

# Technical Meetings

Lewis News  
May 22, 1964

*Lewis will be the site of the Fourth Annual Photovoltaic Specialists Conference. Set for June 2 and 3, the conference is sponsored by the Energy Sources Division, Professional Technical Group on Electron Devices of the Institute of Electrical and Electronics Engineers.*

*The program includes three sessions on Film Photovoltaics, Radiation Damage, and Solar Cell Testing, plus a general session covering miscellaneous topics. The conference is intended to be a working specialists' meeting.*

*Dr. Andrew E. Potter Jr., head of the Reaction Kinetics Section, Chemistry and Energy Conversion Division, is a member of the seven-man conference committee.*

## Simulation Symposium

*Erwin V. Zaretsky, section head in Lewis' Fluid Systems Components Division, is chairman of a Symposium on Aerospace Simulation to be held in Chicago May 28.*

*The symposium is being held in conjunction with the annual meeting of the American Society of Lubricating Engineers.*

*Among the panel of six experts who will address the symposium is a Lewis staff member — Robert L. Johnson, head of the Lubrication Branch, Fluid Systems Components Division. He will present a paper entitled "Lubricants and Mechanical Components Of Lubrication Systems For A Space Environment."*

## Lewis Staff Members Active In International Lubrication Conference

Two papers by Lewis staff members will be presented at the Eleventh Joint International Lubrication Conference in Washington, D.S.C., Oct. 13 - 15.s

The conference is sponsored by the American Society of Lubricating Engineers and the American Society of Mechanical Engineers.

The Lewis papers to be presented are:

*"Rolling-Contact Studies with Four Refractory Materials to 2000°F."*, by R. J. Parker, S. J. Grisaffe, and E. V. Zaretsky.

*"Influence of Crystal Structure on Friction Characteristics of*

*Rare-Earth and Related Metals in Vacuum to 10<sup>-10</sup> Millimeter of Mercury"*, by Donald H. Buckley and Robert L. Johnson.

William J. Anderson, Edmund E. Bisson, and Johnson have been instrumental in planning the conference. Zaretsky will be vice chairman of one of the sessions.

Some 500 to 600 people, including representatives of 16 foreign countries, are expected to attend. Some 50 papers are to be presented.

The conference — which will survey many advancements in the field of lubrication — will be one of the first of its kind.

# Zaretsky Admitted To Federal Law Practice

Erwin V. Zaretsky, a section head in the Bearings Branch, Fluid System Components Division, has been admitted to practice before the Federal District Court.

Zaretsky, who has been a Lewis staff member for eight years and holds a professional engineer's license, received his Juris Doctor degree from Cleveland-Marshall Law School, Baldwin-Wallace College, in 1963. He also has been admitted to practice before the Illinois and Ohio Bars.

4 *LEWIS NEWS*

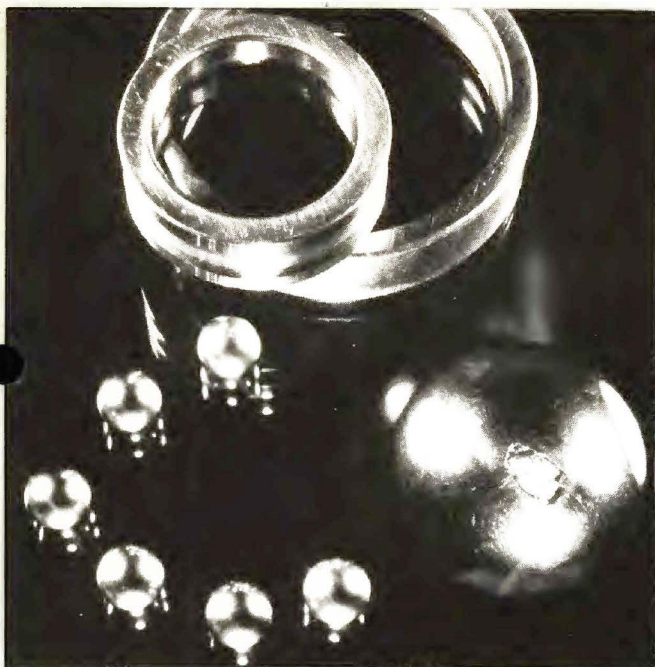
March 19, 1965

# LEWIS NEWS

Lewis Research Center  
National Aeronautics and Space Administration  
Cleveland, Ohio

Vol. 2, No. 16

August 6, 1965



## Bearings Researchers Report Major Advance

Greatly increased life for ball and roller bearings used in everything from machinery to satellites is expected based on the results of an extensive research program conducted at Lewis.

This advance in rolling element bearing technology, announced recently, is expected to result in savings of millions of dollars a year in replacement bearings and many more millions in extended life of machines.

Four to five times greater fatigue life can be realized from bearings made according to the Lewis hardness differential guide than from bearings which do not follow this guide.

The Lewis team that made this latest advance includes Erwin V. Zaretsky, Richard J. Parker and William J. Anderson, all members of the Bearings Branch, Fluid System Components Division. They conducted a program to extend the fatigue life of rolling contact bearings.

Lewis engineers have been working toward increasing the life and reliability of bearings for many years.

During World War II, bearing research centered on both the structure and lubrication of bearings for reciprocating engines used in fighters and bombers. Next came work on bearings for jet and rocket engines.

A number of advances in bearing technology have been made by Lewis engineers.

Included is the discovery that the surface of balls made from drawn metal rods do not have uniform fatigue strength because of the fiber orientation. It was also

proven that the smallest balls possible should be used in bearings for rocket engines.

One of the factors that limit the useful life of a bearing is fatigue.

Fatigue appears as the loss of material from the balls or races, giving them a pitted appearance. This is caused by repeated flexing of the surfaces as they come in contact with each other. As soon as pitting appears, the bearing is no longer useful.

Zaretsky's group studied the fatigue problem with three objectives:

- (1) to determine if a maximum bearing fatigue life does exist at some optimum component hardness combination, (2) to determine if a relation exists between plastic deformation, relative hardness of bearing components and fatigue life, and (3) to determine if residual stresses correlate with component hardness combinations and fatigue life.

Their tests showed that bearing load capacity and fatigue life are greatest where the rolling elements of the bearing are between one and two points harder (measured on the Rockwell C scale) than the races.

Full scale bearing tests demonstrated that by assembling bearings according to this hardness differential guide, four to five times greater fatigue life could be

(Continued on Page 6)

## **2 LEWIS NEWS**

**October 1, 1965**

### **On Location**

Featured on the September 21 edition of the popular "On Location" radio series were Lewis staffers William J. Anderson, Erwine V. Zaretsky and Richard J. Parker.

The three, all members of the Bearings Branch, Fluid System Components Division, discussed a major advance in bearing technology resulting from an extensive research program here.

"One Location" is broadcast eight times daily by five local radio stations.



LEWIS' TOP INVENTION AWARD winners in a recent ceremony are, left to right: Erwin V. Zaretsky, William J. Anderson, and Richard J. Parker who found differential hardness in bearings and races resulted in premium life for these components. Photo by Martin Brown

## Cash Awards For Inventions Go To Lewis Staff Members

Four scientists, three engineers, and a mechanic recently received invention awards and checks totaling \$3,300 in ceremonies at Lewis following action by NASA's Inventions and Contributions Board.

Eugene J. Manganiello, deputy director, who presented the awards, cited the men's valuable contributions to the mission of NASA and the benefits to the government and the nation.

**THE LARGEST AWARD**, \$2,500, was divided by Erwin V. Zaretsky, William J. Anderson, and Richard J. Parker for developing a method of improving the life and reliability of contact bearings, such as ball and roller bearings.

Zaretsky is head, Bearing Materials and Fatigue Section; Anderson is chief, Bearings Branch, and Parker is a research engineer, Bearings Branch.

Through their concept the fatigue life of rolling contact bearings could be increased 400-500 per cent. The technique is broadly applicable to all rolling element bearings and can be used in a large number of varied products.

**THE BEST RESULTS** are achieved when the rolling elements are about 1.5 points harder than the races. As an alternative, the controlled differential hardness can be applied to achieving equal fatigue life with increased bearing loads. A number of techniques can be used to incorporate the concept in production bearings.

This advance in bearing technology is expected to result in savings of millions of dollars a year on replacement bearings and many more millions in extended life of machines.

Zaretsky said research is continuing on the basis that the hardness differential concept may be valid for other rolling contact surfaces such as gear assemblies.

**JOHN R. JACK**, head, Environ-

mental Physics Section, and Wolfgang E. Moeckel, chief, Electromagnetic Propulsion Division, received a \$400 award for their electro-thermal rocket. This is a small rocket engine which uses electrical means to heat a propellant such as hydrogen. It is under consideration for attitude control of satellites. By using electricity to heat the propellant, rather than burning it, far greater efficiency can be obtained.

Glenn E. Mealy, experimental electronic equipment mechanic, Test Installations Division, received \$300 for developing a high voltage divider system. Mealy's system provides a more accurate, convenient, and economical method of measuring high voltages.

**THIS IS** Mealy's second award recently. He also earned an incentive award for development of a high voltage insulation for vacuum tanks.

John C. Evans, physicist, Photo-voltaic Fundamentals Section, Chemistry and Energy Conversion Division, and Dr. Henry W. Brandhorst, Jr., physicist in the same section, received \$100 for their invention of a high power laser apparatus and system.

THE LEWIS NEWS presents the terms of its people, its purpose and Fridays, the News is produced by the Research Center, National Aeronautics and Space Administration, Brookpark Rd., Cleveland, Ohio 44135

Deadline for news items is 10:00 a.m. and inquiries should be sent to room 1000

Editor

**Next Deadline, Sept. 6;**

## Names in the News

William Rowe, chief, Research Operations Branch, Air Breathing Engine Division, and his 12-year-old daughter, Eileen, went swimming unexpectedly recently. Aboard Rowe's 21-foot sailboat about a mile off Rocky River in Lake Erie, Rowe made what he calls a "faulty come-about" and the boat capsized. After sitting on the bottom of the boat for a half hour, they swam towards shore. Eileen wore a life jacket and Rowe used an inflated canvas sail bag. A cabin cruiser picked them up near shore and Rowe got his boat the next day. The Rowes were unhurt and the boat was undamaged.

Joe Hobzek, Test Installations Division, recently had a good night at Buckeye bowling lanes when he got 11 strikes out of the 12 possible and a 276 score. This was Joe's first bowling night of the season. He bowls with the Ions team in the NASA No. 5 Wednesday Night League.

E.e.v. Zaretsky spoke to 275 engineers, executives, and researchers earlier this month at the Dartmouth College Bearings Conference. His topic, "Material Properties and Processing Variables and Their Effect On Rolling-Element Fatigue," was based on the paper prepared by himself and W. J. Anderson.

## Names in the News...

Jack Cuthrell, Environmental and Computer Service Section, is the new Cub Scout Master for Troop 737 of Riveredge Township. He wishes to publicly thank Dr. Abe Silverstein, Don Kelsey, and Joe Hobzik for their cooperation in arranging a meeting place for the boys.

Merle Frye was recently appointed to fill an unexpired term as fourth ward councilman of Willard. Frye, Procurement Branch at Plum Brook, completed his first four-year term in 1965.

Winners at the first session of the NASA duplicate Bridge Club were Jim and Mary Ellen Crouse with Milo Swanson and John Woloschak coming in second. Ed Woolridge and Jim Richardson won the Oct. 1 session with Dino Frastaci and Joe Notardonato in second place. For information concerning the Bridge Club, call Stan Smith, PAX 3159 or Jim Crouse, PAX 4233.

The Lewis Speakers Bureau announces the following employees are scheduled to give talks during the next two weeks:

Oct. 15, Marshall Dietrich will speak to the Uni-Royal Management Club in Mentor and David Robinson will give a talk at the Guardian Angels Church in Copley.

Earl Bloam will speak to the West Side Singles in Rocky River on Oct. 18.

Oct. 21 Byron Siegel will talk to the Ladies and Girls Committee at the West End YMCA in Willoughby. On the same day, Robert Friedman will speak to the Traffic Club of Youngstown.

Erwin Zaretsky, head, Bearing Materials and Fatigue Section, was recently elected to the executive committee of the American Society of Mechanical Engineers.



# LEWIS NEWS

Lewis Research Center

Cleveland, Ohio

National Aeronautics and Space Administration

Vol. 6 No. 12

June 6, 1969

For national conferences

## Staffers travel

Heavy conference activity during June will draw more than 30 Lewis professionals to locations throughout the country where they will present papers, chair sessions and seminars.

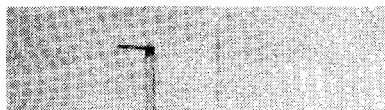
A dozen staff members will attend the AIAA Fifth Propulsion Joint Specialist Conference, June 9-13, in Colorado Springs, Colo. The conference will be highlighted by the presentation of the James H. Wyld Propulsion Award to Harold Kaufman, Assistant Chief of the Electromagnetic Propulsion Div.

Other conference participants will include: R. G. Stabe, F. A. Wilcox, R. E. Coltrin, T. P. Moffitt, J. F. Cassidy, R. J. Stochl, J. B. Esgar, R. G. Ragsdale, F. E. Rom, D. R. Boldman, and N. L. Miller.

The following week, R. J. Weber will present a paper at the CRYO-69 Conference in Los Angeles, Calif. During the same week, June 15-19, five others will travel to Seattle, Washington to attend the Fifteenth Annual American Nuclear Society Meeting. They are: R. E. Henry, G. P. Lahti, C. D. Lanzo, L. Clemons, and A. F. Kascak.

E. V. Zaretsky will attend a NASA-sponsored symposium on the

(Continued on page2)



# Conference . . .

(Continued from page 1)

**Interdisciplinary Approach to Lubrication, June 15-17, in Troy, N.Y.**

Closer to home, W. A. Brainard and D. H. Buckley will discuss results of their research at the Vacuum Metallurgy Conference in Pittsburgh, Pa., being held June 16-19. At the same time in Chicago, Ill., N. L. Sanger will deliver a paper before the American Society of Mechanical Engineers.

Back on the West Coast, June 17-19, ASME will hold its Spring

Lubrication Conference in San Francisco, Calif. Attending will be R. J. Parker, E. V. Zaretsky, and C. W. Allen (Lewis Faculty Fellow).

San Francisco also is the site for the AIAA Second Fluid and Plasma Dynamics Conference, June 16-18, which will be attended by three staffers. They are R. E. Schwirian, L. A. Povinelli, and N. D. Sanders.

In Los Angeles Lewis will be represented at the Cryogenic Engineering Conference, June 16-18, by J. C. Laurence, R. Simoneau, K. Bau-

# Center saves nearly \$7 million in fiscal '70

Lewis individuals and organizations have topped the Fiscal Year 1970 Cost Reduction goal by more than 2½ million dollars, saving nearly 7 million dollars for the Center during the year.

Cost Achievement certificates were awarded to 21 Plum Brook staffers October 29, and will be presented to 67 Cleveland employees in December. Director Bruce Lundin emphasized that although in some cases the certificates cited individual accomplishments, in many instances the individuals receiving the award was representing his co-workers in group efforts to achieve a more economical government operation. In addition, four Cleveland and two Plum Brook units received group cost achievement awards for certain suggested economies.

Individuals receiving awards are listed in division groupings:

## CLEVELAND

**Procurement** - Florence Giles, "Streamlining the Handling of Contract Copies"; Quillian Johnson, "Method Used for Obtaining Outside Printing"; David Kinzel, "Improved IFB/RFP Procurement Package"; Helen Siodla, "Maintenance of Purchase and Delivery Order Records";

**Management Services** - Clifford Brooks, "Improved Processing of 16 mm Motion Picture Film"; James Modarelli, Dorothy Morris, "Savings on Journal Subscriptions"; Samuel Shelton, "Developer Stain Elimination in Automatic Photographer Paper Processor";

**Airbreathing Engines** - James Lavelle, "Improvement to Research Combustor Housings"; Porter Perkins, "Redirection of Contract Work for Twin-Ram Inductor Combustor";

**Fluid System Components** - Calvin Ball, William Stevans, "Change in Downstream Throttle Locations of W-7 Multistage Compressor Facility"; William Jones, Jr., "Redesign Induction Coil"; Lawrence Ludwig, Robert Johnson, "Procurement of Engineering Development and Testing of Gas Turbine Mainshaft Sales"; Max Seikert, "Modification of Shoe Specimen for Hip Joint Apparatus"; Erwin Zaretsky, "Reusable Bearings";

**Advanced Research Institute** - Robert Finke, Walter Krawczonek, "Modification to Electrochemical Timing Mechanism for Federal Water Pollution Control Administration";

**Electromagnetic Propulsion** - Charles Michels, "Repair and Modification of Existing Image Converter Camera System";

**Instrument and Computing** - Richard Booth, "Use of Lens Insertion Tool";

**Direct Energy Conversion** - Louis Rosenblum, "Use of a Mixing Valve"; Joseph Singer, Harold Kautz, "Test Material for Dielectric Loss Measurement"; Lawrence Thaller, "Electrolyte Fill Tube";

**Space Power Systemse** Armen Asadourian, "Cost Reduction in Power Measuring Instrumentation"; James Dunn, "Cost Reduction in Repair of Damaged Brayton Rotating Units (BRU's)"; Francis Gourash, "High Power Transistors"; Bill Ingle, "Fabrication of Electronic Speed Controller"; Robert Macosko, Henry Block, Carl Richter, Stacy Lumannick, "Electric Heat Source for Brayton Cycle System Test"; David Medwid, "Less Costly Method of Overcoming Design and Fabrication Problems";

**Nuclear Systems** - Chester Lanzo, "Rental Rather than Procurement of Power Supply by Contractor"; Armin Lietzke, Robert Rohal, "Simplification of Radiation Capsules Requiring Instrumentation Leads";

**Materials and Structures** - Gerald Beremand, "Furnace Temperature Profiling and Calibration"; Sidney Hill, "Specimen Hangers"; Tito Serafini,

Morgan Hanson, Christos Chamis, "Simultaneous Composite Fabrication and Strain Gage Installation";

**Test Installations** - Charles Bissler, "Nylon Tubing for Instrumentation"; Fayette Clark, Robert Sorg, "Electronic Production of an Oscilloscope Grid"; Thomas Dorony, "Repair of Defective X-ray Tube"; James Ely, Jr., "Modifying a Stairstep Generator"; Willie Fleming, "Remote Control Radial Prepositioner"; Dennis Fronek, "Dri-Transfer Lettering"; Kenneth Jensen, "Automatic Plasma Starter and Monitor"; Frank Kubancik, Robert Robinson, "Revolution Counter for Ampex Tape Recorder"; Edwin Pocta, "Installing Swagelok Quick-Connect Fittings"; Richard Speer, "Quick Disconnect Rail"; George Tunder, "Revised Tunnel Checkout";

**Facilities Operations** - Richard Mueller, "Improved Method of Making Calorimeters Eliminate Waste"; Thomas Ockuly, "Automation of 10 x 10 Pumphouse Equipment";

**Engineering Design** - Edward Hronek, David Janetzke, "Blade Coordinate Drafting Improvement";

**Launch Vehicles** - Rodney Knight, "Elimination of Revalidation of SERT II Agena Vehicle"; Edwin Muckley, "Incorporation of Mission Modification During Production of AC 23 and 24"; George Pablic, "Repair of Liquid Helium Transfer Line Section at ETR Complex 36A"; Roger Palmer, "Elimination of Revalidation of OGO-F Agena Vehicle"; Sanford Tingley, "Reduction of AC-21 Software Analysis - Dispersion Analysis"; Joseph Ziemianski, Lawrence Ross, "Incorporation of Mission Modifications during Production of AC21 and 22";

## PLUM BROOK

**Rocket Systems** - Irving Hansen, "Solid State Relay for Thermocouple Ovens";

**Reactor** - Henry Barkley, Jr., "Reactor Fuel Savings via Reduced Reactor Power Operation"; Richard Brickley, Ervin Minderman, "Recycle of Reactor Fuel Elements"; Thomas Junod, "Reduction in Contract Personnel at PBRF";

**Space Power Facility** - Richard D. Heath, "Use of High Pressure Gas Storage Cylinders"; George Prok, Charles Daye, Harold Christenson, Henry Hettel, "Brayton Engine Electric Heat Source";

**Engineering** - Warren Jones, Bowyer Fout, Jr., "Water Treatment Chemicals and Consultant Services";

**Administration** - Roy Cooley, Janet Forgeron, "Reduction of the Number of Subscriptions to ASTM Standards";

**Facilities Service** - Howard Bauer, "Helium Valve Repair"; John Fryer, "Fabrication of Radioactive Gas Sampling Vials"; John Glaze, "Consolidation of Plum Brook Contractor Managerial Positions"; Wilson Hildebrandt, Earl Oravitz, "Liquid Nitrogen Vaporizer Heat Exchanger Modification"; Robert Humbel, "CO<sub>2</sub> System for Environmental Chamber"; Ralph Jacko, "36" Diffusion Pump Fiberglass Insulation Protection".

