

1962-1972 The first decade

The time was 10:00 a.m. E.S.T., Nov. 27, 1963. The countdown was at T-90 minutes and holding. Cloud cover at 30,000 feet and shear winds were postponing the flight of the nation's first hydrogen-oxygen powered launch vehicle...the Centaur.

There was more than the usual tension as the weather hold dragged on at launch complex 36A at Cape Kennedy. The flight of Centaur...officially designated AC-2...was not an ordinary one. Centaur represented an evolutionary step beyond the ordinary chemical propel-

lant systems powering the world's rockets up to that time.

There was more than the usual tension for another reason too. It was the first flight for Centaur since responsibility for its development had been transferred to the Lewis Research Cen-

ter in October 1962. Prior to that transfer its only other flight failed 40 seconds after launch.

One hour ticked by in the Mission Director's Center in Hangar AC at the Cape, and then a second hour. Gradually the cloud cover began to scatter and upper air winds to change. Finally it was clear enough for the photographic coverage essential for proper documentation of the flight. The countdown picked up at 12:23 p.m... and at 2:03 p.m., liftoff.

A sigh of relief was audible in the control center as the first minute of flight went by. Maximum G-loads and structural stress are encountered about 60 seconds after liftoff.

Then at T plus 235 seconds separation occurred. The next few seconds seemed to drag on for minutes until telemetry signals announced...Centaur engines have started. A 380 second burn of the two Centaur engines placed it in an elliptical orbit ranging from 300 to 1000 miles above the Earth's surface...the first successful flight!

On August 21, 1972, Centaur made its 21st operational flight, successfully placing America's heaviest and most complex scientific satellite, an Orbiting Astronomical Observatory, into Earth orbit. Daniel J. Shramo, Centaur Project Manager, called it, "A storybook countdown and storybook flight."

The time between the transfer of Centaur to Lewis and the present time has been filled not only with triumph but also one of dedicated hard work, and temporary setbacks.

The selection of Lewis to manage Centaur development was a natural one. Lewis began research and study of high energy propellants in the late 1940's. By 1952, laboratories and test engines were being set up to experiment with liquid

hydrogen both as a rocket propellant and fuel for turbo-jet engines.

By 1955, Lewis was successfully firing small liquid hydrogen engines and turbo-jets on test stands. At the same time, work on lightweight insulation for flight tanks and lines was going on. Pumps and other hardware for handling liquid hydrogen were also being developed.

Work was far enough along by December 1956 to fly a converted B-57 bomber on liquid hydrogen. This and subsequent flights proved the possibility of using this fuel to greatly increase the range and altitude capability of airplanes.

In the meantime, progress was being made in using liquid hydrogen in rocket engines. The size of engine was growing too...from early 200 pound thrust engine to 5,000 pound thrust in 1954, to 20,000 pound thrust in 1958.

Among the problems investigated in this early Lewis work were: injector and thrust chamber design, fuel pumps, burning characteristics, and use of hydrogen for engine cooling. The design of the injector now being used in the RL-10 engines for Centaur is a direct outgrowth of this early Lewis work. What's more important perhaps was the experience gained at Lewis has a direct bearing on the decision to use liquid hydrogen in the upper stages of the Saturn vehicle.

