demands to reprogram the computer for different memory map configurations several times a day. Command and computer operations were done solely at APL.

By the first month of flight, all data-harvesting and experiment-controlling programs had been exercised. The computer successfully provided the following services:

1. Support of attitude stabilization using delayed command function;
2. Data storage and processing in conjunction with the attitude, Disturbance Compensation System, Environmental Survey Package, Radioactive Thermal Generator, and thermal systems;
3. Broadcast of a valid navigation message resulting in a successful ground navigation experiment;
4. Operation of the on-board GMT clock using the two timekeeping systems;
5. Exercise of the special Pseudo Random Noise mode on the 160-MHz downlink.

After a month in orbit, a failure in the telemetry system put an end to 90% of the possible telemetry functions. This drastically curtailed the real-time data available during satellite passes and eliminated the usefulness of most of the data-gathering flight programs.

After the failure, the flight computer became the only means of monitoring the Disturbance Compensation System and its fuel consumption rate. The Disturbance Compensation System thruster program was used extensively in this capacity to support a long-term Disturbance Compensation System experiment. Other major computer activities during this period included broadcasting 50 bits/sec navigation data and managing the on-board clock.

A second failure at the end of the second month—this time in the computer injection logic—prevented further access to the computer. Although all experiments using the computer had been run as planned, the early system failures meant a disappointing data yield.

In judgment of the flight software system, all of the requested combinations of activities were accomplished within the on-board constraints. The realization of continuous computer activity ranged between one and two weeks between disruptions. These problems were due largely to the complex ground support operations needed for TRIAD and the varying operational procedures for different experiments.

Failure notwithstanding, the TRIAD flight computer proved to be an extremely useful and versatile tool in a satellite with such diverse experimental and operational requirements.

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Nov. 2—"Astronomy and City Planning in Ancient Mexico," by A. F. Aveni, Colgate University and University of South Florida.

Nov. 9—"The Physics of Earthquakes and Earthquake Prediction," by C. H. Scholz, Columbia University.

Nov. 16—"Electrostatics in Action," by A. D. Moore, University of Michigan.

Nov. 30—"The Automobile and the Environment in an Era of Conflicting Demands," by E. S. Starkman, General Motors Corporation and University of California.

Dec. 7—"Computer Abuse," by D. B. Parker, Stanford Research Institute.

Dec. 14—"The Nature of Heart Disease," by K. B. Lewis, The Johns Hopkins University.

Dec. 21—"The Present and Potential Use of a Brain Pacemaker," by I. S. Cooper, St. Barnabas Hospital, The Bronx, New York.

ADDRESSES

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L. R. Gieszl, "Modularization," *Second Texas Conference on Computing Systems,* University of Texas, Austin, November 1973.

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M. H. Friedman, "A Bioengineering View of Corneal Mechanics, Transport and Thickness Control," *Biomedical Engineering Department Seminar,* Johns Hopkins Medical School, Baltimore, December 6, 1973.

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D. E. Olsen, "Simultaneous Prediction Intervals for Poisson Observations," *Joint Statistical Meeting of the American Statistical Association and Biometric Society,* New York, December 27–30, 1973.

WITH THE AUTHORS

T. L. McGovern, co-author of "TRIAD Incremental Phase Shifter," a native of Maryland, received his B.S. degree in physics from The Johns Hopkins University. Prior to employment at APL in 1961, he was employed at Melpar Inc. where he specialized in electronic airborne reconnaissance equipment and military aircraft flight simulators, and in the U.S. Army at Huntsville, Alabama, as an electronics specialist in surface-to-air guided-missile systems. Mr. McGovern has been with the Space Development Department since his employment with APL and has principally been involved with the digital design of flight systems and exploratory processing systems for ground support. Mr. McGovern is a member of the American Physical Society and The American Association for the Advancement of Science.

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