Units recognized for group achievement for the first time in certain areas are:

**Launch Vehicles** - "Acquisition of Contractor Owned Inventory at no Cost"; "Deletion of the RL-10 Management and Engineering Contract";

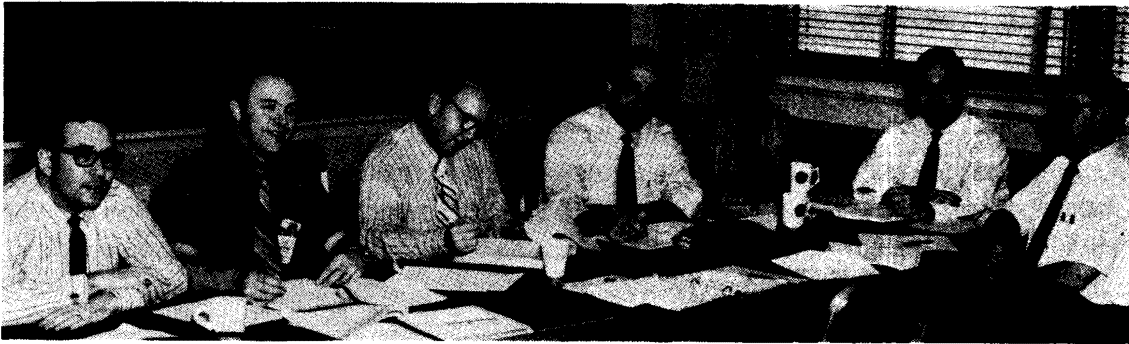
**Nuclear Systems** - "Fabrication of Uranium Shields";

**Airbreathing Engines** - Redesign of the Housing for Test Combustors - ECRL-!";

**Data Recording and Engineering Section** - "New Central Digital Data Recording System";

The following Plum Brook Branches received awards:

**Reactor Operation Branch and Reactor Service Branch** - "Plum Brook Reactor Facility Shift Team Reduction".



*Members of the Rolling Element Committee (from left to right), Tedric Harris, Richard Parker, Jack Sherlock, Eric Bamberger, William Kasmarsky, Erwin Zaretsky, and Charles Moyer. (Martin Brown photo)*

## *Committee updates bearing data*

Members of the Rolling Element Committee of the Lubrication Division, American Society of Mechanical Engineers (ASME), meeting at Lewis, became editors for a day as they did the final proofing of their joint 1½-year project which will end up as an ASME publication.

The committee undertook an assignment to define advances made in rolling element bearings within the last 25 years. The findings will be presented at ASME's winter meeting which will be held in Washington, D.C., later this year.

Each committee member was assigned an area to research under the committee's project, 'Life Adjustment Factors for Ball and Roller Bearings — An Engineering Design Guide.'

According to Erwin V. Zaretsky, chairman of the committee, their effort is the first attempt at updating bearing life predictions since 1946. "Bearing standards have not reflected the advances, many of which came about due to aerospace research," he said. "This has resulted in engineers overdesigning, and in many cases,

spending more money for bearings than necessary if advanced technology were factored into the engineering calculations."

In addition to being able to more accurately predict bearing life, Zaretsky feels that then engineering design guides will enable engineers to select bearing materials and lubricants for all types of applications, and determine operating limits.

May 21, 1971

# ASME cites Zaretsky, Bisson

Erwin V. Zaretsky, Head of the Bearing Materials and Fatigue Section, was introduced as the newly elected chairman of the 800-member Cleveland Section, American Society of Mechanical Engineers (ASME), at its annual Banquet held May 20 at the Cleveland Engineering and Science Center.

At the same banquet, Edmond E. Bisson, Associate Chief, Fluid System Components Division, received an award for continuing outstanding contributions to the Cleveland Section, ASME, and specifically to lubrication technology. The award was presented by outgoing chairman Norman Morella.

Anthony J. Garofoli, Cleveland City Council President, was the main speaker.

ASME is a technical society which generates and sustains the art and science of engineering in the mechanical engineering area. The society publishes literature in more than 30 technical areas. Its 65,000 members are located in every state in the Union as well as Canada.

Zaretsky, a former U.S. Air Force captain, joined Lewis in 1957 as an aerospace research engineer. He has authored some 55 technical papers on bearing fatigue, elasto-hydrodynamics, advanced lubrication concepts and bearing design.

Zaretsky earned a Bachelor of Science degree in mechanical engineering from Illinois Institute of Technology and a Doctor of Law (J.D.) degree from Cleveland-Marshall Law School. He is a member of the Ohio Bar as well as a licensed professional engineer.

Bisson has had research experience since 1939 in the fields of friction, wear, lubrication and bearings. He is co-author of a book *Advanced Bearing Technology*, published by NASA in 1964. The book was used by Bisson as a text for a course he presented at UCLA and Case Institute of Technology.

A licensed professional engineer, Bisson earned a Bachelor of Science degree in mechanical engineering, with honors, from the University of Florida.



ZARETSKY



BISSON



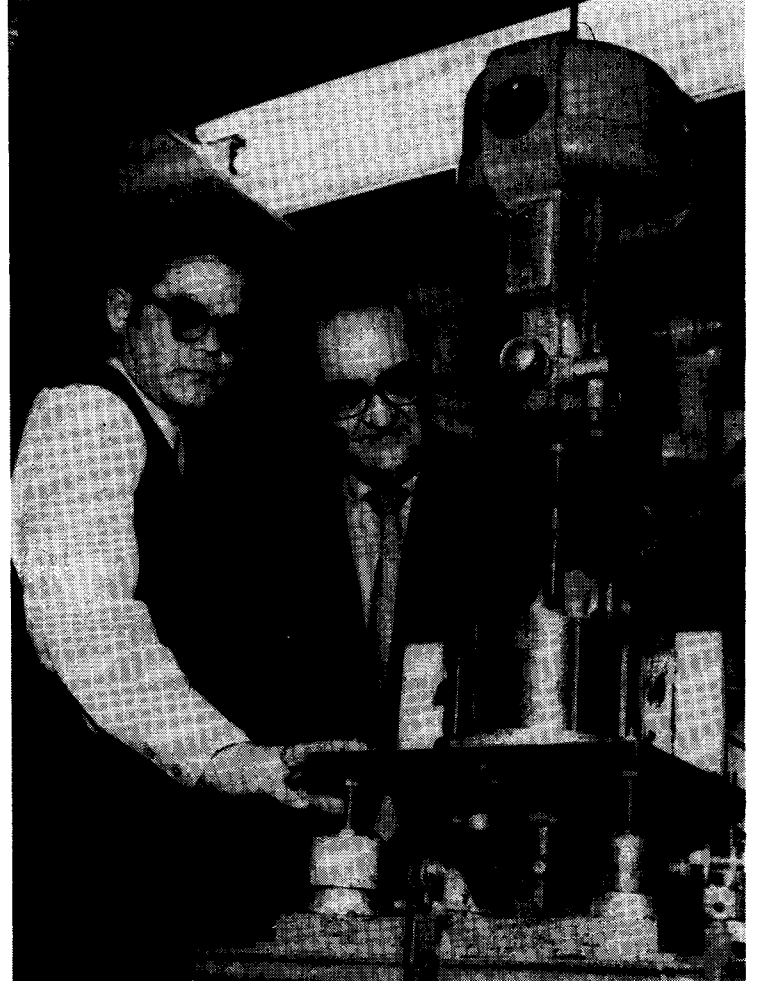
Stuart H. Loewenthal (top) and Dennis P. Townsend compare gear assemblies for helicopter and heavy equipment use.

Research on rolling bearings, gears, and shafts as part of transmissions as well as turbomachinery for aircraft keep William J. Anderson's Bearings and Mechanical Power Transfer Branch busy. Three sections, augmented by engineers of the Army Air Mobility Research and Development Laboratory at the Center, apply research on novel concepts and bearing and lubricating materials at both high and low temperatures.

Erwin V. Zaretsky's Bearing and Gearing Section studies methods for extending the fatigue limits of material-lubricant combinations in bearings and gears.

Dr. David P. Fleming's Shaft and Rotor Dynamics Section concentrates on the behavior of shafts to help in solving problems in rotorcraft power transmissions and in ultra high speed turbomachinery. This section also conducts fundamental research in fluid film bearings using low viscosity gases and liquids as lubricants for such power cycles as the Brayton and Rankine systems.

The Rolling Bearing Dynamics Section, headed by Herbert W. Scibbe, designs and tests high speed rolling bearings to meet aircraft turbine engine requirements into the mid-1980's. A number of innovative approaches to the new bearing demands are being explored both ex-



Engineers David E. Brewe (left) and Marshall W. Dietrich check bearing placement in cryogenic test equipment.

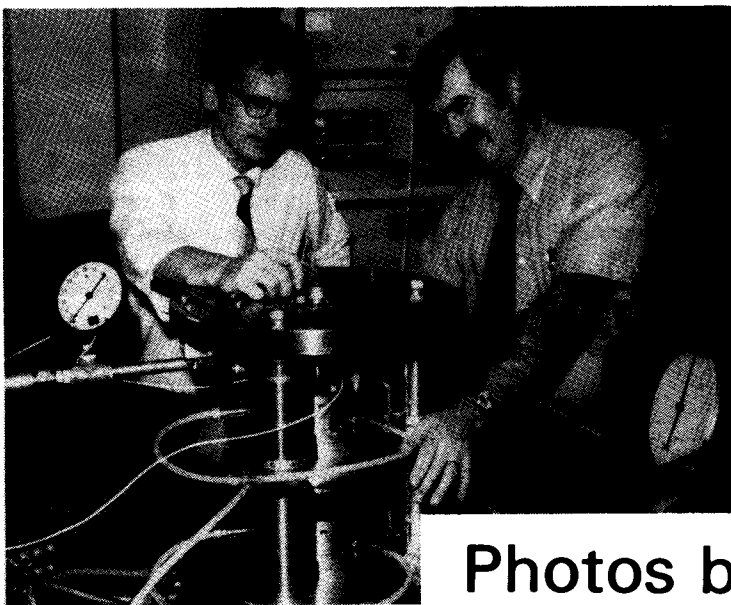
# transfer power

perimentally and analytically.

With the increased emphasis on aeronautical re-

search, Anderson foresees a continuing challenge in bearing development for many years to come.

## Bearings...



Dr. William J. Thayer III (left) and Robert E. Cunningham install a probe on a bearing rotor-dynamic and damping rig.

Photos by  
John Marton



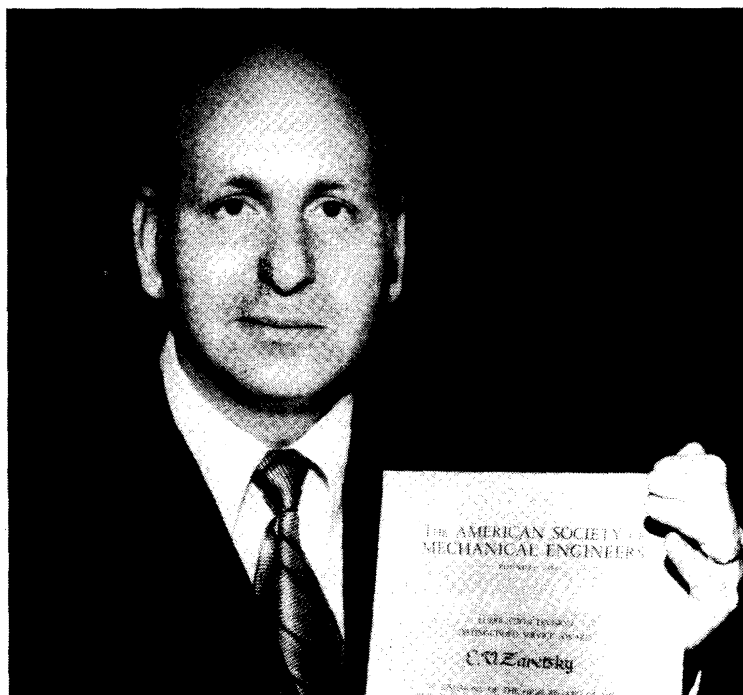
Richard J. Parker (seated) points out a fatigue specimen of a rolling element bearing to Dr. James L. Chevalier.



Frederick T. Schuller (left) and Zolton N. Nemeth examine journal bearing pad for Brayton Space Power System.



Harold H. Coe (left) explains a high speed rolling bearing to mathematical analyst Bernard J. Hamrock.



*The American Society of Mechanical Engineers presented Erwin Zaretsky with this award for his work in advancing the engineering profession. (Martin Brown photo)*

## ***ASME cites staffer for leadership role***

Erwin V. Zaretsky, Head of the Bearings and Gearing Section was recently presented a distinguished service award by the American Society of Mechanical Engineers (ASME) "for his valued service in advancing the engineering profession."

Given by the Lubrication Division of ASME, the award reflects ASME appreciation for Zaretsky's "aggressive leadership as chairman of its Rolling Elements Committee and as the driving force in the preparation of the engineering design guide called "Life Adjustment Factors for Ball and Roller Bearings."

ASME, with a worldwide membership of some 70,000, promotes and advances the arts and science of mechanical engineering. The Cleveland Chapter, of which Zaretsky currently serves as chairman, has more than 800 members.

Zaretsky who is a practicing attorney as well as a professional engineer, has written more than 70 technical papers. He is a member of the Board of Directors of the Cleveland Society of Professional Engineers and a member of the Cleveland Regional Construction Arbitration Committee of the American Arbitration Association.

He earned a Bachelor's degree in mechanical engineering from Illinois Institute of Technology and a Doctor of Law (J.D.) from Cleveland-Marshall Law School and is a member of the Ohio Bar.

A former Air Force captain, Zaretsky joined Lewis in 1957 as an aerospace research engineer.

# Faculty Fellows sharpen skills as interns here

Twenty-seven university science and engineering professors representing schools throughout this country and abroad, are spending the summer here as Faculty Fellows to bolster their knowledge and lend their expertise to Lewis through first hand experience.

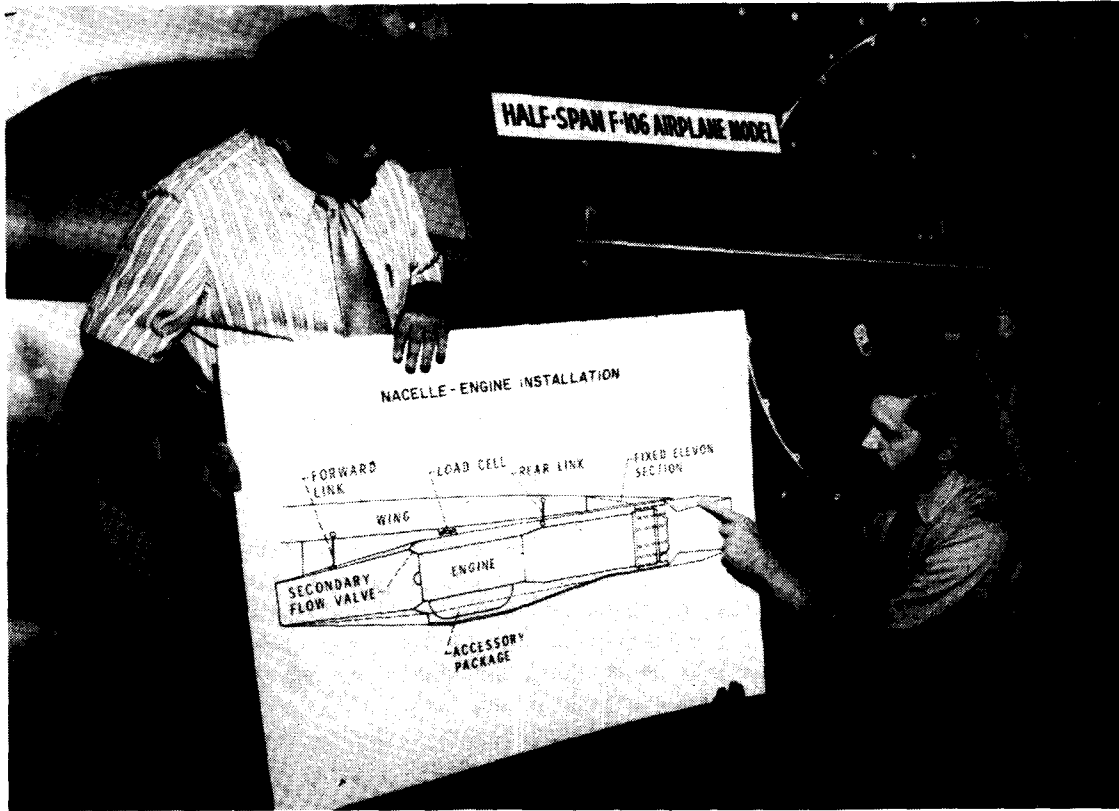
Starting here in June, the professors are working in their areas of expertise until the program ends in mid August.

Those working in the program, their school and the type of research they are involved in are as follows.