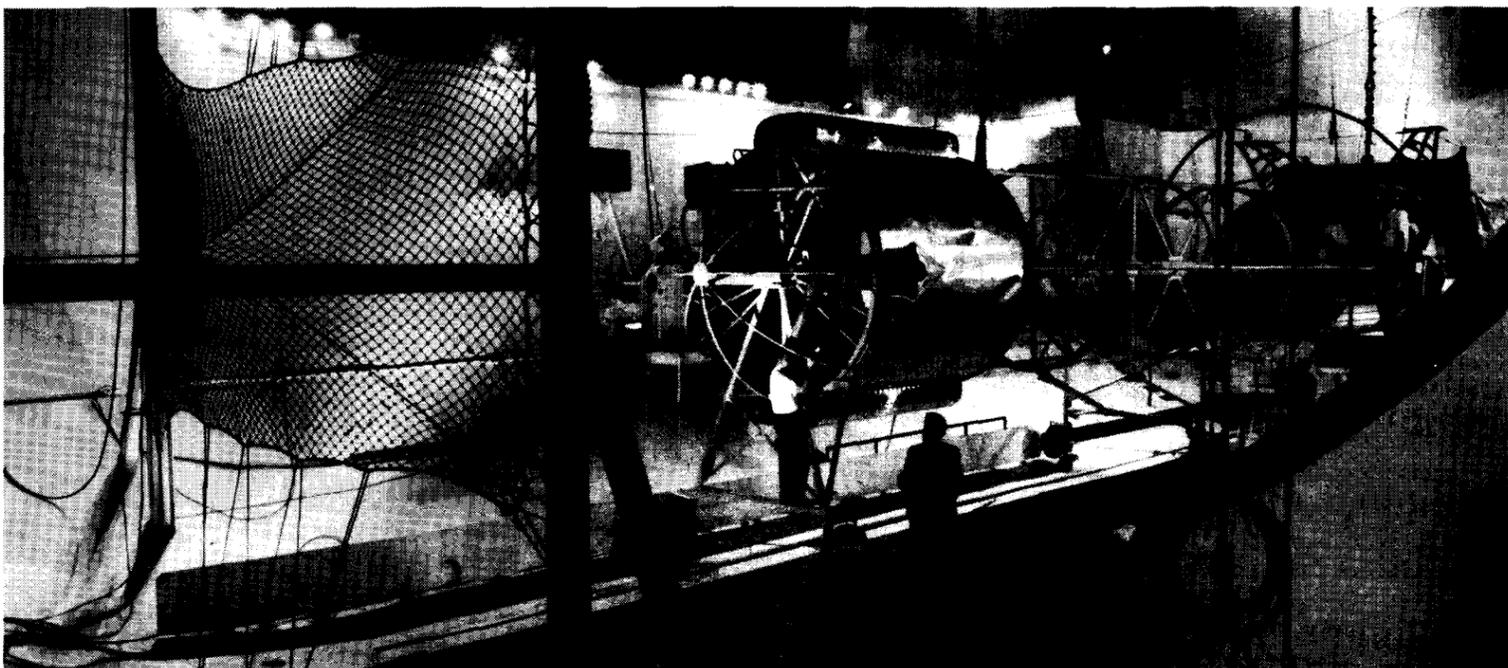
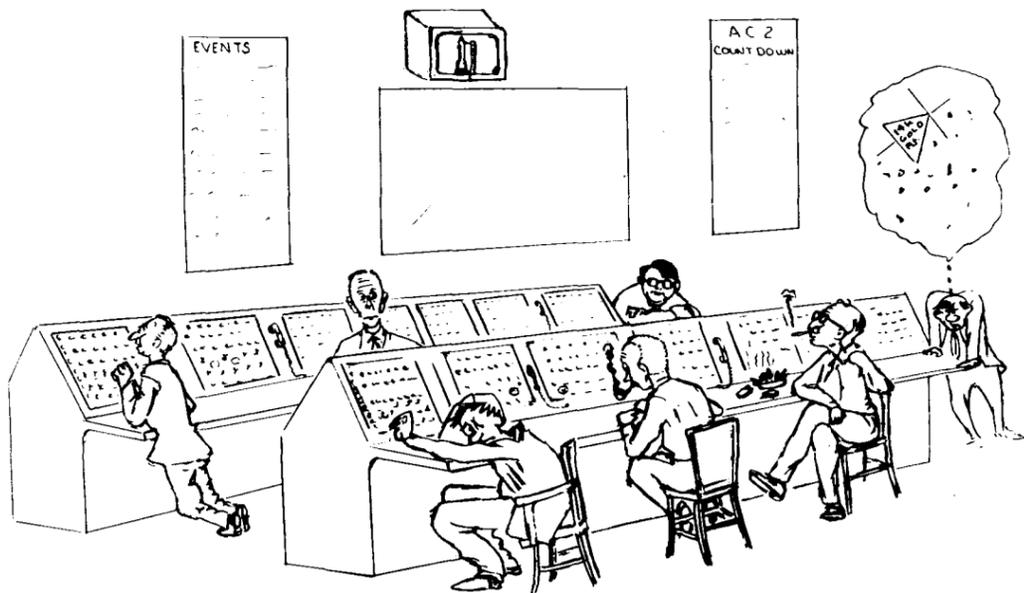
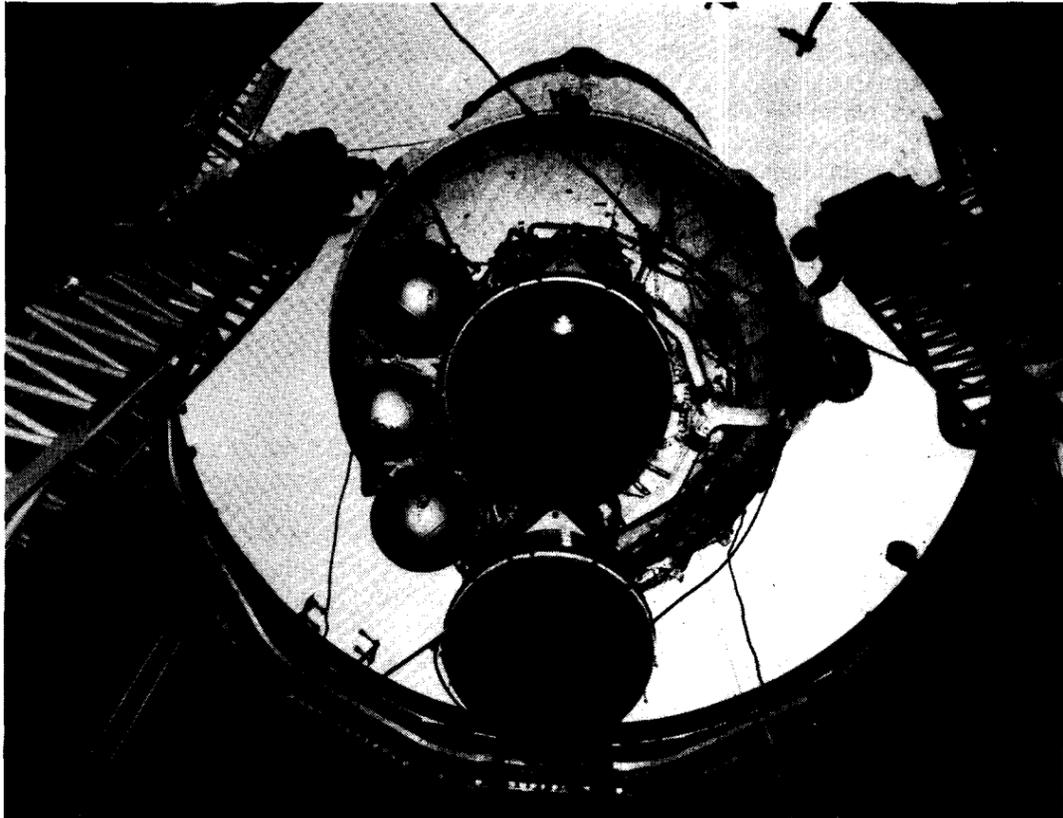
The Centaur project itself was initiated in 1958 by the Department of Defense and transferred to NASA in July 1959. Management of the development program was assigned to Marshall Space Flight Center in Huntsville, Alabama, then the only vehicle development center.

