

breakaway friction level are compared in Fig. 3. These data show excellent correlation between model predictions and measured hardware data over a wide range of torque levels. The conventional friction model, which neglects elastic de-

formation, would yield no motion for these torque levels. The model has also been verified by comparison with measured hardware data over a wide range of frequencies (1 to 1000 radians per second).

## PUBLICATIONS

Compilation of principal recently published books and technical articles written by APL staff members.

- A. G. Lubowe (Bell Tel. Labs.) and R. E. Jenkins, "Numerical Verification of Analytic Expressions for the Perturbations Due to an Arbitrary Zonal Harmonic of the Geopotential," *Celestial Mechanics* **2**, No. 1, May 1970, 21-40.
- E. L. Cochran, F. J. Adrian, and V. A. Bowers, "Electron Spin Resonance Study of Elementary Reactions of Fluorine Atoms," *J. Phys. Chem.* **74**, No. 10, May 14, 1970, 2083-2090.
- E. B. Dobson, "Measurement of the Fine-Scale Structure of the Sea," *J. Geophys. Res.* **75**, No. 15, May 20, 1970, 2583-2586.
- J. R. Kuttler, "Finite Difference Approximations for Eigenvalues of Uniformly Elliptic Operators," *SIAM J. Numer. Anal.* **7**, No. 2, June 1970, 206-232.
- Y. J. Alloucherie, "Light Conversion Efficiency of Calcium Tungstate Using a Light Intensifier Tube," *Appl. Optics* **9**, No. 6, June 1970, 1403-1409.
- F. W. Schenkel, "Design Consideration for Infrared Imaging in the 10-12.6 Micron Band from a Synchronous Earth Satellite," *J. British Interplanetary Soc.* **23**, June 1970, 423-440.
- M. H. Friedman, "Free Swelling of Biological Tissue: The Corneal Stroma," *Chem. Eng. Symp. Series* **66**, No. 99, 1970, 33-42.
- L. R. Gieszl, "Continuous Flow Charts," *Simulation* **14**, No. 6, June 1970, 281-289.
- R. E. Walker and B. F. Hochheimer, "Inversion-Rotation Emission Spectrum of Thermally-Excited NH<sub>3</sub> in the 60-200-cm<sup>-1</sup> Region," *J. Molec. Spectroscopy* **34**, No. 3, June 1970, 500-515.
- P. M. Bainum, P. G. Fuechsel, and D. L. Mackison, "Motion and Stability of a Dual-Spin Satellite with Nutation Damping," *J. Spacecraft and Rockets* **7**, No. 6, June 1970, 690-696.
- J. M. Whisnant, D. K. Anand, V. L. Pisacane, and M. Sturmanis, "Dynamic Modeling of Magnetic Hysteresis," *J. Spacecraft and Rockets* **7**, No. 6, June 1970, 697-701.
- S. M. Krimigis, "Alpha Particles Trapped in the Earth's Magnetic Field," *Particles and Fields in the Magnetosphere*, edited by B. M. McCormac, Dordrecht, Holland: D. Reidel Publishing Co., 1970.

tion," *Carnegie-Mellon Institute, Transportation Research Institute Conference on Urban Transportation Systems*, Pittsburgh, May 26, 1970.

W. H. Guier, "Cardiovascular Sensors in the Clinical Environment," *National Bureau of Standards Transducer Conference*, Gaithersburg, Maryland, May 1970.

The following two lectures were presented at the *Polytechnic Institute of Brooklyn, Phased Array Symposium*, Brooklyn, New York, June 2-5, 1970:

E. V. Byron, "A New Flush Mounted Antenna Element for Phased Array Application;"

T. C. Cheston, "Beam Steering of Planar Phased Arrays."

M. H. Friedman, "Computer Experiments on the Cornea," *Summer Computer Simulation Conference*, Denver, June 12, 1970.

B. E. Tossman, "Low Nutation Rate Dampers," *Fifth Aerospace Mechanisms Symposium*, NASA Goddard Space Flight Center, Maryland, June 15, 1970.