Dr. Hafiz Atassi, Assistant Professor of Aeronautics and Mechanic Engineering, Notre Dame University. Dr. Atassi is assigned to the Physical Science Division where he is engaged in analyzing various sources of noise radiation in compressors and assisting in processing a proposal on the unification of aerodynamic noise theory.

Dr. Edgar H. Buyco, Associate Professor of Engineering, Purdue University. He is assigned to the Power Systems Division where he analyzes surface type combustors for use with Brayton and Rankine cycle power systems.

Dr. Donald Chi-An Chiang, Associate Professor of Mechanical and Aerospace



Dr. Philip M. Gerhart (left) of the University of Akron, and Bernhard H. Anderson, head of the Aerodynamics Analysis Section, study the boat tail of a jet engine in an F-106 aircraft. (John Marton photo)

Rose-Hulman Institute of Technology. He is assigned to the Fluid System Components Division and is involved in making analytical studies of surfaces in elasto-hydrodynamic contacts.

Dr. Otto E. Crenwelge, Assistant Professor, Northern Arizona University, is assigned to the V/STOL and Noise Division. His project includes analysis and suppression of casing noise ra-

Dr. Richard D. Etters, Associate Professor of Physics, Colorado State University, is assigned to the Physical Science Division. His assignment includes work on high pressure properties of solid hydrogen. Research may help to design an experiment which could produce metallic hydrogen.

Dr. Elmer J. Felderman, Assistant Professor Mechanical Engineering, South Dakota State University is assigned to the V/STOL & Noise Division. He will study a range of diffuser geometries for conventional and sonic inlets applied to V/STOL and STOL aircraft.

Dr. Phillip M. Gerhart, Assistant Professor, Mechanical Engineering, Akron University. Dr. Gerhart's principal area of study will be the analysis of transonic flow about nozzle boattails.

Dr. Hihad A. Hussain, Associate Professor of Mechanical Engineering, California State University at San Diego is assigned to the Physical Science Division. He is currently investigating the heat transfer in a river during winter to determine the river's heat exchange and freezing characteristics.

Dr. Antoni K. Jakubowski, Assistant Professor, Aerospace Engineering, Virginia Polytechnic Institute is assigned to develop a correlation based on the existing data and existing theoretical methods that can be used to predict separation at the leading edge of the inlet to a function of the flow variables.

Dr. C. William Kauffman, Assistant Professor, Aerospace Engineering, University of Cincinnati is making exhaust gas analysis measurements behind a swirl-can combustor module for the Airbreathing Engines Division.

Dr. Theodore G. Keith, Assistant Professor, Mechanical Engineering, University of Toledo is assigned to the V/STOL and Noise Division. There he takes existing experimental 20-inch diameter inlet data and determines a correlation method that will predict when inlet lip separation will occur.

Dr. Alvin S. Konigsberg, Associate Professor, Physics, New York State University College, is providing technical support to slight experiments aboard the Lewis F-106 aircraft for the Global Air Sampling Program (GASP). He is assigned to the Airbreathing Engines Division.

Dr. Chung-Chiu Liu, Associate Professor, Chemical Engineering, University of Pittsburgh is assigned to the Energy Conversion & Material Sciences Division. His primary objective will be to define existing capabilities and research opportunities in electrochemical water quality so that a remote solar powered water quality monitoring system may be developed that is reliable and capable of operating at minimum power levels.

Dr. Francis Ta-Cheng Loo, Associate Professor, Mechanical Engineering, Clark College is assigned to the Airbreathing Engines Division. He will analyze with the use of photoelasticity techniques, the effect of film cooling hole geometries on turbine blade and vane life.

Dr. Barry R. Maxwell, Assistant Professor of Mechanical Engineering, Bucknell University, is assigned to the Physical Science Division. His research includes using laser doppler velocimeters to determine how well seed particles track the gas flow and which substances can be used for seed particles.

Dr. Marlin D. Minich, Associate Professor, Civil Engineering and Engineering Mechanics, Cleveland State University, is assisting in developing an advanced computer capability for the dynamic and static analysis of turbine and compressor blades. He is assigned to the Materials and Structures Division.

(Continued on page 5)



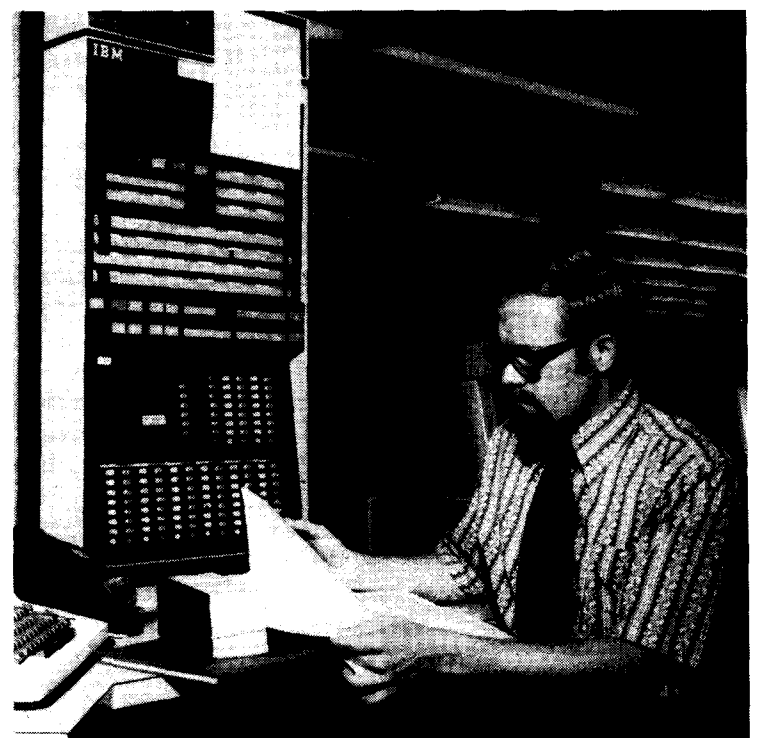
Faculty Fellow Dr. John J. Coy of the Rose-Hulman Institute of Technology (left), and Erwin V. Zaretsky, head of the Bearing and Gearing Section, measure surfaces of bearing elements using a surface tracer instrument called the rotary proficorder. (John Marton photo)

Engineering, Rose-Hulman Institute of Technology. Assigned to the Physical Science Division, Dr. Chaing's assignment includes determining systems efficiency for a "light bulb" heat exchanger combined with an MHD generator.

Dr. John J. Coy, Assistant Professor, Mechanical and Aerospace Engineering,

diation from a turbofan engine.

Dr. Izydor Eisenstein, Professor of Engineering, Purdue University. He is assigned to the Fluid System Components Division where he performs analyses to predict the behavior of a multi-mass high speed flexible rotor in flexible damped supports.



Faculty Fellow Dr. Elmer J. Felderman of South Dakota State University examines a computer run of one of his analytical studies involving inlets for the V/STOL and VTOL aircraft. (John Marton photo)

THE LEWIS NEWS presents the Lewis Research Center story in terms of its people, its purpose and its progress. Published on alternate Fridays, the News is produced by the Public Information Office, Lewis Research Center, National Aeronautics and Space Administration, 21000 Brookpark Road, Cleveland, Ohio 44135.

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Editor . . . . . Charles Mitchell



# ***ASME sponsors events***

The American Society of Mechanical Engineers, (ASME) Cleveland Section, will sponsor two major events later this month.

On May 7-8, the Society will sponsor a "Design of Bearings and Sliding Surfaces" seminar at the Sheraton Inn at Cleveland Hopkins Airport.

William J. Anderson, Chief, Bearings and Mechanical Power Transfer Branch, and Edmond E. Bisson, retired former Associate Chief of the Fluid System Com-



Zaretsky

ponents Division, both recognized nationally and internationally in the field of friction, will conduct the course. For additional information, call Richard L. Lantz, PAX 6251 or PBX 252.

Following the course, ASME, Cleveland Section, will host the ASME Regional Administrative Conference

at the Sheraton Cleveland Hotel May 12-14.

The regional conference includes 18 sections from Ohio, Michigan, Pennsylvania, New York, and Canada, West Virginia.

According to Erwin V. Zaretsky, Head of the Bearing and Gearing Section and former president of ASME, Cleveland Section, the conference is being held to formulate national ASME policy on a regional basis.

Part of the agenda includes "Developing an Engineer Career Opportunities Program;" "Informing Industry of ASME's Professional Employment Principles and Ideals;" "Implementing Disclosure Procedure for Employment Guidelines;" and "Providing a Register of Consultants."

The highlight of the conference will be the banquet Monday, May 13, to honor the incoming national ASME president.

Zaretsky will be master of ceremony, and the main speaker will be Dr. Albert Burstein, Associate Professor of Mechanics and Orthopedic Surgery, Case Western Reserve University. He will speak on "Safety Devices in Sports Equipment."

# Zaretsky joins select group

Erwin V. Zaretsky is the latest to join the handful of Lewis engineers who have written 100 or more technical papers.

But he insists that the milestone would be a hollow achievement without the support of personnel in the Management Services Division.

"If an author had to perform all the functions involved in preparing and disseminating technical reports, it would be virtually impossible to achieve such a high number, both in quantity and quality," he said.

Zaretsky's paper which brought him the century mark is entitled, "Endurance and Failure Characteristics of Main-Shaft Jet Engine Bearings at  $3 \times 10^6$  DN." The subject of the

paper won for Lewis the IR-100 Award as one of the 100 most significant new technical products of 1975.

The majority of Zaretsky's technical papers are in the area of bearings, lubrication, rolling element fatigue, and gearing. In addition, to his technical papers, he has written numerous articles on various aspects of law. The busy writer holds a law degree in addition to an engineering degree.

Continuing his praise of support persons who are responsible for taking his manuscript drafts and developing a finished product, Zaretsky said, "The excellent support others and I receive from the Management Services Division too often goes unrecognized."

He heads the Bearing,



Zaretsky

Gearing and Transmission Section and states that the Section's teamwork in performing its tasks allows for a high output of technical publications. The Mechanical Components Branch of which his section is a part, constantly produces the largest number of technical publications in their field than any other similar organization in the world, Zaretsky said.

Zaretsky wrote his first technical report in 1960 and since that time has averaged about seven publications a year.

"I try to focus on significant state-of-the-art advances in hopes that those who will come after me can continue and improve upon it," states Zaretsky who remains active as a writer although many of his duties are administrative.

The former Air Force Captain holds a Bachelor's degree in mechanical engineering from Illinois Institute of Technology and a Doctor of Law degree from Cleveland State University. He has served as a consultant and lecturer both here and abroad. His strong contribution to the field of engineering and science, according to those who know him, is his ability to bridge the gap between the research laboratory and practical engineering applications.

## Hoffman assumes duties as manager of TSCO

Robert G. Hoffman has been appointed Chief, Technical Services Coordination Office, Center Director Dr. Bruce T. Lundin announced.

Hoffman brings 12 years of supervisory and managerial experience to his new position where he directs activities aimed at supporting the research and development efforts of the Center.

These activities include working with Technical Services Directorate supervisors to plan manpower deployment, maintenance of facilities equipment, and efficient work control procedures for the Directorate. Members of his staff also monitor contracts and purchase orders to prevent project delays.

Hoffman began at Lewis' Plum Brook Station in 1959



Hoffman

as an experimental electronic equipment mechanic. In just four years he moved up to head the Instrument and Controls Service Section where he directed the efforts of 45 technicians and 10 apprentices. He was part of a committee that set up the

*(Continued on page 2)*

### 3-year effort pays off

## *Grinding process restores bearings*

Successful results of a prototype program and three years of intensive laboratory tests to "requalify" scrapped rolling-element bearings through a grinding process were reported at a seminar held at the Army's Aviation Systems Command (AVSCOM) in St. Louis, Missouri.

Attending the seminar, which was by invitation, were representatives of the three military services as well as NASA-Lewis personnel.

The project, sponsored jointly by Lewis and AVSCOM, was undertaken to evaluate and apply the concept of restoring bearings through grinding.

The restoration process was developed jointly by Industrial Tectonics, Inc., of Compton, Calif., and Lewis' Bearing, Gearing and Transmission Section.

The process involves grinding stressed or damaged material from rollers or ball bearing raceway surfaces and installing oversized rolling elements in the bearings. Bearings are restored to the quality and dimensions of the original manufactured items.

Three different types of bearings from the Army's UH-1 helicopter were used for the proto-type program. Industrial Tectonics restored the bearings under a contract to the Army.

Richard J. Parker of the Bearing, Gearing and Transmission Section who was Lewis'

project manager, coordinated the testing, data reduction and analysis with three participating contractors. He also analyzed test results and made recommendations required for the Army to implement the program.

Dr. Gerald F. Hein of the Space Flight Systems Study Office made an economic analysis of the risks and costs of restoring the bearings; and the Army's Corpus Christi Army Depot prepared and conducted helicopter engine and transmission operational tests on the restored bearings.

Bearing, Gearing and Transmission Section Head Erwin V. Zaretsky and Gilbert J. Weden of the Fluid System Components Division coordinated the overall planning efforts.

The reported findings of the Lewis and AVSCOM teams showed that bearing costs would be reduced one million dollars a year for the Army and about \$300,000 a year for the Air Force by implementing bearing restoration. It was reported at the seminar that the Army plans to implement the program, according to Zaretsky.

Major Frank Gasperich head of the Lewis-based Air Force Systems Command Liaison Office who attended the seminar, stated that the Air Force is currently studying implementing the program. He also felt that bearing restoration could save the Air Force more than the estimated \$300,000 stated at the seminar.



Attending the seminar on bearing restoration were (left to right) Stewart M. Chen, AVSCOM; Dr. Gerald F. Hein, Lewis; Richard J. Parker, Lewis; Erwin V. Zaretsky, Lewis; Heinz Hanau, Industrial Tectonics, Inc.; and John T. Conroy, AVSCOM.



## *French visitors*

*People from foreign countries as well as persons in this country seek out Lewis expertise. Recently, two French engineers visited Lewis to discuss advanced bearing materials technology. The visitors were representing the French aircraft turbojet engine manufacturing firm, Societe Nationale D'etude et de Construction de Moteurs D'aviation (SNECMA). Taking time out to pose for pictures after the discussions are (left to right) Erwin V. Zaretsky of Lewis; Jean Pierre Nicolas, France; Richard J. Parker, Lewis; and Roaul Huet De La Tour. (Martin Brown photo)*



*Dennis P. Townsend (standing) was this year's chairman of the ASME International Power Transmission and Gear Conference recently held in Chicago. John J. Coy (seated) co-chaired a session at the conference. (Martin Brown photo)*

## Townsend chairs conference

Design engineering technical conferences of the American Society of Mechanical Engineers (ASME) in Chicago last month had a number of Lewis engineers presenting papers or taking part in various other roles.

Heading the list of Lewis participants was Dennis P. Townsend of Bearing, Gearing and Transmission Section. He was named chairman of the International Power Transmission and Gear Conference, which featured 44 foreign papers and 37 papers from U.S. participants. He also presented a paper entitled "Study of Lubricant Jet Flow Phenomena in Spur Gears—Out of Mesh Condition" at the conference.

John J. Coy, also of the Bearing, Gearing and Transmission Section, was vice-chairman of the conference's session on "Gear Noise."

Coy, Townsend and Erwin V. Zaretsky, who heads the Bearing, Gearing and Transmission Section, jointly presented a paper entitled "Experimental and Analytical Load-Life Relation for AISI9310 Steel Spur Gears."

At ASME's Vibrations Conference, Lewis' David P. Fleming chaired a State-of-the-Art Seminar on Flexible Rotor-Bearing Dynamics and Louis J. Kiraly chaired a session on Blade Dynamics.



Leo Sienkiewicz (right) 40-year Service Award recipient, Acting Center Director Dr. Bernard Lubarsky is at left.

"The longest way  
round is the shortest  
way home." Anon

**Staffers honored  
for long, devoted  
Federal service**



Edwin Trojan, 40-year Service Award Recipient.

**THIRTY-FIVE YEAR AWARDS**

- \* Frank Baldizzi
- Leo R. Bruder
- Helmut F. Butze
- Edward T. Calmer
- Thomas G. Donohoe
- Frank H. Dunn
- Carl L. Eppich
- \* Albert J. Gallovic
- Ambrose Ginsburg
- Frederick W. Glaser
- Harold Gold

- \* Donald C. Guentert
- Tadeusz H. Guzik
- Billy R. Harrison
- Jack W. Hartsock
- Louis E. Herman
- Frank Holt
- Eldred H. Johnson
- Clair R. Kind
- Harold Kline
- Ted J. Kopacz
- Edward L. Kozar

- \* Rudolph F. Kravanya
- Coleman A. Lewis
- George Macian
- Salvatore J. Manzi
- William H. McComb
- Riley O. Miller
- Frank V. Nickle
- Walter T. Olson
- Paul M. Ordin
- George A. Reich
- Robert W. Reich

- Valentine J. Rys
- \* Chester Scarci
- Robert W. Schmidt
- Agnes R. Schmotzer
- William B. Schwab
- Chester S. Skony
- Francis J. Stash
- Harold B. Utte
- Thomas H. White
- Nicholas A. Wik
- Harry Zimmermann

**THIRTY YEAR AWARDS**

- Walter J. Bajorek
- Cazimir A. Ball
- William S. Bossert
- James J. Brichacek
- William F. Brown, Jr.
- Sebastian D. Codespoti
- Carmen R. Coletta
- John R. Danicic
- Elmer H. Davison
- Andrew J. DeFrank
- Alice P. Dill
- \* Vincent J. Dominak
- James F. Dugan, Jr.
- Jack B. Esgar
- Joseph J. Etzkin
- Harvey V. Funk
- Donald F. Garman
- Dominic J. Giomini
- Edwin L. Hagedorn
- Bernice L. Hartman
- Robert F. Humbel
- Robert Kaczmarek
- John Klyop
- Mylo J. Krejsa
- Frank M. Kubancik



- George Lampshire, Jr.
- Harry E. Langdon
- Anthony J. Laudato
- Frank E. Leciejewski
- Bernard Lubarsky
- Wallace Meder
- Richard T. Murphy
- Dumas A. Otterson
- Frances M. Poorman
- James J. Priebe
- Richard O. Raabe
- Patrick R. Raynak
- Edward J. Rolnicki
- Danny Rusyniak
- Robert J. Schwartzberg
- Peter Semenyina
- Ronald J. Simmerly
- Richard A. Steen
- Lawrence A. Stitz
- James L. Storer
- Curtis D. Strawn
- George Tunder
- John W. Weeton
- Leonard A. Wilhelmi
- George E. Yaniga

**TWENTY-FIVE YEAR AWARDS**

- Robert E. Alexovich
- Donald Alger
- Gordon P. Allen
- Richard L. Altimus
- Henry C. Anderson III
- Otho W. Artis
- Frank J. Barina
- Baxter L. Beaton
- Robert E. Becker
- Milton A. Beheim
- Joseph J. 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

- Roy S. Cooley
- Robert J. Crowl
- Ronald A. Dawson
- Carl E. DeWitt
- Stanley Domitz
- Delmar W. Drier
- Thomas J. Dudzinski
- Theodore J. Dukles
- David G. Evans
- Joseph L. Fiala
- Robert Friedman
- Robert E. Ging
- William J. Gleason
- Alvin C. Hahn
- Patricia A. Haley
- Clint E. Hart
- Elmer E. Haseley
- Kirby W. Hiller
- Vincent F. Hlavin
- Charles F. Hnatek

- Vernon L. Jividen
- Jerome A. Johnson
- Joyce C. Jones
- Milan Jopek
- Danile J. Keliher
- 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. Lezberg
- Cut H. Liebert
- Louis E. Light
- John C. Liwosz, Jr.