In October 1962, Centaur was reassigned to Lewis where the first task facing the new team put together by Director Dr. Abe Silvestein and Bruce T. Lundin, then Associate Director, Development, was a complete re-appraisal of the entire program.

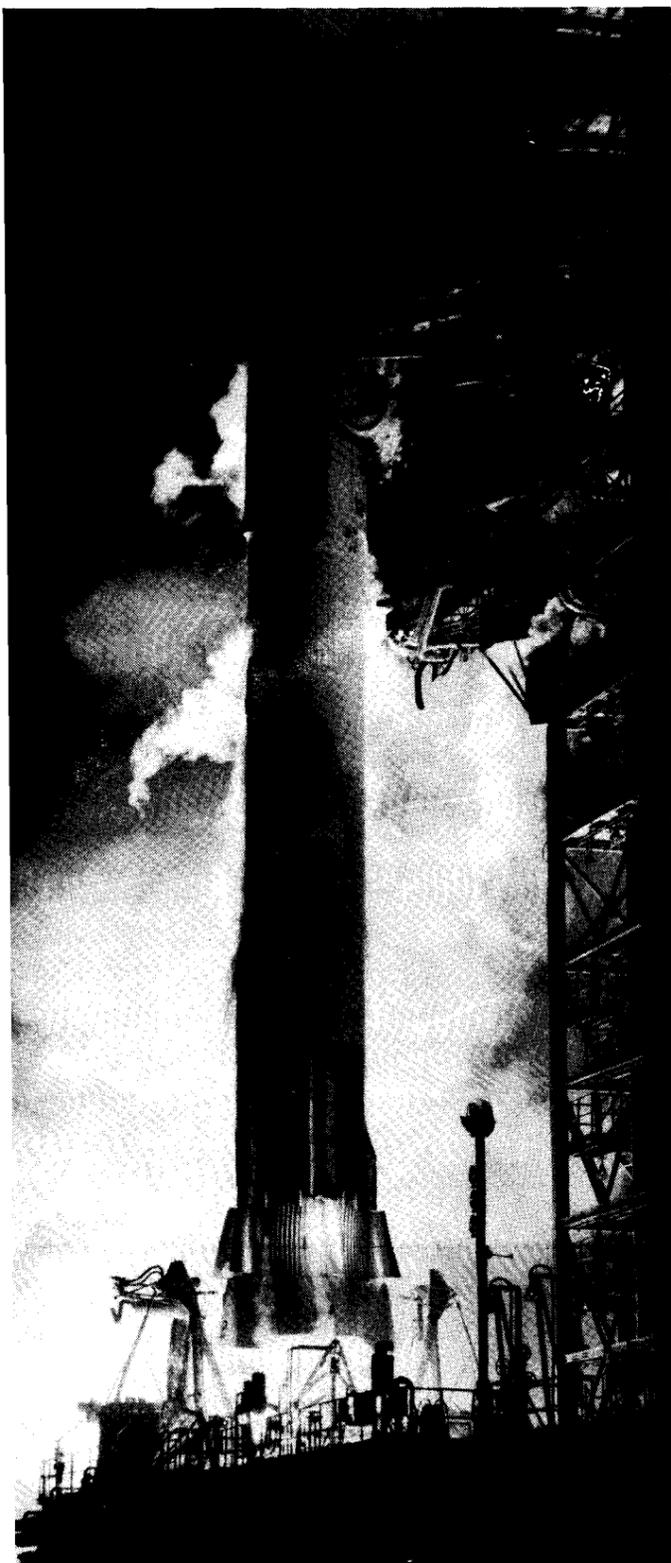
To evaluate a launch vehicle, the exact function and requirement of each component and system must be established. The performance of each assembly, sub-assembly and part is measured against this standard.

