and device construction details; coordinating meetings with representatives of the three involved contractors; monitoring activities at the independent company which performed screening tests on parts to be used by the Centaur contractors; and reviewing the results of detailed disassembly inspections of sample quantities of each type of part to be used in the manufacture of flight electronic equipment.



*Titan-Centaur ready for the Voyager launch.*