- James E. Loeser
- Walter K. Love
- James P. Malloy
- Jerry H. Malone
- 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
- George M. Prok
- Darrell C. Puckett
- Mauri K. Raita
- Swight H. Reilly, Jr.
- June R. Reynolds
- Joseph A. Richvasky
- Paul F. Riedel
- Edward E. Robbins
- Andrew S. Sabo
- Nick E. Samanich
- Anthony Sarraino
- Paul D. Savage
- Harold W. Schmidt
- Roger R. Schulte
- Herbert W. Scibbe
- Richard G. Sheehan
- Jack P. Shinn
- Robert A. Signorelli
- Joseph N. Sivo

- James V. Steigerwald
- Gordon R. Steiner
- James F. Strosnider
- George Succop
- James D. Swiers
- Edward J. Takacs
- Stephan C. Teleha
- Marvin W. Tiefermann
- Merlin E. Vance
- Gilbert J. Vasek
- Raymond D. Viancourt
- Peter W. Weber
- Clarence Wem, Jr.
- George F. Wildschrey
- Eugene L. Wilkosz
- Cloyd M. Wolford
- Richard J. Yako
- Robert E. Yavoich
- Arthur V. Zimmerman
- Francis J. Zubricky

**TWENTY YEAR AWARDS**

- Blondele H. Anderson
- Robert J. Antl
- Paul R. Auerhamer
- Joseph R. Avsec
- Carleton J. Baker
- Robert C. Baker
- Calvin L. Ball
- David A. Bender
- Kenneth J. Bowles
- Earle O. Boyer
- Donald K. Brasted
- William J. Brown
- John W. Burke
- Robert J. Buzzard
- Donna M. Calala
- Augustine A. Cervelli
- Eileen C. Cox
- Clifford C. Crabs
- Mike Crnobrnja
- James E. Crouse
- Joseph DeFazio

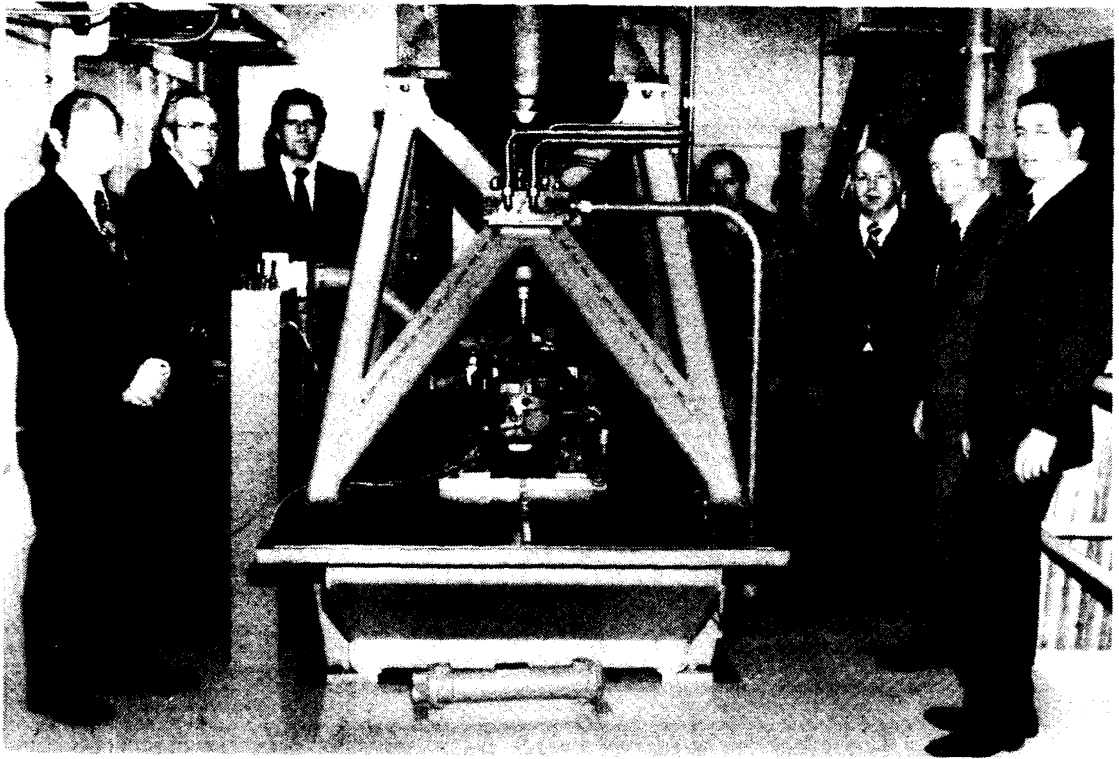
- William Dey, Jr.
- Ben T. Ebihara
- Joseph D. Eisenberg
- John C. Estes
- Anthony J. Fakolt
- William L. Fielder
- Paul E. Foster
- Fredric N. Goldberg
- Salvatore J. Grisaffe
- Theresa D. Gulko
- William D. Guthrie
- John T. Halloran
- Alton Z. Hallum
- Paul A. Harlamert, Jr.
- Verlon L. Head
- Robert C. Hendricks
- David M. Herb
- Frederick P. Herke, Jr.
- Norman J. Hill
- Theresa A. Horvath
- Michael B. Hoyman
- Frank J. Hrach

- William F. Hyde
- \* William A. Jost
- Leo Kalis
- Joseph Kimmel
- Richard H. Knoll
- Henry G. Kosmahl
- Norman A. Landis, Jr.
- Daniel F. Larson
- Milton R. Lauver
- William F. Loftus
- Carl F. Lorenzo
- Gordon D. MacKay
- Paul Manos
- Louis Maschak
- Bonnie J. McBride
- Anna L. Miller
- John A. Misencik
- James L. Morgan
- Dorothy A. Morris
- John W. Myers
- Jerry H. Nelson
- Robert E. Nixon

- Mary Ellen Nolder
- Ralph C. Nussle
- Donald R. Packe
- Andrew F. Parchem
- James V. Patton
- Albert J. Pavli
- John Petro
- Warren H. Philipp
- Andrew Pindor
- John A. Pomplas
- Dale E. Pope
- James R. Ramler
- Karl F. Reader
- Andrew Reha
- Edward A. Richley
- Ronald R. Roskilly
- Neil D. Rowe
- Raymond J. Rulis
- Frank P. Savel, Jr.
- Donald E. Schmidt
- Herbert E. Schmidt
- Robert W. Schroeder

- Richard M. Schuh
- Nathaniel H. Sears
- Sidney H. Singer
- Earl L. Sprague
- Edward T. Stefonsky
- Francis J. Stenger
- Timothy L. Sullivan
- Andrew J. Szaniszlo
- John Urban, Jr.
- James O. VanVleet
- Donald J. Veleva
- Carl Weigel, Jr.
- Paul Weisenbach, II
- Harley L. White
- Robert C. Williams
- Julius Wondrak
- Frederick H. Yarris
- James E. Youngman
- Erwin V. Zaretsky
- Frank J. Zeleznik
- Charles L. Zola

\* Retired



## *Unique transmission test stand*

*Bearing, Gearing and Transmission Section engineers recently inaugurated the 500-horsepower transmission test stand—one year after NASA began the helicopter transmission system technology program.*

*The test stand is unique in that it not only can accommodate conventional helicopter transmissions, but can also test traction-type transmissions. Traction transmissions are being pioneered at Lewis for helicopters and terrestrial applications.*

*When the program is completed in 1983 engineers in the Bearing, Gearing and Transmission Section hope to demonstrate improvements on weight, noise, maintenance, cost and size of helicopters through applying advance technology power transfer components. They also hope to demonstrate the compactness and reliability of traction drive systems for helicopters. Shown at the test stand are (from left) John Coy, project manager of the helicopter transmission systems and dynamics; Charles Braddock of Bell Helicopter; Stuart H. Loewenthal, project manager, traction and hybrid transmissions; B. J. Hampton, Bell Helicopter; Erwin V. Zaretsky, head, Bearing, Gearing and Transmissions Section; Walter D. Sonneborn, Bell Helicopter and Dennis P. Townsend, project manager, gearing and lubrication system. (Greg Lewis photo)*



Some of the key persons who helped develop the new traction drive are (seated from left) Dr. Algirdas L. Nasvytis and Stuart H. Loewenthal. Standing (from left) are Neil E. Anderson, Erwin V. Zaretsky and Douglass A. Rohn

(Don Huebler photo)

## Better traction drive may replace gears, improve power transmission

Just as the internal combustion engine gave way to the jet, so too, gears may step aside for multiroller traction drives to transmit power in industrialized societies of the future.

Following more than six years of research and testing, a team of NASA Lewis Research Center engineers reports it is very near achieving what could be a major advance in the state-of-the-art of power transmission.

The development is called the Nasvytis Multiroller Traction Drive, so named because it is based on a 1966 invention of Cleveland Dr. Algirdas L. Nasvytis who is still associated with the project.

NASA Lewis reports that its new drive is able to transmit high power loads at high speed ratios without the use of toothed gears and, further, that it could replace gearing operations in a

broad range of applications.

For example, Lewis believes the new power transmission could probably find almost immediate application in the machine tool industry where ultra-high speeds for such as grinders and millers could be achieved, engendering vastly improved product quality and production rates.

Similarly, in high-speed drive systems normally powered by gas turbines, the Nasvytis drive, as a speed increaser married to a conventional AC electric motor, could accomplish the same results in a far simpler and less expensive manner.

As a replacement for both geared drives and conventional traction drives, it could find its way into a host of other power transmission applications including automotive gas turbine engine drive trains, helicopter main rotor transmissions, aircraft drive systems, rocket engine turbopump drive systems, wind turbines, high speed turbomachinery and, probably, more.

### DRIVE COULD MINIMIZE NOISE POLLUTION

According to Stuart H. Loewenthal, lead engineer for Lewis on the multiroller traction drive project: "We are just now beginning to find out exactly what these

(Continued on page 2)





*Congratulating Erwin V. Zaretsky (second from left) on receiving the Fellow award from the American Society of Mechanical Engineers are (from left) Dr. Algirdas L. Nasvytis, William J. Anderson, Richard L. Lantz, Andrew Mitchell and Eric Bamberger.*

## ASME honors Zaretsky with its highest award

Erwin V. Zaretsky, Head, Bearing, Gearing and Transmission Section, was awarded the grade of Fellow by the American Society of Mechanical Engineers.

Fellow is the highest honor the Society can bestow on its members. Zaretsky was honored for his outstanding contributions to the engineering profession and for his significant engineering achievements.

Andrew Mitchell, chairman of the Cleveland ASME section and a member of the Lewis staff, presented the award to Zaretsky.

William J. Anderson, Chief of the Mechanical Components Branch, served as Master of Ceremonies.

A former Air Force captain, Zaretsky joined Lewis in 1957. He has established an international reputation in the field of mechanical components technology and has written over 100 papers, primarily in the areas of bearings, lubrication, rolling-element fatigue, gearing and mechanical transmissions.

Zaretsky also holds a degree in law and has written numerous articles on various aspects of the law.

Outstanding contributions he has made include pioneering research in the field of elastohydrodynamic lubrication, where the first experimental relationship was shown between lubricant thickness, lubricant chemistry and rolling-element fatigue.

He also has pioneered work in high-temperature lubrication. Zaretsky was responsible for the design and development of the fastest rolling-element bearings, which have operated successfully for 75,000 hours under simulated operating conditions of advanced jet aircraft.

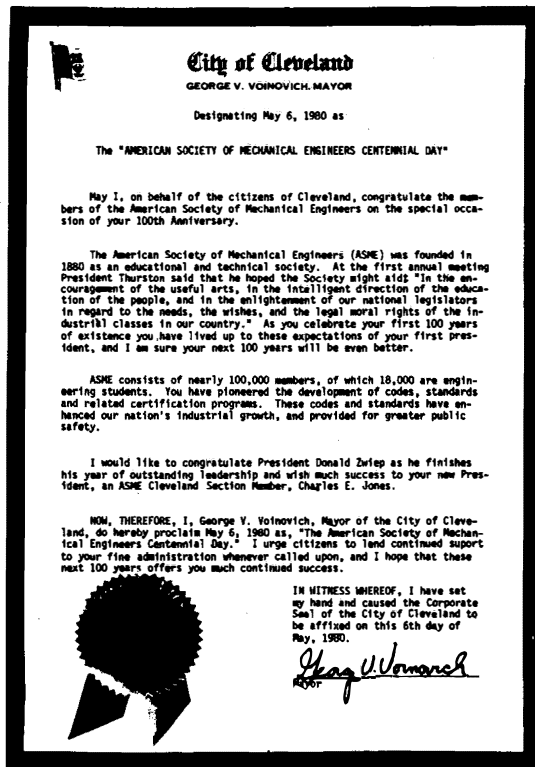
In addition to membership in ASME, Zaretsky is also a member of the national and Cleveland sections of the Society of Professional Engineers, and of the American and Ohio Bar Associations.

Zaretsky's other award from ASME came in 1972 when that 80,000-international-membership body honored him with its distinguished service award "for his valued service in advancing the engineering profession." The award reflected ASME's appreciation of Zaretsky's "aggressive leadership" as chairman of its Rolling Elements Committee and as the driving force in preparing an engineering guide.

Zaretsky has received numerous other awards for innovations resulting from his NASA work. In 1975, 1977 and 1979 NASA Lewis was the recipient of the IR-100 award for one of the nation's 100 most-significant new technical products due to research performed in his section.

Zaretsky commented, "I consider the Fellow award a recognition of not only my contributions, but also a recognition of my professional colleagues and support persons at Lewis. The excellent support others and I receive too often goes unrecognized."

# ASME, Lewis staffers celebrate Society's 100th year



Lewis former and present staffers at ASME banquet are (from left) Jesse Hall, retired, William J. Anderson, Warner L. Stewart, Erwin V. Zaretsky and Andrew M. Mitchell.

The Cleveland Section of the American Society of Mechanical Engineers celebrated the 100th year of that technical society recently at the Crawford Auto-Aviation Museum.

Lewis has the largest number of ASME members of any area government agency or private industry concern.

Andrew M. Mitchell of Lewis and ASME Cleveland Section Chairman said the banquet was a "celebrative affair" with more than 170 attending the program.

ASME's national president Don Zwiep was the keynoter, stressing the advancement and impact of 100 years of mechanical engineering and announcing that ASME's goal is to have a membership of 100,000 by the end of the year.

Mitchell in his closing remarks acknowledged that "society today is a technological, socio-economic interwoven fabric, where any change in one affects the other." Mitchell went on to state that "the day of scientific and technologic secularism is over."



Some of the 170 ASME banquet attendees.



Richard Lantz (left) of Lewis receives the Distinguished Service Award for his work as the Honors and Awards Chairman from Region Five vice president John Po.

## ASME. . .

*(Continued from page 1)*

authors, the single largest contribution by an organization presented there.

Lewis authors at that conference, in addition to Coy, Loewenthal and Townsend, were Erwin V. Zaretsky, Neil E. Anderson and Douglas A. Rohn of the Bearing, Gearing and Transmission Section. Lewis Staffers also chaired four technical sessions at the conference.

The International Lubrication Conference was sponsored jointly by ASME AND THE American Society of Lubrication Engineers.

William J. Anderson, Chief of the Mechanical Technologies Branch, was a member of that conference's planning committee. Anderson, along with William A. Jones of the Lubricants Research Section, were members of the conference organizing committee.

Eleven papers were presented by Lewis authors at the Lubrication Conference. In addition to Anderson, Lewis authors were Donald H. Buckley, Head, Lubrication Fundamentals Section, Kazukisa Miyoshi and John Ferrante of the same section, Izhak Etsion, Seals and Rotor Dynamics Section, Coy, Zaretsky, Richard J. Parker and Harold H. Coe, Bearing Gearing and Transmission Section.

Serving as session chairmen were Harold E. Sliney, Head, Lubricants Research Section, Lavern D. Wedeven and Bernard J. Hamrock of the Mechanical Technologies Branch and Anderson, Zaretsky and Jones.

As with the Power Transmission and Gearing Conference, Lewis researchers comprised the single largest group of contributors at the Lubrication Conference.

Buckley and Myoshi also presented papers at the Metal Working Lubrication Conference.

Loewenthal received the Newkirk Award for his "outstanding work in developing the engineering principles which significantly improved the technology of traction devices, and which have made that energy-efficient transmission system a viable option in advanced propulsion machinery."

Loewenthal has been invited to present his work at conferences both in this country and abroad.



## *Nine for appeal*

*Nine Lewis employees were admitted to practice law before the U.S. Court of Appeals, the second highest court in the country. The Lewis nine were sworn in before a three-judge panel comprising judges Anthony J. Celebrezze, Nathaniel Jones and George Edwards.*

*Lewis persons sworn in are (from left) Kenneth O. Heise, Gene E. Shook, Donald H. Buckley, Erwin V. Zaretsky, Edward A. Zak, James A. Mackin, William A. Brahams, Norman T. Musial and Eugene Schiopota. Behind Schiopota is John P. Hehman, clerk of 6th Circuit Court of Appeals. The picture was taken in the U.S. courthouse on Public Square in Cleveland. (Don Huebler photo)*



Lewis Research Center  
Cleveland, Ohio  
June 5, 1981

## *Advanced Power Transmission Technology Meet to draw 300*

Some 300 persons are expected here June 9-11 to hear about the latest advances in bearing, gearing, lubrication and transmission technologies.

The symposium is co-sponsored by NASA Lewis and the Army Aviation Research and Development Command (AVRADCOM) headquartered in St. Louis, Missouri. The Army maintains a Propulsion Laboratory on the Center grounds.

Objective is to describe and assess latest research efforts and results in bearing, gearing, lubrication and power transmission work in the Helicopter Transmission System Technology Program. The audience will include representatives of a variety of industries where these technologies are important.

Acting Technology Utilization and Public Affairs Director James E. Burnett will issue a Call to Order to get the symposium under way on June 9. This will be followed by an "Introduction to Lewis" by Center Director Dr. John F. McCarthy, Jr. Richard Lewis, Technical Director for AVRADCOM, will describe the "U.S. Army/NASA Technology Interface," then Harrison Allen, Jr. will discuss NASA technology transfer.