Several key ground testing facilities were constructed at Lewis and its Plum Brook Station near Sandusky.

Structural tests were conducted on the Atlas booster at Plum Brook Station. In the axial load test, 248,000



de of Centaur



nds pressure was applied to the thin skinned Atlas to simulate the crushing 6-G force experienced by the vehicle after liftoff. At Lewis, the 21-year-old Altitude Wind Tunnel was modified for testing a new method of separating the Centaur stage from the Atlas booster. The

method significantly reduced the separation time, which reduced the danger of collision between the two stages during separation.

Another leg of the old Altitude Wind Tunnel was sealed off with huge steel bulkheads to form a space environment chamber cap-

able of pressures as low as those found 90 miles out in space. These low pressures coupled with solar simulation and cryogenic temperatures tested Centaur's ability to operate under space conditions.

The RL-10 engine was fired extensively in Lewis' Propulsion Systems Laboratory at simulated altitudes of 90,000 feet. Pre-launch chilldown using liquid helium was also studied in the PSL facility. This method of chilling the RL-10 engines prior to liftoff was devised to cut the pre-cooling time during flight. It is one of the most significant changes made at Lewis.

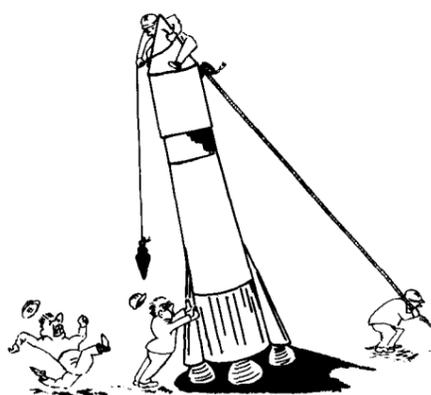
The work on Centaur has never stopped at Lewis. Plum Brook's Spacecraft Propulsion Research Facility (B-3) was specially designed to allow hot firings of an entire Centaur stage under space conditions. Shroud separation and other tests have helped insure the success of many launches.

Although this is a Lewis anniversary, Edmund R. Jonash, Director for Launch Vehicles, said, "This must also be a time for saluting the accomplishments of the more than 300 private companies involved in building each Centaur. General Dynamics/Convair, prime contractor for the vehicle, and Pratt and Whitney Division of United Aircraft Corp., associate prime contractor for the engines, and Honeywell, Inc., associate contractor for the guidance system have done a magnificent job over the years. They and their subcontractors exemplify of the sort of responsible cooperation which can exist between private industry and government agencies."

Today, as Lewis' Centaur group poises on the edge of a new decade, the first flight of a new breed of Centaur stands ready on Pad 36 at Cape Kennedy. Although only six and a half years have elapsed since the first operational flight of Centaur boosted the first Surveyor toward a soft landing on the Moon, some Centaur systems grew obsolete. Technology advanced so quickly electronic parts that were the latest available then have gone out of production.

The changes in the new Centaur (D-1-T) primarily involve a new integrated electrical-electronic system which takes advantage of the new developments in the field since Centaur was first designed.

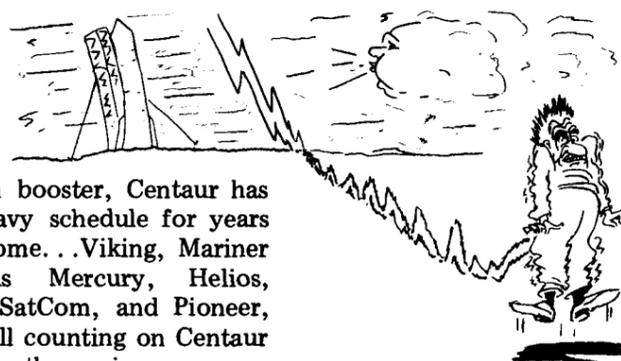
Its first job will be to place an Intelsat IV communications satellite into Earth orbit. And there is a busy future ahead for it. Using either the Atlas or



