the satellite clock against the standard station, and compute the error in the station clock epoch relative to the standard station. Measuring error is limited by the signal to noise ratio associated with the received timing signals and is presently about 30 μsec RMS for the data received on a single pass.

Frequency errors which are constant throughout a satellite pass produce no errors in the computed position of the station or satellite. Oscillator drift during a pass, however, may produce a small error in the minimum range, similar to that which would be produced by an along track velocity error. Frequency standards currently in use typically have oscillator drift rates of a few parts in \(10^{11}\) per day, corresponding to negligible position errors due to this effect.\(^6\)


**Summary**

The TRANET system is capable of providing high-density, high-accuracy doppler data for a large number of satellites in a form ready for immediate computer processing.

The TRANET system is capable of measuring the doppler frequency received from a satellite with an accuracy of 1 part in \(10^{19}\) and the satellite position with a precision of 10 meters. Accuracy of orbit determination is limited to about 50 meters by incomplete knowledge of the earth's gravity field.

It is estimated that the TRANET system could reliably handle as many as ten near-earth satellites in full time operation with maximum accuracy. With lessened accuracy requirements the number of satellites which the system could be called on to track would be greatly increased.

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**ADDRESSES**

The listing below comprises the principal recent addresses made by APL staff members to groups and organizations outside the Laboratory.


WITH THE AUTHORS

S. A. Taylor, co-author of "Digital Pulse Compression Radar Receiver," was born in Washington, D.C., and attended the University of Maryland, George Washington University, and the University of Virginia. A specialist in circuitry as applied to radar techniques, Mr. Taylor joined the Laboratory in 1952. His first assignment, in the Transistor Circuits Group, included fabrication and test of electronic equipment used in the evaluation of missile prototypes. Presently, as a member of the Radar Techniques Group, he is responsible for the design of various signal processors, including multi-frequency receivers and post detection interpretation and pulse compression equipment.

J. L. MacArthur, co-author of "Digital Pulse Compression Radar Receiver," is a native of Columbus, Ohio. He received a B.E.E. degree in electrical engineering from Catholic University in 1951, and an M.S. degree in the same field from the University of Maryland in 1959. A specialist in electronic circuit design and analysis and signal detection theory, Mr. MacArthur joined APL in 1957. Since his association with the Laboratory, he has been involved in experimental detection studies, and in the evaluation of missile link systems and signal-processing techniques. Mr. MacArthur has also been involved in tracking receiver design and experimental operations. He is currently Assistant Supervisor of the Missile Radar Development Group.

R. E. Hicks, author of "Chemical Milling of Space Flight Hardware," was born in Baltimore, Maryland. He is presently working on a B.S. degree in Industrial Engineering at The Johns Hopkins University Evening College. Prior to his association with APL in 1963, Mr. Hicks was employed by the Martin Company where he was engaged in electronic packaging and product design. At APL, Mr. Hicks assisted in the development of the ministick packaging technique, and in the package design of satellite memory systems. A specialist in advanced packaging and process techniques, he is concerned with the use of thin-film materials for current and future applications. Mr. Hicks is a member of the Institute of Electrical and Electronics Engineers.

C. A. Dunnell, author of "TRANET Doppler Tracking System," is a native of Brainerd, Minnesota. He holds a B.S. degree in military studies which he received from the University of Maryland in 1961. A specialist in communication electronics, Mr. Dunnell joined APL in 1961 where he was first assigned as an engineer in the Ground Systems Development Group. Subsequent duties involved tracking station instrumentation for the Navy Navigation Satellite System. Presently, as Supervisor of the Station Services Project in the Space Development Department, Mr. Dunnell has responsibilities in connection with technical operation of the Tranet System, evaluation of network performance, and for providing assistance to stations in meeting stated requirements.