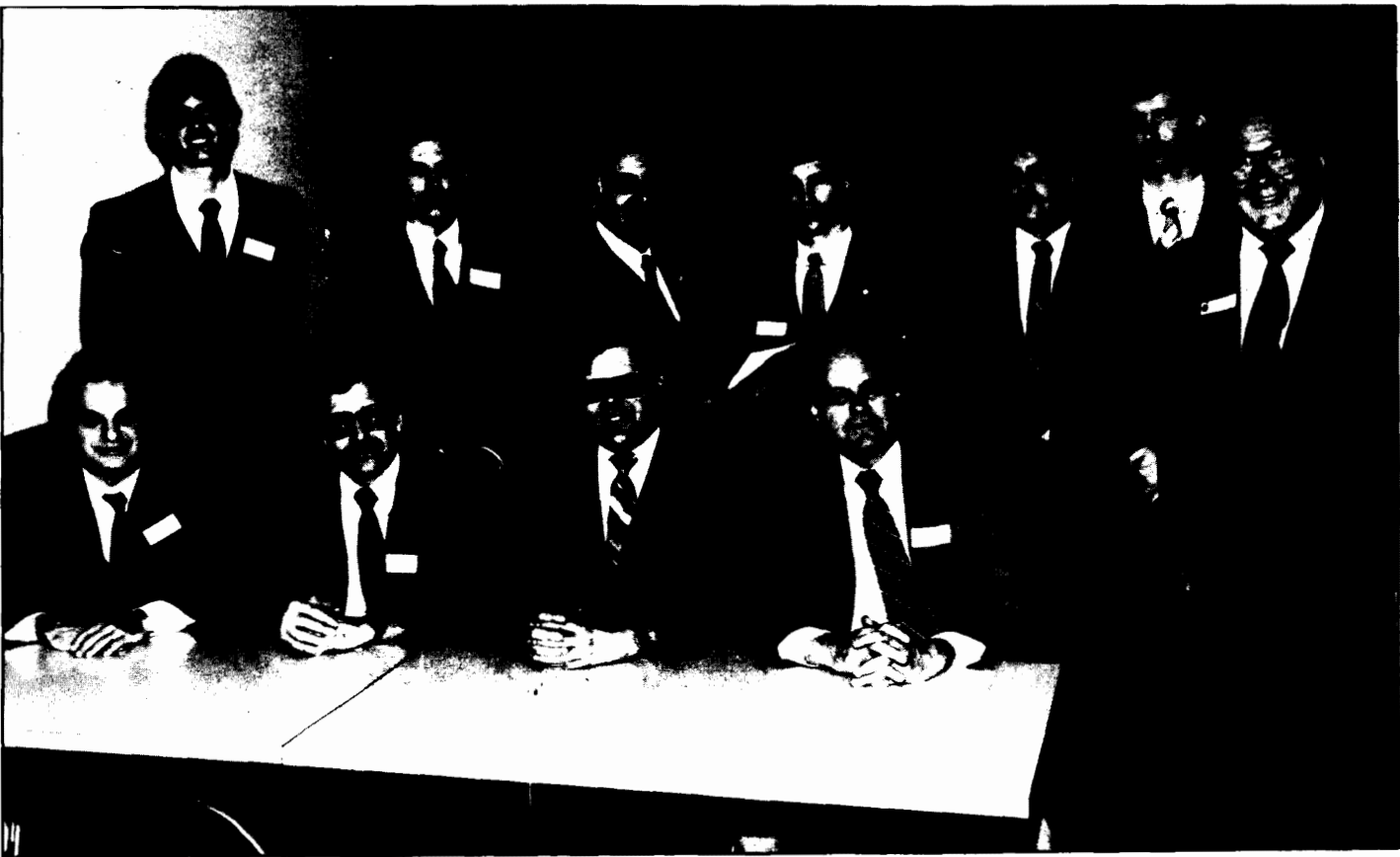
In the first session, "Technology Overviews," Lewis and Army Propulsion Laboratory presenters are as follows:

Erwin V. Zaretsky (Lewis), "The NASA Helicopter Transmission System Technology Program"; Richard J. Parker (Lewis), "Rolling-Element Bearing Technology"; John J. Coy (Army Propulsion), "Geared Power Transmission Technology"; and Stuart H. Loewenthal (Lewis), "Traction-Drive Technology."

Following the overviews, major technology sessions are scheduled as follows: June 9, 1:30 p.m., "Advanced Transmission Concepts"; June 10, 9:05 a.m., "Rolling Element Bearing Technology"; June 10, 12:30 p.m., "Traction Drive Technology"; June 10, 3:15 p.m., "Spiral Bevel Gear Technology"; June 11, 9:05 a.m., "Spur Gear Technology I"; and June 11, 12:05 p.m., "Spur Gear Technology II."

In all, some 40 presentations will be made by representatives from Lewis, the Army, universities and industry during the three-day conference.

Laboratory tours will be conducted after the conference sessions on June 9 and 10 and on June 11 if necessary.  
*(continued on page 2)*



**LEWIS ENGINEERS SERVE AS JUDGES** - Lewis recently hosted a student research paper competition sponsored by the local chapter of the American Society of Mechanical Engineers (ASME). Lewis' Robert Graham and Engineer Erwin Zaretsky judged papers presented by engineering students from Cleveland State University and Case Institute of Technology. Students and faculty present included: (front row, left to right) Earnest Poulos, CSU; Joseph Prah, CWRU; John Frater, CSU; Ramuldas Kasuba, CWRU. Back row: Thomas Flohn, CSU; David Kocka, CSU; Erwin Zaretsky, Lewis; Charles Schrieber, CSU; Ray Laubenthal, CWRU; Paul Barnhart, CWRU and Charles Jones, ASME.

Don Huebler photo

# Awards to Lewis staffers total \$92,780

Nearly 300 Lewis employees shared \$92,780 in Special Achievement Award money at ceremonies in the DEB auditorium June 26. The number of recipients and the amount of cash awarded set new records for the twice-a-year recognition program.

Director Andy Stofan presided at the ceremony assisted by Phil Stone and Shirley Livingston, who read award citations for each individual and group honored.

A total of 297 employees received awards. There were 69 individual awards and 32 group awards that involved 228 employees. Checks presented had already been adjusted to reflect income tax liability.

"The purpose of this ceremony is to publicly and monetarily recognize specific Lewis staff members for their important contributions to the Center's mission," said Stofan.

"The Special Achievement Awards are granted for performance exceeding normal job requirements over an extended period of time, or for special acts or services that involved overcoming unusual difficulties or resulted in significant economies to the Center."

Light refreshments were served in the DEB Cafeteria after the ceremonies. In a letter to each award recipient, Stofan wrote:

"It is always a special privilege to recognize employees for their meritorious accomplishments. Only through the dedicated work and special efforts of individual employees has the Center been continually able to enhance its reputation for excellence and to achieve so much of lasting value in areas important to the Nation.

"I feel strongly that our Center must use all available means to show its appreciation to those who make notable contributions, and I am pleased that we are able to provide cash awards to recognize outstanding efforts.

"For this reason it is my sincere pleasure to present you with this check. You have my thanks on behalf of the Center and NASA for your exceptional performance and accomplishment."

Individuals who received awards are:

Arthur R. Wycoff Jr., Charles C. Giamati, Harold E. Renkel, Pamela P. Caswell, Robert F. Billy, Donald F. Szmania, Evelyn M. Carnahan, Karen D. Cox, Charles L. Zola, Carl J. Daniele, John C. DeLaat, Joseph F. Wasserbauer, Carolyn M. Ternovan, Roger Chamberlin, Royce D. Moore, Walter J. Kreim.

Also Jerrold D. Wear, Juan C. Rivera, S. Stephen Papell, Richard J. Woelfle, Fredric H. Harf, Alden F. Presler, William A. Brainard, Carolyn J. Clapper, Jody C. Getz, Richard L. DeWitt, Harold G. Price, Robert J. Hoover, Robert W. Jech, Norman W. Orth, Stanley J. Klima, Irene M. Geye, Erwin A. Edelman, Philip E. Hodge.

Also Arno W. Nice, Russell J. Jirberg, Royce W. Myhre, James O. Rotnem, Ernie W. Spisz, Maurice F. Baddour, Godfrey Anzic, Donald L. Alger, Charles H. Kerrigan, Stanley M. Nosek, Michael Skorobatchky, Carl F. Weegmann, Earl T. Bloam, Harold J. Kasper, Gordon D. MacKay, Robert B. Smith Jr., Adolph C. Spagnuolo, Rudolph Iglesias, Thomas V. Hudach, Myron H. Clifford, James W. Cery, Donald J. Szalkowski, Edward T. Kremser.



**John F. Sweeney, retired supervisor in the procurement division, receives his award check from Andy Stofan. He was part of the group honored for automation upgrade of the division office.**

(Lewis photo by Howard Slater.)



**Bernice Godbott receives her award check from Andy Stofan during the ceremonies. She is a member of the group honored for timely processing of pay and leave records.**

(Lewis photo by John Marton.)

Also Gordon R. Steiner, Marius Stiasny, Joseph A. Richvalsky, Daniel J. Totire, Donald H. Hardy, Mike A. Minichiello, Pamela J. Plencner, Norma L. Nead, George F. Wildschrey, Daniel F. Wills, Michael D. Slivka, Donald J. Veleba and George Y. Baaklini.

Group awards were made to these individuals as grouped:

**Minority recruitment plan:** Arthur R. Wycoff, James E. Burnett, Clyde E. Bailey, Judy Montfort, Robert P. Allen, Maury L. Blanton, Francis J. Montegani, David N. Bowditch, Erwin V. Zaretsky and Richard T. Gedney.

**Equal opportunity counselors:** Pamela P. Caswell, Susan M. Johnson, Frederick F. Simon, George Succop, Annie J. Easley and Joseph L. Joyce.

**T700 digital controls tests:** George A. Bobula, Gary A. Klann, Ronald A. Robinson, Thomas J. Biesiadny, Kevin R. Carmichael, Robert C. Seidel, William G. Costakis and Anastacio N. Baez.

**Educational programs:** Joseph A. Nervi, Joan Aldoy, R. Lynn Bondurant Jr., John G. Bluck, Jon A. Brown, Judith A. Budd, Shirley M. Jones and Judith A. Closson Olson.

**Supersonic wind tunnel development:** Warren R. Hingst, David W. Sheldon and Robert J. Freedman.

**Research on ADEN nozzle:** Rudolph E. Grey, Roy A. Lottig, Charles M. Spuckler, Joseph F. Lubomski, Lively Bryant, Irving Sheer, Robert F. Solomon, Martin F. Ginley and Robert J. Crowl.

**Space Shuttle insulation tests:** Kenneth L. Baskin, Robert F. Hanlon, Larry E. Smith, Steve Gonczyk, Douglas E. Kyr and Francis J. Paulovich.

**High-speed propeller analysis:** Charles Lawrence, Lawrence J. Bober, Hung T. Huynh, David A. Sagerser, Bruce J. Clark, James R. Scott, Robert A. Aiello, Murray S. Hirschbein, Krishna Rao V. Kaza, Robert E. Kielb, Oral Mehmed and Marsha L. Mencl.

**Power systems for transport aircraft:** Robert M. Plencner, Robert P. Dengler, Anthony C. Hoffman, Kent S. Jefferies, Raymond F. Beach, Irving G. Hansen and Robert J. Frye.

**Design of wind tunnel vane sets:**

Richard H. Cavicchi, Eric R. McFarland, Thomas F. Gelder, Nelson L. Sanger, and Jose Sanz.

**Research on gaseous fuels:** R. James Rollbuhler, C. Robert Morse, John P. Dorner, Barry W. Eberhart, Louis E. Herman, Louis J. Kren, Robert W. Robinson, John J. Svoboda and Robert J. Vanek.

**Fund control and document**

**processing:** Mary J. Beranek, Mary Beth Celebrezze, Linda L. Greytak, Rosemary B. Kreidler, Debra M. McCafferty and Nancy J. Pajak.

**Expediting travel claims:** Beatrice M. Benedict, Doreen L. Halstead, Donna K. Herbster and Johnnie M. Vines.

**Processing pay and leave records:** Thomas M. Pniewski, Bernice Farris, Louise A. Tupper, Thomas C. Murray, Joseph A. Anthony, Mona K. Marchetti, Diane V. Casper, Bernice Godbott, Linda M. Henninger, Patricia McFarland and Agnes M. Quint.

**Procurement automation upgrade:** Robert M. Purgert, Barbara R. Sedelmeyer, Gregory S. Sites, Karen Weber and John F. Sweeney.

**Support service contracting:** Kathryn L. Ferrini, Paul A. Karla, Mark W. Manthey, Gloria J. Rhyner, Ronald W. Sepesi and Virginia M. Wycoff.

**Silicon solar cell technology:** Irving Weinberg and Clifford K. Swartz.

**Atomic oxygen degradation:** Dale C. Ferguson, Bruce A. Banks and Michael J. Mirtich.

**Vibration and thermal vacuum tests:** Neil D. Rowe, Richard W. Vernon, Ralph J. Zavesky, Jon C. Oblebay and Richard J. Krawczyk.

**Space nuclear power program:** Karen K. Hughes, Raymond K. Burns, Robert D. Green, Joseph J. Nainiger, Robert J. Stochl, Harvey S. Bloomfield, John L. Collins, Jack A. Heller, Albert J. Juhasz, John M. Smith, Ronald J. Sovie, Jerry M. Winter, Donald G. Beremand, Donald L. Alger, Jack G. Slaby, Lanny G. Thieme, James N. Deyo, Ira T. Myers, Robert L. Davies, Coulson M. Scheuermann, Henry S. Rigo, Robert English and David J. Benis.

**Centaur contract negotiations:** Alvin C. Gerold, Gerald L. Snyder, Eugene

Schiopota and Paul W. Kuebler.

**Spin rig data acquisition:** Charles Lawrence, Erwin H. Meyn, Stephen J. Posta, Ronald R. Carney, Louis J. Kiraly and Johnnie L. Poole.

**Centaur negotiations with Convair:** Jack R. Herman, Kenneth A. DeLaat, Robert L. Firestone and Jack T. Harper.

**ESCORT III field station:** Emye L. Benavage, Donna L. Miller, Juan Rivera, Chi-Chiu Wypasek, John C. Sikora, John D. Jackson, Louis Maschak, Rocco Poli, Crescenzo A. Rocco, Raymond D. Viancourt, James M. Vrtis, George E. Wilcher and James C. Wohlever.

**Centaur negotiations with Pratt & Whitney:** Ronald E. Everett, Nancy K. Horton, James A. Burkhart and Isadore I. Sonkin.

**Centaur negotiations with Teledyne:** David J. Hale, Bradley J. Baker, Bruce M. Shuman and Edmund R. Ziembra.

**Loewy Extrusion Press:** Walter Rzasnicki, Darryl J. Klag, David M. Herb and John F. Stock.

**Transition of One-by-One supersonic tunnel:** Otis D. Anderson, Larry A. Jones, Dennis W. Kinzelman, Anderson Pickett Jr., Dennis R. Young and Rocco DeLiberto.

**Replaceable blade turbine test facility:** Susan M. Benford, Gilbert J. Santoro, Frederick D. Calfo, James R. Johnston, Donald Noga, John A. Kolis, Regina B. Ralys, Howard J. Cobb III, George P. Pindroh, Miguel Rivera Jr., Thomas B. Schneider, James J. Stachiw, Michael W. Lupton, Robert J. Thomas, Robert B. Collins, Anthony L. Dolence Jr., Richard Kovachik, Benjamin Rodriguez, Clarence Wem Jr., Elmer J. Petelka, George S. Sarvey, Nick J. Taranto, Philip J. Kramer, Charles G. Moon, Ronald J. Kirsch, Richard J. Schmidt and Glen R. Zellars.

**Cause of TF-34 compressor failure:** Dan J. Thoma and Peter T. Bizon.

**Secure processing on VAX/CRAY systems:** Glenn R. Cowgill and David A. Remakus.

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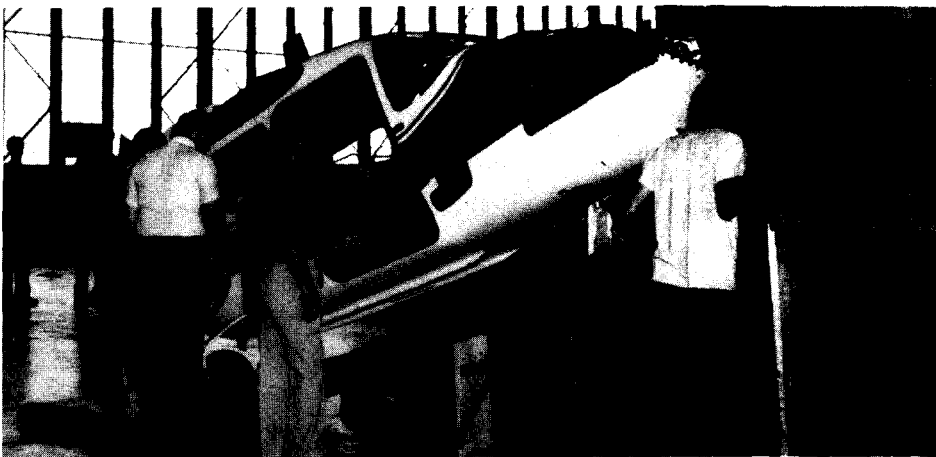
## Helicopter group saluted

Director Andy Stofan saluted members of the Helicopter Transmission System Research Program for outstanding performance and achievements over a period of years.

The program has been a cooperative effort between Lewis and the U.S. Army Aviation Research and Development Command. The purpose was to develop technology useful both for military and cost-competitive commercial application.

The program has contributed toward quieter and more efficient transmission systems having higher power-to-weight ratios with significantly improved life and reliability as compared to current state-of-the-art transmissions.

Between January 1978 and September 1982, 112 NASA technical publications resulted from this program.



**OFF TO THE AIR SHOWS ---** Fuselage of the Cessna Skymaster was loaded on a truck for exhibiting at air shows in Muskegon, Mich., and Oshkosh, Wis. Its front engine is a new type rotary. Accompanying it will be Phil Meng, project engineer, and crew of Tom Bond, Norm Prahst, Paul Antczak and Chris Wisbar. Photo by Don Huebler.