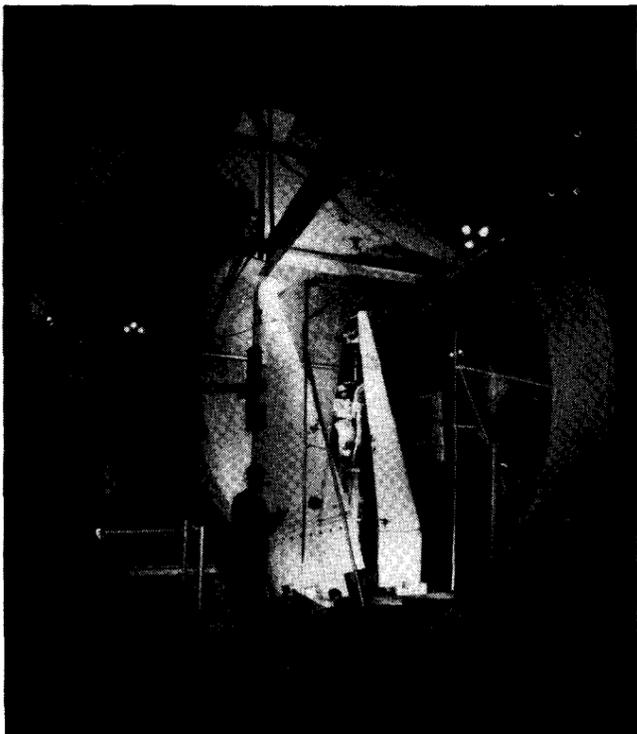
ATLAS/CENTAUR LAUNCHES

Vehicle	Mission	Launch Date
AC-2	R&D (one-burn)	November 27, 1963
*AC-3	R&D (one-burn)	June 30, 1964
AC-4	R&D (two-burn)	December 11, 1964
*AC-5	R&D (one-burn)	March 2, 1965
AC-6	R&D (one-burn)	August 11, 1965
*AC-8	R&D (two-burn)	April 7, 1966
AC-10	Surveyor 1 (one-burn)	May 30, 1966
AC-7	Surveyor 2 (one-burn)	September 20, 1966
AC-9	R&D (two-burn)	October 26, 1966
AC-12	Surveyor 3 (two-burn)	April 17, 1967
AC-11	Surveyor 4 (one-burn)	July 14, 1967
AC-13	Surveyor 5 (two-burn)	September 8, 1967
AC-14	Surveyor 6 (two-burn)	November 7, 1967
AC-15	Surveyor 7 (two-burn)	January 7, 1968
*AC-17	ATS-4 (two-burn)	August 10, 1968
AC-16	OAO-A2 (one-burn)	December 7, 1968
AC-20	Mariner Mars 6 (one-burn)	February 24, 1969
AC-19	Mariner Mars 7 (one-burn)	March 27, 1969
AC-18	ATS-5 (two-burn)	August 12, 1969
*AC-21	OAO-B (one-burn)	November 30, 1970
AC-25	INTELSAT IV (two-burn)	January 25, 1971
*AC-24	Mariner Mars 8 (one-burn)	May 8, 1971
AC-23	Mariner Mars 9 (one-burn)	May 30, 1971
AC-26	INTELSAT IV (two-burn)	December 19, 1971
AC-28	INTELSAT IV (two-burn)	January 22, 1972
AC-27	Pioneer 10 (one-burn)	March 2, 1972
AC-29	INTELSAT IV (two-burn)	June 13, 1972
AC-22	OAO-C (one-burn)	August 21, 1972

*Launch Vehicle Failure



Titan booster, Centaur has a heavy schedule for years to come... Viking, Mariner Venus Mercury, Helios, FleetSatCom, and Pioneer, are all counting on Centaur to give them wings. (To be continued next issue)





From left: Paul Kavanaugh, secretary; Stanley Fisher, outgoing president; Murray Gordon, incoming president; and U.S. District Judge Thomas Lambros, one of directors of Federal Bar Association.

Bar chapter merits award

The Cleveland Chapter of the Federal Bar Association, headed by Lewis' Murray B. Gordon, recently received a national award at the Associated Press Society of Ohio. The award was for the chapter's many activities in Cleveland, including seminars and speeches and discussions on various phases of law and justice. The chapter, which has about 300 members, is one of the most active of the 60 chapters of the national association. The association is made up of lawyers in government service and those who served at one time or another. Chapter officers honored were, from left — Stanley M. Fisher, past president; Paul

Kavanaugh, secretary; Murray B. Gordon, president; and U.S. District Judge Thomas D. Lambros, one

of the Chapter's Directors. Gordon is Chief of Labor-Management Relations at Lewis.