## APL COLLOQUIA

May 1—"The Present Status and Future Plans of the N.A.L.," by T. L. Collins, National Accelerator Laboratory.

May 8—"Air Pollution and Global Climatic Change," by J. M. Mitchell, Environmental Sciences and Services Administration.

May 15—"Technical and Economic Evaluation of Urban Transportation Systems," R. A. Makofski, Applied Physics Laboratory.

## ADDRESSES

Principal recent addresses made by APL staff members to groups and organizations outside the Laboratory.

W. Seamone, "Control of an Externally Powered Upper Limb Prosthesis," *IEEE Washington Chapter*, McLean, Virginia, May 4, 1970.

W. H. Avery, "Transportation," *The*

*Johns Hopkins University, School of Hygiene Seminar*, Baltimore, May 5, 1970.

W. H. Avery, "An Overview of the Basic Technology and the Economics of Advanced Transporta-

## HONORS AND AWARDS

*A. J. Zmuda*, a member of the Research Center staff, has been elected president of the Section on Geomagnetism and Paleomagnetism of the American Geophysical Union, to serve until June 30, 1972. Dr. Zmuda has also been named a Fellow of The American Geophysical Union.

*Mary M. Schaefer*, Editor in the

Space Development Department, was presented the "Award for Distinguished Technical Communication" by the Society of Technical Writers and Publishers.

*S. G. Smith*, Assistant Supervisor of the Illustrations Project, Technical Reports Group, and *C. L. Towle*, former member of the Editorial Project and currently a member of

the staff of the Advanced Surface Missile System Project Office, have received an "Award of Merit" from the Society of Technical Writers and Publishers.

*R. M. Fristrom*, a member of the Research Center staff, has been appointed a member of the National Research Council Committee on Fire Research, to serve until June 30, 1973.

## WITH THE AUTHORS



*T. O. Poehler*, co-author of "Cyclotron Resonance in Solid-State Plasma," is a native of Baltimore, Maryland. He received the B. S., M. S., and Ph. D. degrees in electrical engineering from The Johns Hopkins University. In 1956 Dr. Poehler was an associate engineer with the Martin Co. in Baltimore, and from 1958 to 1962 was a member of the research staff of The Johns Hopkins Institute for Cooperative Research. A specialist in solid-state physics, semiconductors, thin films, and optical lasers, Dr. Poehler joined APL in 1963 as an engineer

in the Microelectronics Group. In 1965 he was appointed a physicist in the Microwave Physics Group of the Research Center. In this position he studied several properties of indium antimonide, characteristics of far-infrared lasers, and cyclotron resonant absorption in compound semiconductors. Dr. Poehler is a member of the American Physical Society, the Institute of Electrical and Electronics Engineers, and the American Association for the Advancement of Science.

*J. R. Apel*, co-author of "Cyclotron Resonance in Solid-State Plasma," has been represented in the *Digest* on two previous occasions. He was a co-author of "Beam-Plasma Interaction," which was published in the May-June 1964 issue, and was the author of a hobby paper, "Ways and Means of Boat Design," which appeared in the November-December 1965 issue. Dr. Apel, originally from New Jersey, received his B. S. and M. S. degrees from the University of Maryland and his Ph. D. from The Johns Hopkins University in 1970. He joined APL in 1957 as a mathematician in the Assessment Group where he performed analyses in the fields of antisubmarine warfare; effects of



high-altitude nuclear explosions; and re-entry physics and ballistic missile defense. In 1961 he became a member of the Plasma Dynamics Group where he presently is Assistant Group Supervisor. His research fields currently are microwave emission from solids, cyclotron resonance, quantum dielectric tensor analysis, and solid-state plasma physics. Dr. Apel is a member of the American Physical Society, the Philosophical Society of Washington, the American Association for the Advancement of Science, and the New York Academy of Sciences.

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