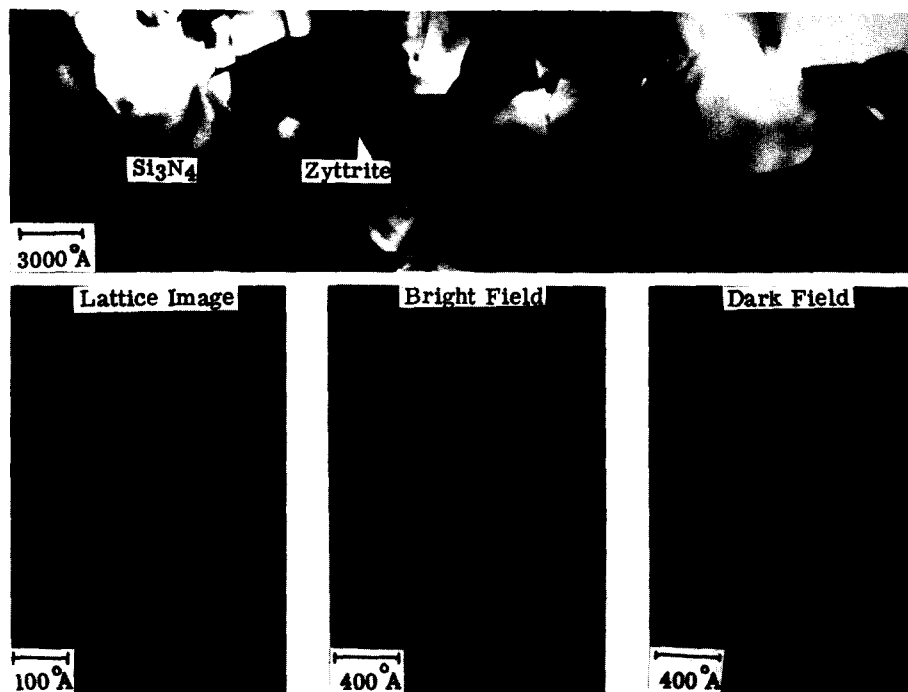
"Excellent correlation between experimental and analytical predictions of bearing and gear performance was established," Stofan said.

During the course of the program Lewis developed two unique test facilities: the 500-hp and 3000-hp helicopter transmission test stands. The program also pioneered the 500-hp hybrid transmission having up to 40 times the life of geared transmissions.

"The efforts of the Lewis team are visible not only in the U.S. helicopter industry but also in the bearing and gearing industries," Stofan wrote in his letter to team members. "Your efforts have brought favorable recognition to Lewis as a leader in mechanical components and transmission technologies throughout the world."

Erv Zaretsky headed the Bearing, Gearing and Transmission Section. □

**MICROSTRUCTURE OF A HIGH PERFORMANCE SILICON NITRIDE CERAMIC**



**WINNING ENTRY --** Bruno Buzek (Microstructural Characterization Section) and Sunil Dutta (Ceramics Section) of the Materials Division won second place (in transmission electron microscopy category) in the American Ceramic Society 86th Annual Meeting Ceramographic Contest held in April, in Pittsburgh. The contest was sponsored by the Basic Science Division of the American Ceramic Society. The duo's entry shown here, was entitled "Microstructure of a High Performance Silicon Nitride - Zyttrite (yttria stabilized zirconia) Ceramic". The photo shows a typical microstructure (top) of the Lewis developed (with Norton and Avco) material. Bright field-Dark field and Lattice imaging indicated a thin amorphous grain boundary phase. Characterization of this material at Lewis indicated a fully-dense, fine-grained microstructure with significantly improved room temperature and higher temperature strengths than those of commercial silicon nitride materials. Also, the new material exhibited very high oxidation resistance at 2500 F in air. The fully - dense, high strength and high oxidation resistance silicon nitride material has excellent potential for high temperature applications.





CD-88-3473A

## Small Business Innovation Research Program Finds Good Ideas From Private Sector Businesses

Established by the Small Business Innovation Development Act of 1982, the Small Business Innovation Research (SBIR) Program encourages small, private sector, high-technology businesses to submit proposals for innovative research, or research and development projects. The program's objectives are to stimulate technological innovation in the private sector, strengthen the role of small business in meeting Federal research and development needs, increase the commercial application of Federally supported research results, and encourage minority and disadvantaged persons in technological innovation.

Harvey Schwartz, manager of the Space Commercialization Office, said, "NASA's Office of Commercial Program, which

provides overall management of the SBIR effort, also views SBIR as a potential way for small firms to become active participants in the commercial development of space."

This year NASA will invest, nationwide, approximately \$10 million in more than 200 high-quality proposals for Phase I contract awards.

There are three phases to an SBIR cycle, with a new cycle starting each fiscal year. SBIR funds only the first two phases, although NASA program funds can be used in Phase III for projects important to one of its programs.

During Phase I the scientific and technical merit of a proposed innovation is evaluated, and the feasibility of its continued development is established. Phase

I is normally not to exceed \$50,000 and six months duration. Continued development of the most promising Phase I projects are accomplished in Phase II, which is the principal research effort as a SBIR project. Up to 24 months of effort is allowed for Phase II at a cost not to exceed \$500,000. The primary purpose of Phase III is for private sector investment to complete any needed development to bring the innovation to the marketplace.

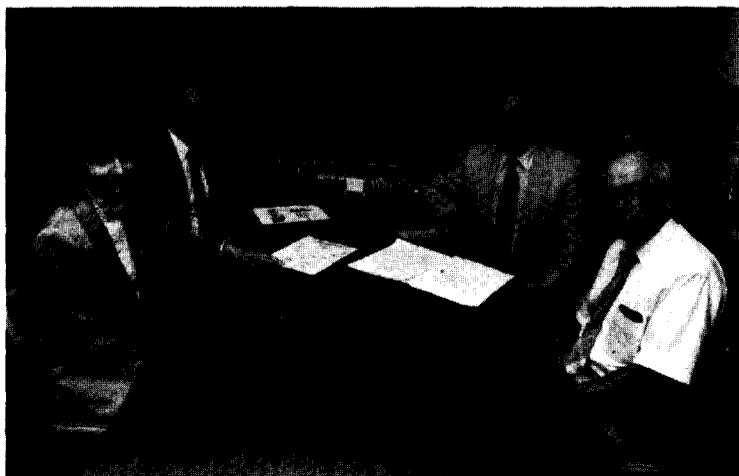
A SBIR cycle starts with the submission of subtopics from divisions having a responsibility for areas of research and technology. Each subtopic is assigned a division subtopic manager. The subtopics identify technology needs in the various technologies required for NASA programs in aeronautics and space. Subtopics, from all nine NASA centers, are published together in a SBIR Program Solicitation from which small business companies respond in the form of Phase I proposals. In 1988, Lewis has responsibilities in 24 of 150 subtopics. Four of these are shared with other centers.

The subtopic manager obtains the evaluation of Phase I proposals; each proposal must have a minimum of two evaluations. Subtopic managers also rank the proposals for the SBIR Committee. Evaluation of Phase II proposals is the responsibility of

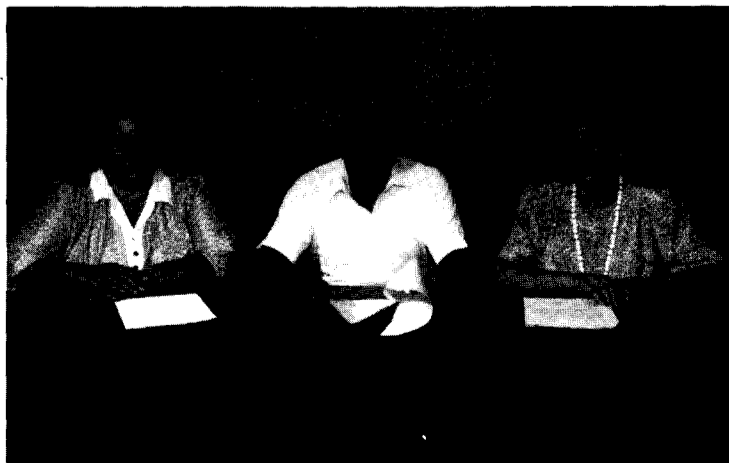


Past and present SBIR managers, seated left to right, are Francis J. Montegani, George M. Prok, the present manager, and William A. Brainard.

As the first SBIR manager, Francis Montegani laid the ground work for the SBIR Program at Lewis. He was assisted by Jean Chapman with clerical and secretarial duties and Bruce Chiccine with fiscal matters. The SBIR manager's duties passed on to Bill Brainard and in December 1987, George Prok became manager with Diane Benton performing the clerical and secretarial function. Chiccine continues to assist with fiscal matters.



Engineers in the Technology Assessment Office provide technical assistance to the Lewis SBIR manager. They are, seated from left to right, Loretta M. Shaw, David D. Renz, George M. Prok, and Robert W. Graham.



Past and present SBIR secretaries are Diane Benton, left, and Jean Chapman, right Fiscal officer is Bruce G. Chiccine, center.

CONTINUED ON NEXT PAGE

Phase I technical monitors. Three evaluators are required for Phase II proposals. Only successfully completed Phase I projects can compete for Phase II funds. Based on the history of SBIR at Lewis, more than 130 evaluators will spend about 2,600 hours evaluating Phase I and Phase II proposals for the 1988 SBIR cycle.

Final center ranking of all Phase I proposals, in order of priority, is made by the Lewis SBIR Committee, chaired by Manager George Prok. For Phase II, the Lewis SBIR Committee is presented a summary of the Phase II proposals and the evaluation results by the technical monitors. The committee determines, in priority order, the

Phase II proposals that are recommended for awards. The SBIR program office at NASA Headquarters makes the final decision on awards and announces these awards through a press release. The projection for Lewis is 30 Phase I awards for 1988. About half of these will result in Phase II awards.

When NASA Headquarters announces its selection, Procurement obtains the proposals and reviews the cost and business aspects of the offers. The Phase I pricing is relatively straightforward and is usually done by the contract specialist. For Phase II, the offer is generally more complex and requires both a NASA-written Statement of Work (which must be concurred

on by the Offeror) and the attention of a price analyst. Once the pricing is completed, the contract specialist can determine the terms and conditions, as well as the price, that are acceptable to the Government. Then, negotiations are initiated, agreement is reached, and the contract is forwarded to the Offeror for signature. When the offeror returns the signed contract, the contracting officer signs it and award is made. After contract award, Procurement performs contract administration duties that monitor the contractor's performance through final closeout.

The SBIR Procurement process is constantly under review in an effort to improve efficiency and expedite award. This year, procurement will review the recommended proposals prior to Headquarters' formal selection, an additional effort designed to shorten the time needed to accomplish award.

In the administration of the SBIR Program at Lewis, the manager receives technical assistance from the staff of the Technology Assessment Office. The Resource Analysis and Management Office assists in the fiscal management of the program. The manager also represents Lewis on the NASA SBIR Board. This board meets twice yearly at the various participating centers.

Eligible SBIR participants are those small businesses which, at the time of award of Phase I or II contracts, are independently

*CONTINUED ON NEXT PAGE*



SBIR committee members, from left to right, are Edward Willis, Jr., James Bagwell, Frank Berkopec, Karl Faymon, and Erwin Zaretsky.

The committee consists of 13 members. Each major organization that submitted a subtopic is represented on the committee. The committee ranks the Phase I and II proposals for the Center and makes award recommendations to NASA Headquarters.



SBIR subtopic managers, from left to right, are James Bagwell, Stanley Grisnik, Karl Faymon, Douglas Rohn, and Richard Parker.

Twenty-two subtopic managers are responsible for obtaining the reviews and evaluation of Phase I proposals in response to the 24 1988 subtopics. In addition, they determine the ranking of proposals within a subtopic. Over 500 Phase I proposals were received for 1988.



SBIR subtopic managers are, seated left to right, Larry Fishback, Louis J. Kiraly, and Godfrey Anzic. Standing are Guy Ribble, and Tony Ratajczak.



Aeronautics technical monitors standing in the front row, from left to right, are Gene Krejsa, Fred Newman, Susan Johnson, Waldo Acosta, and Wojciech Rostafinski. In the second row are Tom Benson, Robert Anderson, Russ Claus, Jack Oldenburg, and Dick Seasholtz.

Over 40 technical monitors were involved in SBIR Phase I and II in the past year. The photos show those who were available for pictures from the Aeronautics Directorate and the Aerospace Technology Directorate.

Two completed SBIR contracts, left, are on perfluoroether fluids as high-temperature lubricants have had an impact on work at Lewis. These lubricants, which will be used in advanced gas turbine engines or in satellite bearing systems, represent a new approach in this technology area and will reduce the cost of lubricants. From left to right are Division Technical Evaluators Wilfredo Morales and Nancy Shaw, Technicians Eugene W. Farkas, Jr., and Ronald E. Miller, Division Technical Evaluator William R. Loomis, Jr., and Technical Monitor William R. Jones.



Aerospace technical monitors standing in the front row, from left to right, are Ken Bowles, Joe Lubomski, Ed Wintucky, Les Berke, Darrell Gaydosh, and Joe Warner. In the second row are Irving Weinberg, Robert E. Jones, Bob Kerczewski, Donald Behrendt, Louis J. Kiraly, and Doug Rohn. In the third row are David Snyder, Gene E. Schwarze, John P. Jones, and Arnon Chait.



**MANNED FLIGHT AWARENESS HONOREES ERWIN ZARETSKY, LEFT, STRUCTURES DIVISION, AND RICHARD QUENTMEYER, LAUNCH VEHICLE TECHNOLOGY BRANCH, attended the launch of STS-30 (Magellan) and toured the facilities at the Kennedy Space Center as part of the program designed to honor outstanding employees. The primary objective of the Manned Flight Awareness Honoree event is to ensure astronaut safety and mission success by emphasizing to NASA and industry employees the great importance of their work. Zaretsky was honored for his engineering practice and insight to improve the reliability of the shuttle main engine bearing, which has contributed to maintaining safe launch capability. Quentmeyer was honored for his technical achievements which may lead to improvements in the space shuttle main engine main combustion chamber.**

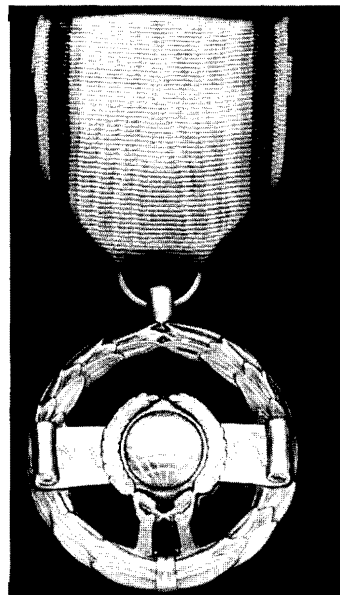


## DISTINGUISHED SERVICE MEDAL:

*John M. Klineberg*, director of LeRC, for technical direction and leadership of research and technology programs.

## EXCEPTIONAL SERVICE MEDAL:

*Kenny E. Aguilar*, deputy chief of Human Resources Management Division; *Armen S. Asadourian*, deputy chief of the Instrumentation and Data Systems Branch; *Gerald J.*



**EXCEPTIONAL SERVICE MEDAL**

*Barna*, deputy of Integration of the Center's Space Station Freedom Directorate and chief of the Systems Engineering and Integration Divisions; *Peter G. Batterton*, chief of the Supersonics and Powered Lift Branch; *Kenneth W. Baud*, aerospace engineer serving as a technical advisor to the chief of the Launch Vehicle Project Office; *Thomas H. Cochran*, deputy director of the Space Station Freedom Directorate; *James H. Diedrich*, chief of Aerodynamics, Icing, and Flight Branch; *Richard T. Gedney*, manager of the Advanced Communications Technology Satellite (ACTS) Project Office; *Howard D. Jackson*, heading Advanced Communications Technology Satellite (ACTS); *Richard B. Lancashire*, Mission Assessment and Applications Branch; *Carl F. Lorenzo*, Advanced Control Technol-

ogy Branch; *Carl E. Lowell*, deputy chief of the Materials Division; *William J. Middendorf*, chief of the Electronic and Control Systems Division; *Harold E. Neustadter*, chief of the Information Systems Service Branch in the Operations Division; *George A. Pinkas*, chief of the Structural Systems Branch; *James R. Ramler*, chief of the Space Electronics Division; *Joseph A. Saggio*, Comptroller of Lewis Research Center; *Jack A. Salzmann*, chief of the Microgravity Science and Technology Branch of the Space Experiments Division; *Francis J. Shaker*, deputy chief of the Structural Systems Dynamics Branch; *Robert J.*

Electrical Components and Systems Branch; *Theodore W. Porada*, Electronic and Control Systems; *Erwin V. Zaretsky*, Structures Division.

## EXCEPTIONAL SCIENTIFIC ACHIEVEMENT MEDAL:

*J. Anthony Powell*, Engine Sensor Technology Branch, for pioneering research and innovation in the development of silicon carbide.

## OUTSTANDING LEADERSHIP MEDAL:

*David C. Byers*, Space Propulsion Technology Division, Low Thrust Propulsion Branch, for leadership in low-thrust propulsion technology; *J. Stuart Fordyce*, director of Aerospace Technology, for management in the

**"It's the people who make things happen. It is you folks here today that are the kind of people that make NASA tick,"—NASA Deputy Administrator J.R. Thompson.**

*Shaw*, deputy chief for Applied Aerodynamics, Propulsion Systems Division.

## EXCEPTIONAL ENGINEERING ACHIEVEMENT MEDAL:

*Thomas J. Benson*, deputy chief of the Computational Methods Branch; *Lawrence J. Bober*, deputy chief of the Propeller and Acoustics Technology Branch; *Rodrick V. Chima*, acting head of the Turbomachinery Technology Branch; *Irving G. Hansen*, Power Technology Division,



**EXCEPTIONAL SCIENTIFIC MEDAL**

Aerospace Technology Directorate; *Omer F. Spurlock*, Advanced Space Analysis Office, Systems Analysis Branch chief, for identifying, recruiting, and developing high-caliber, professional engineers; *Steven V. Szabo, Jr.*, director of the Engineering Directorate, for organizing and managing the Engineering Directorate.

## GROUP ACHIEVEMENT AWARD:

Presented in recognition of outstanding management, superior technical expertise, and exemplary NASA teamwork in the design, development, and operation of the Atlas/Centaur launch vehicle and the recent successful launch of the Navy FLTSATCOM-8 communications satellite on the last NASA managed Atlas/Centaur vehicle AC-68.