Team champions, the Deltas, include (from left): front row — Peter Sockol, Robert Dengler, Ruluff McIntyre, Donald Sinclair, James Dunn; back row — Robert Seidel,

Ronald Thomas, Earl Brown, James Dayton, Louis Russell, Louis Russell, Jr., Stanley Domitz and Joseph Curreri. (John Marston photo)

Thank you

"Many thanks for all the wonderful get well wishes during my recent surgery and convalescence." Roger L. Smith

"Mary and I would like to thank everyone for the wonderful party, gifts and best wishes on my retirement. Thoughts of NASA will always bring back fond memories of friends I associated with through the years on and off the job and I hope in the future. Thanks again." Edward J. Soper

"My wife and I would like to express our sincere thanks and appreciation for the many expressions of sympathy received at the death of my brother, Dr. Raymond Hickey." John E. Hickey

"I would like to thank all my friends at Lewis for their kind expressions of sympathy extended at the time of the death of my wife, Eleanor." Charles J. Bergen, retired.

Tennis season nets winners

Lou Russell credits "good team practice sessions" for the Deltas beating out three other Lab tennis teams in season play. His team won 21 of 36 matches to become local champs.

The 52 tennis enthusiasts capped off their half-year season with elimination tournaments. In singles competition John Ewashinka defeated Robert Koenig 5-7, 6-4, and 7-5. Last year Koenig beat Ewa-

shinka for the championship. In doubles, Ewashinka and Koenig teamed up to win the first two out of three sets, 6-4 and 6-3, from Lou Russell and Donald Zelten.

Most matches are played at Baldwin-Wallace College courts. This year the season ran from mid-April through mid-September.



Retiring

William Trubitz, a metal modelmaker in the Sheet-metal Branch, Fabrication Division, retired this month after a 31 year government career. He began his career in 1941 at Wright Patterson Air Force Base, served 3 1/2 years with the U.S. Navy and joined Lewis in 1946. He and his wife, Florence, look forward to enjoying their retirement together.



Tournament winners Robert Koenig and John Ewashinka.

Golfers sink league putts

NASA Women

The NASA Women's Golf League finished off the season with their annual golf banquet at the Sheraton Hopkins Inn. Trophies were presented to winners and runners-up in Classes A, B and C. Winners were Clarice Shernock, Mary Jane Winter, and Ruth M. Bert. Runners-up were Dorothy J. Creadon, Pat Klann and Marilyn Boecker. Next year's officers will be: Mary Jane Winter, president; Josephine L. Lubin, vice-president; Ruth Bert, secretary; Norma Schulke, treasurer; Dorothy Creadon, Susan L. Button, tournament & rules; Pat Klann, publicity.

Management Services

The Management Services Division Golf League are finishing off the season tonight with a steak roast at the Guerin House. Officers for the 1973 season will be: John (Scotty) Cruickshank, president; John M. Powell, vice-president; John N. Sheehan, handicapper; Barbara A. Krochmal, secretary-treasurer. Trophies will be presented to winners and runners-up in Classes A, B and C. Winners are John Sheehan, Linda J. Peterson and James E. Morrisey. Runners-up are Harry F. Dombroski, Josephine L. Lubin and George T. Hoy. Most improved player is James Morrisey and the league champion is John Sheehan.

The Airbreathing Engine's Golf League held their play-off at Weymouth Valley Country Club. Team champions for the 1972 season are Larry A. Diehl (captain), Kenneth L. Baskin, Eric F. Gustke, William M. Prati, Joseph A. Ziemianski, James E. Calogeras and Harold W. Groth.

Engineering Services

Team champions for the Engineering Services' Golf League are the Nockers captained by Harold E. Griffith. Other team members are Walter E. Russell, George M. Bode, Russell L. Demaline, James C. DeRaimo and Joseph A. Richvalsky. Individual match play winners are: Harold Griffith, first flight; John S. Scerba, second flight; Frank Savino, third flight. Individual metal play winners are: John P. Kelley, first flight; Robert W. Bouman, second flight; Donald F. Noga, third flight. President for 1973 will be Edward J. Kobalka.

Test Installations

The Test Installations Division Golf League held their field day at Riverside. Team champions are Alan W. Studnicka, Robert D. Takac, John R. MacLean, Louis A. Marabito, and John R. Southam. Individual medal play winners are: Jeffrey E. Haas, Class A; Thomas J. Ocilka, Class B; Thomas J. Moore, Class C; John Southam, Class D. After the field day, a picnic was held at Lewis and officers for the 1973 season were elected. They are: Jeffrey Haas, president; John MacLean, handicapper, Richard C. Bainbridge, treasurer; Andrew B. McLachlan and Thomas F. Lakatos, program members. Next year the league's name will be changed to E.R.B. Golf League.

Career Service Awards - 1972

Service awards ranging from 20 to 35 years will be presented to 43 employees at Plum Brook October 27, and to 326 employees in November in the DEB Auditorium.

The names of awardees and length of Federal service are listed below. Astericks indicate employees who retired during the past year.

THIRTY-FIVE YEAR AWARDS

Leo Sienkiewicz



Edwin Trojan



* Dallas E. Weatherford



THIRTY YEAR AWARDS - Cleveland

- | | | | | | |
|--|---|---|---|--|--|
| Frank Baldizzi
Henry C. Barnett
William A. Benser
Casey J. Blaze
Steve Bobeczko
Aaron S. Boksebom
J. Robert Branstetter
Roland Breitwieser
Earl L. Brown
Leo R. Bruder
Rinaldo J. Brun
Helmut F. Butze
Edward T. Calmer
Charles A. Campbell
* D. Merritt Caton
Joseph D. Cenzori
Fred Cepelnik
* Frank L. Cimperman, Jr.
Anthony Colnar
* Edward J. Cudlin
Russell L. Demaline | Albert F. Dolinshek
Thomas G. Donohoe
Clair L. Dornon
Joseph Douglas
* Harold J. Drescher
Frank H. Dunn
Carl L. Eppich
John C. Evvard
Richard D. Faldetta
Harold E. Friedman
Robert W. Gaines
Albert J. Gallovic
John J. Gallovic
Clarence C. Gettelman
Ambrose Ginsburg
Frederick W. Glaser
Harold Gold
Donald C. Guentert
Robert J. Guiton
Tadeusz H. Guzik
Billy R. Harrison | Major Harrison
Jack W. Hartsock
Louis E. Herman
Robert O. Hickel
Andrew J. Hilovsky
* Leslie F. Hinz
Joseph F. Hobzek, Jr.
Frank Holt
Gene L. Hoss
* Frank L. Hren
Joseph C. Jira
Eldred H. Johnson
Robert L. Johnson
* John J. Johnston
William J. Kaczorowski
* Edward P. Kagels
Edwin R. Kaltenstein
Jerome M. Katzman
Thomas A. Keller
* Willis E. Kenyon
Clair R. King | Harold Kline
* John Kocsis
Ted J. Kopacz
Edward L. Kozar
Rudolph F. Kravanya
* Richard P. Krebs
Frank J. Kuchta
Joseph P. Kulik
George E. Larson
Coleman A. Lewis
George W. Lewis
* Milton E. Lipas
Walter O. Logan, Jr.
Orlindo J. Luchini
George Macian
John J. Macuga
Charles E. Maley
Samuel S. Manson
Salvatore J. Manzi
William H. McComb
* Erma D. McConnell | Erwin E. Meilander
C. David Miller
Riley O. Miller
Harry Minster
Emil Naton
Frank V. Nickle
Walter T. Olson
Paul M. Ordin
Earl T. Palmer
Helen E. Parobek
Joseph P. Polonye
James M. Prewitt
Arthur H. Prior
Max Quatinetz
George F. Rafter
George A. Reich
Robert W. Reich
Valentine J. Rys
Chester Scarci
Robert W. Schmidt
Agnes R. Schmotzer | William B. Schwab
Robert D. Scoppa
Phillip J. Serina
Joseph Sikosky
Minerva Simon
Chester S. Skony
James W. Slough
* Dorothy S. Stansell
Francis J. Stash
Lawrence J. Stitt
* Edward W. Thomas
Elmer E. Thome
* William Trubitz
Harold B. Uthe
Thomas H. White
Nicholas A. Wik
John P. Wisner
Forrest D. Wolf
John Zaubi
Harry Zimmermann
James A. Zingale |
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TWENTY-FIVE YEAR AWARDS - Cleveland

- | | | | | | |
|--|--|--|--|---|--|
| Gabriel Allen
Walter J. Bajorek
Henry D. Baveler
Robert J. Blade
George M. Bode
William S. Bossert
William F. Brown, Jr.
Sebastian D. Codespoti
Everett P. Coleman
Carmen R. Coletta
John R. Danicic
Elmer H. Davison | Andrew J. DeFrank
Lois T. Dellner
Alice P. Dill
Vincent J. Dominak
Patrick L. Donoughe
James F. Dugan, Jr.
Joseph A. Durica
Jack B. Esgar
Joseph J. Etzkin
Evelyn R. Franks
Harvey V. Funk
Donald F. Garman | Dominic J. Giomini
Edwin L. Hagedorn
Karl J. Hagedorn
Bernice L. Hartman
Robert R. Hibbard
Harold S. Jones
Robert Kaczmarek
Charles F. Kadow
Richard F. Killey
John Klyop
Eugene J. Korosy
Mylo J. Krejsa | Frank M. Kubancik
Benjamin S. Lalli
George Lampshire, Jr.
Harry E. Langdon
Anthony J. Laudato
Frank E. Leciejewski
Walter J. Lehman
James B. Lenaghan
* Anne R. Lipas
Bernard Lubarsky
Wallace Meder
John C. Montgomery | Richard T. Murphy
Dumas A. Otterson
Allen L. Perry
Frances M. Poorman
Betty E. Price
James J. Priebe
Richard O. Raabe
Patrick R. Raynak
Edward J. Rolnicki
Danny Rusyniak
Alfred R. Rybicki
Robert J. Schwartzberg | Peter Semenyna
Ronald J. Simerly
Joseph A. Sloan
Walter C. Soick
Richard A. Steen
F. Hamilton Stickney
Richard O. Raabe
Curtis D. Strawn
George Tunder
Harland L. Vincent
John W. Weeton
Leonard A. Wilhelm
George E. Yaniga |
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TWENTY YEAR AWARDS - Cleveland