*John Gibb*, Atlas/Centaur project manager, led the team which included: *Kenneth Adams*, *John Andrasik*, *Everett Armentrout*, *Bradley Baker*, *Thomas Banus*, *Kathleen Batke*, *Kenneth Baud*, *Duane Beach*, *Wilhelm Benz*, *Timothy Best*, *Earl Bloam*, *Gary Bollenbacher*, *Donald Brasted Jr.*, *John Brett*, *Thomas Burke*, *Mario Castro-Cedeno*, *William Cobo*, *Russel Corso*, *James*



**EXCEPTIONAL ENGINEERING MEDAL**

*Couch*, *Kenneth DeLaat*, *Augustine Delaney*, *Annie Easley*, *Robert Edwards*, *David Evans*, *Ronald Everett*, *Walter Fenning*, *Richard Flage*, *Wilson Ford*, *Randall Furnas*, *Lawrence Gentile*, *Gary Golinski*, *Theresa Goodwin*, *Scott Graham*, *Vincent Grebe*, *Frank Greco*, *William Groesbeck*, *Klaus Gumto*, *Nancy Horton*, *Rudolph Inglesias*, *Rill Ingle*, *Robert Jabo*, *Thomas Jentner*, *Richard Kalo*, *Harold Kasper*, *Michael Kinkelaar*, *Martin Kisel Jr.*, *William Klein*, *John Klineberg*, *Paul Kuebeler*, *Ralph Kuivinen*, *Raymond Lacovic*, *Vincent Lalli*, *Raymond Larcovic*, *Vincent Lalli*, *Raymond Lark*, *Kuan Lee*, *Michael Makinen*, *William Mason*, *James McAleese*, *Robert Metroka*, *William Middendorf*, *Robert Miller*, *Theodore Mockler*, *Carl Monnin*, *Edwin Muckley*, *Thomas Niezgodza*, *Donald Noga*, *Cecil O'Dear*, *Richard Oeftering*, *Richard Orzechowski*, *Donald Perdue*, *Clarence Pierce*, *David Plachta*, *Edwin Procasky*, *Debra Rak*, *John Reagan*, *David Repas*, *William Rice*, *Jean Rogers*, *Robert Robal*, *Dennis Rohn*, *Francis Rooker*, *Lawrence Ross*, *Harold Sample*, *Rafael Sanabria*, *Noel Sargent*, *Lois Scaglione*, *George Schaefer*, *Eugene Schiopota*, *William Schoren*, *Margaret Schuler*, *Thomas Seeholzer*, *Karen Sherman*, *Jack Shinn*, *Michael Skor*, *Robert*

*Smith Jr.*, *Gerald Snyder*, *Isadore Sonkin*, *Earl Sprague*, *Cynthia Stepka*, *Margie Studley*, *Steven Szabo Jr.*, *Andrew Szaniszlo*, *Thomas Tokmenko*, *Dennis Vanco*, *Mary Kay Varholick*, *Vernon Weyers*, *Ulrich Wiedenmannott*, *Lynne Wiersma*, *Stephen Wiersma*, *Joseph Wikete*.

## DISTINGUISHED PUBLICATION AWARD:

*Khairul Zaman*, *Daniel J. McKinzie*, *Christopher L. Rumsey*, in recognition of their publication "A Natural Low-Frequency Oscillation of the Flow Over an Airfoil Near Stalling Conditions?"

## FIFTY-YEAR SERVICE EMBLEM:

*C. Robert Morse*, Operations Engineer, Aeropropulsion Facilities and Experiments Division.

## FORTY-FIVE-YEAR SERVICE EMBLEM:

*Richard H. Cavicchi*, aerospace engineer, Internal Fluid Mechanics Division; *Roger W.*



**EXCEPTIONAL LEADERSHIP MEDAL**

*Luidens*, aerospace engineer, Aeropropulsion Analysis Office.

## FORTY-YEAR SERVICE EMBLEM:

*Robert W. Graham*, chief of Technology Assessment Office, Office of Interagency and Industry Programs; *Arthur E. Sprungle*, mechanical engineering Technician, Propulsion and Fluid Systems Division.

## News Notes



Zaretsky

**Zaretsky Named Fellow of STLE:** Erwin Zaretsky, chief engineer in the Structures Division, recently was named a Fellow of The Society of Tribologists and Lubrica-

tion Engineers (STLE).

Zaretsky has over 35 years of experience in mechanical engineering related to rotating machinery and tribology. He

has performed pioneering research in rolling-element fatigue, elastrohydrodynamic and high temperature lubrication, high-speed rolling bearings, ceramic and hybrid bearings, gearing, and probabilistic life prediction.

Zaretsky's work resulted in the first successful long-life, ultra-high speed rolling element bearings, and significantly improved ball and roller bearing life and reliability. He is the recipient of the NASA Medal for Exceptional Engineering Achievement and has recieved four IR-100 Awards. Zaretsky also has written over 150 technical papers and books, and has lectured widely throughout the United States, Europe, Asia, and the Middle East. He

teaches courses in rolling bearing technology at the University of Wisconsin, Milwaukee, Center for Continuing Education. He also has taught machine design as a member of the adjunct faculty at Cleveland State University.

Zaretsky received a bachelor of science degree in mechanical engineering from Illinois Institute of Technology in 1957 and a Juris Doctor from Cleveland State University in 1963. He also is a Fellow of the American Society of Mechanical Engineers.

# Lewis employees receive 1997 Honor Awards

**O**N July 7, Center Director Donald Campbell and Chairman, President, and CEO of the Geon Company William Patient presented plaques and medals to NASA Lewis employees and members of external organizations for their outstanding contributions.

## Forty-Year Service Awards

Presented to **Kenneth Bowles**, Polymers Branch; **Donald Brasted**, Scientific Applications Development Branch; **Richard DeWitt**, Fluid Flight Projects Branch; **Joseph Eisenberg**, Subsonic Systems Office; **Frederick Harris**, Engineering Technology Branch; **John Holloran**, Polymers Branch; **Robert Hendricks**, Research and Technology Directorate; **David Herb**, Construction Management Branch; **Daniel Larson**, Facilities Architectural Civil Structural Systems Management Branch; **Carl Lorenzo**, Instrumentation and Control Division; **Bonnie McBride**, Combustion Branch; **Roy Springborn**, Thermal and Fluid Systems Design and Analysis Branch; **Edward Stefonsky**, Combustion Flight Projects Branch; and **Erwin Zaretsky**, Structures and Acoustics Division.

## Forty-Five-Year Service Awards

Presented to **Robert Friedman**, Microgravity Combustion Science Branch, and **George Succop**, Life Prediction Branch.

## Distinguished Publication Award

Presented to **Paul Greenberg**, **Robert Klimek**, and **Donald Buchele** in recognition of the excellence and value to their publication titled, "Quantitative Rainbow Schlieren Deflectometry."

## Abe Silverstein Medal for Outstanding Research Leading to Practical Applications

Presented to **Don Roth** for exceptional achievement in advancing the development of and transferring the technology for an innovative ultrasonic imaging method for aerospace materials characterization.

## Presidential Rank Award

*Meritorious Executive*—Presented to **William Masica** for sustained superior accomplishment in management of programs of the United States government and for noteworthy achievement of quality and efficiency in the public service.

## Exceptional Service Medal



Presented to **Ronald Alexander** for outstanding leadership in promoting the managing and valuing of diversity, and demonstrating NASA Lewis' importance to key policymakers and stakeholders.

Presented to **Luis Beltran** for outstanding technical contributions to NASA's aeroacoustic research programs and exceptional outreach in the Cleveland Area Hispanic community.

Presented to **Stanley Borowski** for exceptional and

innovative advancement of space propulsion system readiness for the next chapter of human and robotic exploration of the solar system.

Presented to **Robert Friedman** for exceptional contributions to NASA's research program, policies, and practices toward assured fire safety onboard aircraft and habitable spacecraft.

Presented to **Herbert Gladden** for his unique, outstanding contributions to the understanding and solution of high temperature heat transfer problems in aeropropulsion systems.

Presented to **Jeffrey Haas** for outstanding leadership in promoting Total Quality principles within the Aeropropulsion Facilities and Experiments Division and exemplary management of the Aeronautics Directorate test facilities.

Presented to **Steven Johnson** for outstanding contributions to engineering and integration efforts for the Space Station Program and to risk mitigation in joint U.S./Russian programs.

Presented to **Mary Ann Meador** for her contributions toward understanding high temperature polymeric materials and her outstanding effort and participation in support of Center goals.

Presented to **Edward Meleason** for outstanding leadership and dedication in defining, managing, and conducting research in the advancement of U.S. airbreathing propulsion technology.

Presented to **Kathleen Needham** for outstanding service that significantly contributed to the quality of procurements at NASA Lewis.

Presented to **Joan Oravec** for exceptional leadership in delivering computational capability to NASA Lewis and for being a key player in many critical Center and Agency initiatives.

Presented to **Barbara Perkowski** for developing a system that allows the External Programs Directorate to respond to customers' needs and requests in a timely and more efficient manner.

Presented to **David Petrarca** for sustained outstanding performance in numerous space experiments.

Presented to **Richard Ranaudo** for outstanding technical contributions to NASA's icing and aeroacoustics flight research programs and the impact he has had on flight safety.

Presented to **Gloria Richards** for exemplary secretarial performance, initiative, and leadership, which significantly contributed to effective operation of the Aeronautics Directorate.

Presented to **Joseph Roche** for exceptional leadership and superb engineering in support of the Solar Dynamic Flight Demonstration and Rocket-Based Combined Cycle Vehicle projects.



AUGUST 1999

# PEOPLE

**Erwin Zaretsky**, NASA Glenn's chief engineer for structures and acoustics, recently received the Society of

Tribologists and Lubrication Engineers' Wilbur Deutsch Memorial Award for his paper "A. Palmgren Revisited—A Basis for Bearing Life Prediction." The award recognizes NASA Glenn's



*Zaretsky*

ongoing contributions as exemplified by Zaretsky to the field of tribology and mechanical component life prediction methodology. It also honors the research conducted at NASA Glenn over the past 4 decades. That research has resulted in an improvement in aircraft engine bearing life of over 200 times and has had a similar impact on ball and roller bearings used in industrial rotating machinery and automotive and truck applications.

# onor Awards

Presented to **Robert Jones** for outstanding leadership, customer focus, and dedication in providing essential institutional services that support the Center's mission.

Presented to **Mary Lester** for exceptional contributions to the management of major Agency programs and projects.

Presented to **Wilfredo Morales** for contributing to NASA's mission by developing innovative, high-temperature, liquid lubricant formulations for aerospace and industrial applications.

Presented to **Marsha Nall** for leadership in championing the needs of the research community and its payload developers throughout the International Space Station payload integration process.

Presented to **Lori Pietravoia** for significant contributions in employee and labor relations with an emphasis on partnerships.

Presented to **Robert Romanofsky** for sustained innovative and creative technology development applicable to future communication systems.

Presented to **Jaiwon Shin** for exceptional management and technical contributions to aviation safety including aircraft icing research.

Presented to **John Whittenberger** for an exceptional career in the research and development of advanced aerospace materials.

## *Group Achievement Award*

Presented to six members of the **Computational Materials Group** for unique contributions to computational alloy design that bridged the quantum world to the experimental material world.

Presented to 25 members of the **Earth Orbiter-1 Pulsed Plasma Thruster Testing Team** for successful acceptance testing of the Earth Orbiter-1 Pulsed Plasma Thruster.

Presented to 10 members of the **Glenn Electrical Power System Subsystem Management Team** for exceptional technical oversight of the electrical power system development for the International Space Station.

Presented to 89 members of the **1997-98 Glenn FIRST (For Inspiration and Recognition of Science and Technology) Team** for outstanding achievement in promoting a Glenn partnership with Cleveland East Technical High School and a systemic education program that highlights academic performance, technical development, and community participation.

Presented to seven members of the **NASA Preparatory Team for the 1997 World Radio Conference** for the development and advocacy of key



spectrum allocation proposals that contributed to the success of the U.S. Delegation to the 1997 World Radio Communications Conference.

Presented to 35 members of the **Outcome-Goal-Based System Studies of OASTT Programs Study Team** for outstanding effort to quantify the contributions of each OASTT program element to the Aeronautics Pillar goals.

Presented to 10 members of the **Telemedicine Applications Team** for exceptional innovation and collaboration with medical research institutions in the application of NASA communication and network technologies to advance the telemedicine field.

## *Public Service Medal*

Presented to **Rafat Ansari** for pioneering work in the use of compact fiber-optic-based, laser light-scattering probe for detection and prevention of eye diseases.

Presented to **Mrityunjay Singh** for outstanding contributions to ceramics that have impacted the course of the High Speed Research Project and space transportation technology and given new industrial capabilities in ceramics via technology development and transfer.

## *Distinguished Publication Award*

Presented to **Robert Berg, Richard Ferrell, Robert Gammon, Hong Hao, William Johnson, Michael Moldover, R. Allen Wilkinson, and Gregory Zimmerli** in recognition of the excellence and value of their publication "Equilibration Near the Liquid-Vapor Critical Point in Microgravity."

## *Forty-Year Service Award*

Presented to **Gerald Brown, Ralph Garlick, Ojars Klans, Richard Shaltens, and Martin Stupiansky**.

## *Forty-Five-Year Service Award*

Presented to **Earl Hanes** and **Robert Siegel**.

## *Senior Executive Service Appointments*

**Lawrence Bober, Randall Furnas, Jeffrey Haas, and Louis Kiraly**.

## *Senior Scientific and Professional Corps Promotions*

**John Adamczyk, Isaiah Blankson, Christos Chamis, Marvin Goldstein, Gary Halford, Robert Hendricks, Louis Povinelli, Robert Siegel, Anthony Strazisar, and Erwin Zaretsky.** ♦



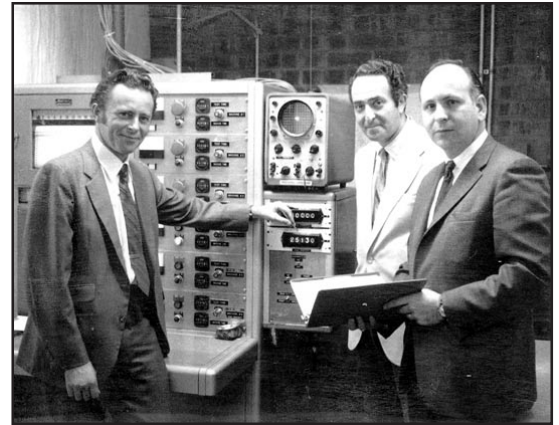


# Celebrating DN Bearing's 30th anniversary

June 29, 2003, marked the 30<sup>th</sup> anniversary of a new era in bearing technology that began in a Glenn test rig. On that date in 1973, a test rig was activated with two specially designed angular-contact ball bearings set to simulate the operation of the main shaft of an advanced turbine aircraft engine with the speed set at  $3 \times 10^6$  DN. A technological breakthrough was achieved 2500 test hours later—the longest lived, high-speed bearings had survived, issuing in the era of the ultra-high-speed, rolling-element bearing.

Up until then, working knowledge on bearing technology was limited to  $2 \times 10^6$  DN. The pioneering research and the development of enabling lubricant and material technology for the  $3 \times 10^6$  DN bearing was initiated in 1959 at NASA Lewis (Glenn) by Erwin Zaretsky, now chief engineer in the Structures and Acoustics Division, in collaboration with industry partners Hans Signer, Industrial Tectonics, Inc., Rancho Dominguez, CA, and Eric Bamberger, General Electric Co., Evansdale, OH.

"We ran a total of 30 specially designed and manufactured 120-mm-bore angular-contact ball bearings at 25,000 rpm ( $120\text{mm} \times 25000 \text{ rpm} = 3 \times 10^6$  DN) for an accumulated total of 74,800 test hours," Zaretsky recalled.



*Working together as a team under NASA sponsorship, left to right, Hans Signer (ITI), Eric Bamberger (GE) and Erwin Zaretsky (NASA) designed and operated the first successful 3 million DN bearings on June 29, 1973.*

Using a high-speed pulley-belt arrangement as a drive, Signer and Zaretsky designed the test rig. They also designed the  $3 \times 10^6$  DN bearing using a high-speed-bearing dynamics computer code developed by Tedric Harris, SKF Industries, King of Prussia, PA, for NASA. This code was the first of its type that incorporated both thermal and elasto-hydrodynamic analysis. Bamberger was responsible for the lubricant and materials used in the bearing. The bearings were manufactured from a single heat of VIM-VAR AISI M-50 steel, using a double-vacuum process for the first time for this purpose. A concept that the researchers name "Bearing Thermal Management" employed both under-ring lubrication and outer-ring cooling. This enabled bearing operating temperatures to increase  $50^\circ\text{F}$  to  $425^\circ\text{F}$  from the then state-of-the-art bearing temperature of  $375^\circ\text{F}$ .

At  $3 \times 10^6$  DN the bearing life was over 23 times that achievable for state-of-the-art single-vacuum-melted (VAR) AISI M-50 steel bearings. As a result of this technological innovation, Zaretsky, Singer, and Bamberger received an *Industrial Research Magazine* IR 100 Award in 1975, now known as the *R&D 100*. In the 3 decades that have passed, this technology has been incorporated into the specifications, design, and manufacture of all aircraft engine bearings.

# People

## Awards

Four Glenn employees will be honored at the 3<sup>rd</sup> Annual Women of Color (WOC) Research Sciences and Technology Conference September 12 and 13. Sponsored by *USBE & Information Technology* magazine, the event celebrates the contributions of distinguished Hispanic, Asian American, Native American, and Black women who through their hard work and perseverance have excelled in the fields of research science and technology in government, industry and academia, while inspiring those that will follow.

WOC Emerald Awards will be presented to **Doris Britton**, Power and On-Board Propulsion Technology Division, for Technical Innovation; **Terri Rodgers**, Systems Management Office, for Professional Achievement; and **Dr. Afroz Zaman**, Applied RF Technology Branch, for Research Leadership. A Certificate of Achievement for a Young Scientist will be presented to **Concha Reid**, Power and On-Board Propulsion Technology Division, recognizing her as one of America's future technology leaders.

For more information about the WOC conference and awards visit <http://www.womenofcolor.net/NashvilleRST/index.htm>.

**Erwin Zaretsky**, chief engineer for the Structures and Acoustics Division, was recently honored by Northern Illinois University, Dekalb, IL, for his long and distinguished service on their Board of Executive Advisors for the College of Engineering and Engineering Technology.



*Britton*



*Reid*



*Rodgers*



*Dr. Zaman*



*Zaretsky*

# Silver Snoopy awards



Continued from page 2

**Glenn L. Williams**, Engineering Development Division, for leadership and technical expertise resulting in the design and development of the major avionics packages for the two largest, most complex space flight experiments (CM-1 and CM-2) ever flown in the Spacelab and SPACE-HAB modules.

**Dr. Zeng-Guang Yuan**, Microgravity Division, as the deputy project scientist for Laminar Soot Processes (LSP) 1 and LSP 2 that flew on *Columbia* in 1997 and again on STS-107 in 2003.

**Edwin Zaretsky**, Structures and Acoustics Division, for expertise in tribology of mechanical systems that have been instrumental in identifying potential shuttle rudder and speed brake actuators failure modes. ♦

## **Honor Awards**

Continued from page 3

and contributing significantly to the valuing and affirming of diversity among the Center's workforce. Through the many and varied activities it has conducted or supported over the past year, the NAAC has effectively promoted the achievement and value of diversity.