- | | | | | | |
|---|---|---|--|--|--|
| Robert E. Alexovich
Donald L. Alger
Gordon P. Allen
Richard L. Altimus
Henry C. Anderson III
Otho W. Artis
Robert W. Bailey
* William F. Balch
Frank J. Barina
Baxter L. Beaton
Robert E. Becker
Milton A. Beheim
Joseph A. Bender
Daniel T. Bernatowicz
Lawrence O. Brown, Jr.
Lively Bryant
Robert G. Calkins
James E. Cleary, Jr.
James W. Coats
Jack R. Colegrove
Robert B. Collins | Donald J. Connolley
Robert J. Crowl
Ronald A. Dawson
Carl E. DeWitt
Stanley Domitz
* Nora R. Dreher
Delmar W. Drier
Thomas J. Dudzinski
Theodore J. Dukles
David G. Evans
Joseph L. Fiala
Robert Friedman
Peter M. Getz
Robert E. Ging
William J. Gleason
Alvin C. Hahn
Patricia A. Haley
Earl W. Harper
Clint E. Hart
Elmer E. Haseley
Kirby W. Hiller | * Howard E. Hinkley
Vincent F. Hlavin
Charles F. Hnatek
Vernon L. Jividen
Jerome A. Johnson
Robert C. Johnson
Harold E. Jones
Joyce C. Jones
Milan Jopek
Daniel J. Keliher
Jack E. King
John Kontra
William M. Korhely
Richard Kovachik
Fred K. Kraus
Donald R. Kwiatkowski
Paul W. Laisure
Raymond F. Lark
Robert E. Lavelle
Richard A. Lehan
Erwin A. Lazberg | Curt H. Liebert
Louis E. Light
John C. Liwosz, Jr.
James E. Loeser
Walter K. Love
James G. Lucas
James P. Malloy
Jerry H. Malone
Joseph Mandelkorn
Vernon L. Mays
William E. McKissock
David A. Mikol
Ronald E. Miller
John J. Mortelette
Fred R. Murray
Robert A. Nagy
Harvey E. Neumann
Joseph Ochmanski
Leo Pelka
Rocco Poli
Raymond J. Porvaznik | Norman C. Prahst, Jr.
John A. Prioletti
Darrell C. Puckett
Mauri K. Raita
June R. Reynolds
Joseph A. Richvalsky
Paul F. Riedel
Edward E. Robbins
Nick E. Samanich
Anthony Sarraino
Paul D. Savage
Harold W. Schmidt
Roger R. Schulte
Herbert W. Scibbe
Virginia E. Schlenkerman
Richard G. Sheehan
Jack P. Shinn
Cay Sidwell, Jr.
Robert A. Signorelli
John C. Sikora
Joseph N. Sivo | Leonard Soffer
James V. Steigerwald
Gordon R. Steiner
James F. Strosnider
George Succop
James D. Swiers
Edward J. Takacs
Stephen C. Teleha
Marvin W. Tiefermann
Merlin E. Vance
Donald J. Vargo
Gilbert J. Vasek
Raymond D. Viancourt
Peter W. Weber
Clarence Wem, Jr.
Eugene L. Wilkosz
Cloyd M. Wolford
Richard J. Yako
Robert E. Yavoich
Raymond Young
Arthur V. Zimmerman
Francis J. Zubricky |
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PLUM BROOK THIRTY YEAR AWARDS

- John R. Burkhardt
Robert L. Cline
Robert I. Dussell
Joseph P. Galdauskas
Daniel E. Gardner
Donald H. Hardy
Louis G. Kolger
Wilbon G. Paul
Alexander W. Ross
Carrol H. Rudy
George J. Suchar
Kenneth R. Timbrook
Philip R. Viers, Jr.

PLUM BROOK TWENTY-FIVE YEAR AWARDS

- Aaron E. Auble
Henry B. Barkley, Jr.
James J. Brichacek
Richard C. Fink
Louis A. Grob, Jr.
Robert F. Humbel
Lester W. Krause
Byron W. Oldham
Daniel B. Shepherd
Roland D. Stowe
Jackie G. Taylor

PLUM BROOK TWENTY YEAR AWARDS

- Jacques S. Boegli
Randall J. Burton
Roy S. Cooley
Proctor J. Fox
Richard W. Gawryszewski
Robert L. Haley
William P. Henze
Wilson C. Hildebrandt
Robert L. Howell
George M. Prok
Dwight H. Reilly, Jr.
Robert F. Rockwell
Andrew S. Sabo
Thomas Shiplet
Robert W. Simons
George F. Wildschrey
Ronald J. Williams

* Retired