Team members: *James B. Jackson, George R. Harpster, Avis V. Hudson, Jeremy W. John, Mark W. Manthey, Raquel L. Redhouse, Denise R. Busch, and Joseph W. Connolly*

### **Senior Executive Service Appointments**

*Thomas W. Hartline*, director, Office of Safety and Mission Assurance Directorate

*William R. Humphries*, deputy director, Space Flight Systems Directorate

*Robert W. Morehead*, director, Space Flight Systems Directorate

*George R. Schmidt*, deputy director, Research and Technology Directorate

*David L. Stringer*, manager, Plum Brook Station

### **Career Service Awards**

#### **Fifty-Years of Service**

*Dr. Robert C. Hendricks*

*David M. Herb* (retired)

*Erwin V. Zaretsky*

#### **Forty-Five Years of Service**

*Clifford H. Arth*

*Ernest Bertone II*

*Ihor Kramarchuk*

*John J. Svoboda*

*Dr. Roy C. Tew, Jr.*

#### **Forty-Years of Service**

*Robert C. Anderson*

*Elmer C. Bartels*

*Leo A. Burkardt*

*Robert L. Cataldo*

*Dr. Christos C. Chamis*

*Daniel D. Chrulski* (retired)

*John W. Gaff* (retired)

*Dr. Marvin E. Goldstein*

*Dr. Hugh R. Gray*

*Albert L. Johns*

*Robert S. Mattingly*

*Dr. Jeffrey H. Miles*

*Thomas C. Murray*

*Edward J. Pluta* (retired)

*Stephen M. Riddlebaugh*

*John E. Rohde* (retired)

*David A. Sagerser*

*Lawrence J. Schroeder, Jr.*

*Ronald L. Shaw* (retired)

*Carl L. Silski*

*Wendell White*

*Richard P. Woodward*

## Senior Technologists Provide Valuable Resource

By Doreen Zudell

"Technical excellence" is more than a catch phrase to 10 Glenn researchers who have achieved the status of Senior Technologists (ST). These men have dedicated their careers to research that has led to the fundamental understanding and advancement of technology.



*Glenn's Senior Technologists, standing, left to right, Dr. Goldstein, Dr. Blankson, Dr. DiCarlo, Dr. Strazisar, Dr. Hendricks, Dr. Smialek, seated, left to right, Zaretsky, Dr. Chamis, Dr. Povinelli and Dr. Steinetz. Credit: NASA/Marvin Smith*

"A Senior Technologist is the highest rank you can achieve within the agency without having management duties," explained Glenn's Chief Scientist and ST Dr. Tony Strazisar. "To achieve this status, scientists or engineers significantly contributed to technological advances, authored papers that are widely used and cited, received honors from major professional organizations for their accomplishments and contributions and served as advisors or consultants on scientific and technological problems that extend beyond their specialties."

Glenn's STs have earned reputations as authorities in a variety of specialties such as turbomachinery, ceramics and composites, fluid mechanics, seals, bearings, turbulence and propulsion systems. While some STs work independently on research and development, others participate in or lead teams.

Dr. Bruce Steinetz, who achieved the rank of ST last August, specializes in the development of advanced seal technology for extreme environments for the agency's aeronautics and space projects. He and his teams have applied, or are currently applying, this expertise to projects relating to the space shuttle, Atlas V Launch Vehicle and the new Orion Crew Module. Steinetz and colleague Pat Dunlap, Mechanical Components Branch, earned the 2004 NASA Invention of the Year Award for their work in

developing a thermal barrier and solid rocket motor joint design for the space shuttle and Atlas V.

In addition to conducting research, STs are relied on to build strong relationships with their government and industry counterparts so that they can acquire and disseminate the latest advances in technology to the agency. STs also provide leadership participation in program reviews and create or build research endeavors to ensure Glenn's technical leadership.

Because of their expertise, experience and connections, STs are well sought-out mentors and advisors. "STs serve as neutral players that have the ability to work across division and directorate levels, therefore engendering new programs and projects," said ST Isaiah Blankson. "The ST group welcomes opportunities to meet with divisions and/or individuals to discuss how we can be a resource for promoting and advancing technology."

Center Director Dr. Woodrow Whitlow Jr. affirms the value of Glenn's STs. "Our Senior Technologists are our most accomplished researchers who have earned international reputations for their technical excellence," he said. "They are a resource that is extremely valuable to Glenn Research Center in meeting our commitments to the agency."

The following is a list of Glenn's STs and their specialties:

### **Dr. Isaiah Blankson**

**Specialty:** Hypersonics/Aerodynamics and Propulsion  
Dr. Blankson's specialty areas include air-breathing hypersonic aerodynamics and propulsion, plasmas and electromagnetic interactions in gas dynamics, magnetic levitation systems and advanced millimeter-wave imaging technologies for aviation safety and homeland security. In addition, as part of NASA's Fundamental Aeronautics Program, he has formulated and instituted a research program in plasma and magnetohydrodynamics (MHD) Interactions in Aerodynamics and Propulsion.

### **Dr. Christos Chamis**

**Specialty:** Computational Structures, Design and Reliability

Over the past four decades, Dr. Chamis has developed new theories, solutions, techniques and algorithms, and currently is leading research for the development of three-dimensional, inelastic methods for hot structures, structural tailoring methods for engine structures, engine structures computational simulator (first phase), probabilistic structural analysis and structural fracture.

### **Dr. James DiCarlo**

**Specialty:** High-Temperature Ceramics and Composites  
Dr. DiCarlo has worked for over 35 years on the deformation and fracture mechanisms of structural

Continued on Page 3

## Senior Technologists

Continued from Page 2

materials. He has gained national and international recognition in the area of understanding and modeling the properties and time/temperature mechanical behavior of ceramic fibers and metal and ceramic matrix composites.

### **Dr. Marvin Goldstein**

Specialty: Aeronautics/Unsteady Fluid Mechanics/Turbulence

Dr. Goldstein served as the Chief Scientist at the NASA Glenn from 1980 to 2004. His technical accomplishments include a long list of "firsts," including the development of an explanation for boundary layer receptivity to free-stream disturbances, a rational analysis of oblique wave model interactions in shear layers, the theory for the so-called Klebanoff modes that are observed in boundary layers at high to moderate levels of free-stream turbulence levels and an analytical solution for the problem of flutter in a cascade with strong passage shock waves.

### **Dr. Robert Hendricks**

Specialty: Bearings/Seals/Secondary Flow

Dr. Hendricks' successful operation of the liquid oxygen (LOX) ammonia-manned rated rocket engine turned to providing critical heat transfer design data for fluid hydrogen, now used in all LOX-hydrogen engines including the Space Shuttle Main Engine (SSME) and crew and cargo vehicle (J2-X and S) engines. He received the NASA Medal for Exceptional Scientific Research for this effort. Work with cryogenics, hydrogen and oxygen led to the development of widely used thermophysical property codes GASP and WASP. This work has provided fundamental understanding of boiling, two-phase flows, supercritical and near-critical fluid behavior.

### **Dr. Louis Povinelli**

Specialty: Propulsion Systems

Dr. Povinelli's professional accomplishments have contributed to the advancement of aeronautics and astronautics in several areas including air-breathing propulsion, scramjet propulsion, rocket propulsion and pulse detonation engines. His activities at NASA Glenn involved research on turbine aerodynamics, inlets, diffusers, mixers and nozzles, turbomachinery, computational fluid dynamics (CFD) validation, scramjet fuel injection, hypersonic propulsion systems and rocket combustion instability and real gas effects in pulse detonation cycles. Dr. Povinelli currently serves as an agency project scientist for the Supersonics Project of the Fundamental Aeronautics Program.

### **Dr. James Smialek**

Specialty: High-Temperature Oxidation and Coatings

Since 1968, Dr. Smialek has worked to advance the science and development of oxidation-resistant, high-temperature materials for aircraft engine components. His innovative research regarding high-temperature oxidation mechanisms has been widely recognized and adopted: for

example, producing ultralow sulfur levels in single-crystal superalloys, demonstrating hot corrosion and scale volatility reactions for ceramic matrix composites and modeling cyclic oxidation kinetic behavior.

### **Dr. Bruce Steinetz**

Specialty: High-Temperature Seals

Dr. Steinetz is recognized as the agency expert on seal technology and tribology for extreme environments found in both aeronautic and space applications. He developed and patented a braided carbon fiber rope thermal barrier for the Space Shuttle Solid Rocket Booster Nozzle to prevent hot (5500 °F) gas effects on nozzle joint Viton O-rings. The thermal barrier has flown four times on the Atlas V launch vehicle, including the recent Pluto New Horizons Mission.

### **Dr. Anthony Strazisar**

Specialty: Turbomachinery

Dr. Strazisar has more than 30 years of experience in turbomachinery aerodynamics research and advanced measurement techniques. Since 1991, Dr. Strazisar has been a Senior Technologist responsible for the design and execution of turbomachinery experiments in support of CFD code model development and validation. He has served as NASA Glenn's Chief Scientist since 2004. In that capacity he serves as a technical advisor to the senior staff and is responsible for management of Glenn's Independent Research and Development Fund.

### **Erwin Zaretsky**

Specialty: Tribology/Bearings/Lubrication Rotating Machinery and Life Prediction

Zaretsky is a noted speaker, writer and consultant to both government and industry. He has over 45 years of experience in mechanical engineering related to rotating machinery and tribology. He has performed pioneering research in rolling-element fatigue, lubrication and probabilistic life prediction. His contributions to the space program have earned him numerous awards, among which are the NASA Medal for Exceptional Engineering Achievement, NESC Director's Award and the Astronauts' Silver Snoopy Award.

*Editor's Note:* Dr. John Adamczyk, who specializes in Turbomachinery Flow Modeling, retired as an ST in February. He is currently working as a Distinguished Research Associate and will continue to offer advice and consultation on turbomachinery research issues to the Glenn staff on a part-time basis. Dr. Adamczyk has been actively involved in the analysis of turbomachinery flows for 40 years. A significant early accomplishment was the development of four unsteady aerodynamic analyses for predicting flutter in high-speed fan stages, two of which are in widely used in industry. He also developed a unified methodology for simulating multistage turbomachinery flows, which has resulted in the APNASA computer code. The methodology upon which APNASA is based has led to significant reductions in the design cycle time for multistage turbomachinery.

## Where He Belongs

When Erwin Zaretsky interviewed with NACA in 1957, he was looking for a temporary position. About to graduate college as a mechanical engineer and U.S. Air Force officer, he was scheduled

for active duty later that year. Little did he know that after a year and a half of duty in Asia, the Air Force would station him right back where he was when he left—at NASA Lewis. In 1960, Zaretsky completed his active military service and joined NASA's civilian staff as a materials research engineer.

"The depth of technical expertise here was immense," Zaretsky said. "The people were outstanding, the work was a challenge, and we were making contributions that had an impact."

One of his biggest contributions was improving rolling-element bearings for aircraft engines. In the 1950s, experts predicted that the speed and temperature of aircraft engine bearings would increase dramatically during coming decades. To address the predicted increase, Zaretsky and his colleagues set out to develop ball and roller bearings that would run faster, withstand higher temperatures and last longer.

"By 1973, we achieved bearings temperatures up to 600 degrees Fahrenheit. They operated two times faster and lasted 40 times longer than when we started," he said. "That technology is now flying in commercial and military aircraft."

Today, Zaretsky is chief engineer in the Materials and Structures Division. He has developed patented technology, earned numerous awards, published two books and more than 180 papers, and traveled all over the world as a speaker.

"It's been a nice experience," Zaretsky said. "I don't think I could have done that anywhere but NASA."



*Zaretsky*

## Celebrating Apollo 11's Historic Mission

The Apollo 11 mission's 40<sup>th</sup> anniversary was a welcomed stimulus to heighten awareness of NASA's impact on the history of space exploration and development of spacecraft for the next generation of explorers.

Throughout the year, NASA Glenn staff led or supported a variety of activities/events to commemorate the Apollo 11 mission (July 20, 1969)—when humans first walked on the moon. Below are some of the events:

- Pop-ups, banners and exhibits relating to the Apollo era were on display at the FIRST (Robotic) Buckeye Regional Competition and the Cleveland Air Show, Cleveland, Ohio; Neil Armstrong Museum, Wapakoneta, Ohio; Dayton Air Show, Dayton, Ohio; and the EAA Airadventure, Oshkosh, Wis.
- Glenn's Speakers Bureau members gave 12 presentations on the Apollo 11 era to organizations throughout the Cleveland area and across our six-state outreach areas.
- Apollo 11 video tribute and exhibit at the "Rocket Scientists" concert in Lakewood, Ohio in March, was reprised at the Ingenuity Festival in July.

*Guests for the onsite panel discussion included, left to right: former Center Director Larry Ross, John Nieberding, Erwin Zaretsky, Robert Hendricks and Louis Povinelli.*



2009-02140

Photo by Bridget Caswell

- In April, WKYC Channel 3 (Cleveland) partnered with Glenn to present a high-definition, hour-long prime time special, "To the Moon: Ohio's Journey," showcasing the Northeast Ohio region's contributions to America's space program. It featured interviews with Glenn managers, staff and former astronauts, and showed archive tapes and a glimpse of the next generation of moon exploration. The special aired again on July 20.
- Glenn's Learning Center offered "Exploration: A Curriculum of NASA History and Space Science Programs," featuring an extensive collection of DVD programs covering every aspect of NASA history, including Apollo 11, this year.

- *AeroSpace Frontiers* highlighted some of NASA Glenn's contributions to the Apollo program and the Agency's future exploration activities in the July issue.
- On July 18, record-breaking crowds attended the Visitor Center's Third Saturday Event, "Return to the Moon," featuring tours of facilities used in developing Apollo missions and presentations that explored NASA's ongoing work spacecraft development.
- Glenn's onsite celebration of the 40<sup>th</sup> anniversary, July 20, featured historic videos and a panel of five current and retiree employees who discussed their contributions to the mission.

—BY S. JENISE VERIS



# Aerospace Frontiers September 2012



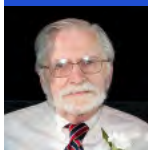
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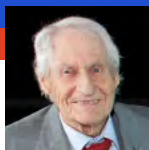
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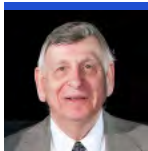
Anderson



Cavicchi



Hendricks



Zaretsky



Roberts



Wozniak

## NASA 50 YEARS HONOREES OCTOBER 1, 1958 – OCTOBER 1, 2008

We express our sincere appreciation, profound admiration and pride as we celebrate your dedication and commitment to the Glenn Research Center and NASA.

**Bernhard H. Anderson**

**Richard H. Cavicchi**

**Earl R. Hanes**

**Robert C. Hendricks**

**Erwin V. Zaretsky**

## ABE SILVERSTEIN AWARD

**Gary D. Roberts**

For contributions in the development of composite structural concepts for fan containment and lightweight rotocraft gear systems and for contributions to aviation safety.

It was a busy summer for Glenn mentors and staff of the Educational Programs Office and Paragon TEC, Inc./Team Momentum, who hosted over 130 interns, including 29 Glenn High School Internship Project (GHIP) students.

In addition to tours, workshops, special seminars and work assignments offered in a traditional internship at Lewis Field and Plum Brook Station, several high school interns explored new opportunities beyond the gates.

“This year, Glenn’s High School Internship Project placed greater emphasis on partnering with local organizations to foster awareness and prepare the next generation for science, technology, engineering and math (STEM) career opportunities in greater Cleveland,” said Lynne Sammon, GHIP project manager.

## Two New Opportunities

In addition to offering the GHIP/Cleveland Clinic Internship, which provides STEM and medical educational experiences. Glenn, now, partners in the University Circle Inc.’s Future Connections (FC) Intern Program and a GHIP/Small Business Innovation Program (SBIR) pilot.

Throughout the summer, five GHIP students participated in the FC program, while another five interned in the SBIR pilot. The FC Intern Program provides 8-week paid internships to high school students entering their senior year from primarily Cleveland and Lorain school districts. Thirty-three



*NASA mentor Erwin Zaretsky, second from left, briefs GHIP/SBIR interns on NASA technology developed with a small, local company.*

local organizations partner to provide learning experiences, in 4-week increments, promoting personal and career development.

The GHIP/SBIR pilot paired them with mentors supporting the SBIR program as technical monitors for small business development in greater Cleveland. They toured and met managers and interns from four local businesses to understand what they do, how NASA technology can improve or advance their product, and learn about STEM career opportunities.

—By S. Jenise Veris



## A century of aerospace achievement

*What was it like to work here when NASA was NACA? Over the coming months, we will share a few memories of NACA employees still working at the center. Our fourth profile is Erwin Zaretsky, who works as a Distinguished Research Associate in the Rotating and Drive Systems Branch, Materials and Structures Division.*

### Erw Zaretsky

**Q.** How did you begin your career at NACA?

**A.** I was “strongly encouraged” to attend a NACA interview arranged by my heat transfer professor, despite my plans to enter the Air Force and flight school to become a pilot. The recruiters persuaded me to work at NACA for the 6 weeks prior to reporting to active duty. They had suggested I go to flight school, then return to become one of NACA’s test pilots. Instead, I got immersed in lubrication/bearings research and the rest is history.

**Q.** What do you remember most about the workforce culture of the early years?

**A.** What really amazed me was the esprit de corps that the staff had for the agency and camaraderie among



*Zaretsky*

**A.** The caliber and capability of the staff has remained very high. However, I believe they are less empowered to peruse pioneering research commensurate to NACA/NASA goals and missions due to monetary and organizational constraints.

**Q.** Who stands out among those you have mentored over your career?

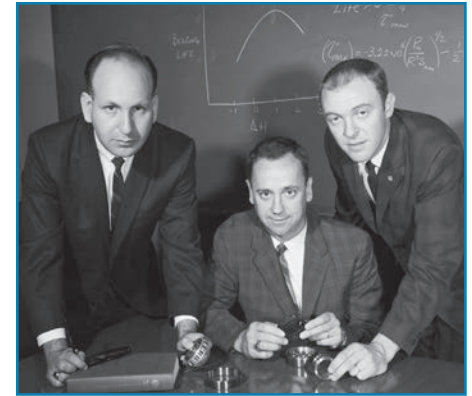
**A.** The late Richard Parker, Stuart Loewenthal and Dr. John Coy, stand out from my early career. More recently, I would say Dr. Bruce Steinetz, who specialized in traction drives and seals, and Dr. David Lewicki, whose expertise is research in gearbox life and reliability impacting maintenance and durability of turboprop aircraft and helicopters. Also, recent retiree Fred Oswald, who led our work related to the Space Shuttle Return to Flight after the Columbia accident.

**Q.** What do you feel is the most important contribution you have made to NASA’s mission?

**A.** I have always worked collabora-

their coworkers. Lights stayed on after 5 p.m., and people came in on weekends.

**Q.** As NASA has evolved through the years, what has stayed the same?



GRC-1966-C-02713

Photo by Martin Brown

*Zaretsky, above, left, with colleagues William Anderson and Richard Parker and their award-winning ball bearing research in 1966.*

tively with individual researchers both within and outside the agency or as a member of a research team. From inception to retirement of the Space Shuttle Program, I provided technical analysis and solutions. I worked with Fred Dolan of NASA’s Marshall Space Flight Center on a turbopump bearing problem on the 1986 Space Shuttle Challenger disaster. Later, I was a member of the NASA Engineering & Safety Center/Glenn/Marshall team assembled after the Space Shuttle Columbia loss in 2003. We identified a potential wear and lubrication problem internal to shuttle actuators that could impact the reliability and safety of the remaining shuttle fleet.

By S. Jenise Veris