a much less complex set of processor activity at 50 Hz, a 500 times higher rate. Coarse benchmarks of PVT filter requirements for processor throughput, and the benchmark tracking loop's requirements, indicate KOOL tracking will require an order of magnitude less throughput, considering both its lower rate and greater complexity.

KOOL tracking high-rate models for phase and range at shorter times will be generated within the digital logic once they are primed with model parameters from the PVT filter. The onboard oscillator must be commensurately stable, requiring (delta F)/F of about 10^{-11} over times up to 10 seconds.

This work was done by Lawrence E. Young and Thomas K Meehan of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-46973

Development of Jet Noise Power Spectral Laws

This model can be used in measuring high-temperature steam pipes, leak noise from high-pressure pipes, or any device that generates noise by jet exhaust.

John H. Glenn Research Center, Cleveland, Ohio

High-quality jet noise spectral data measured at the Aero-Acoustic Propulsion Laboratory (AAPL) at NASA Glenn is used to develop jet noise scaling laws. A FORTRAN algorithm was written that provides detailed spectral prediction of component jet noise at user-specified conditions. The model generates quick estimates of the jet mixing noise and the broadband shock-associated noise (BBSN) in single-stream, axis-symmetric jets within a wide range of nozzle operating conditions.

Shock noise is emitted when supersonic jets exit a nozzle at imperfectly expanded conditions. A successful scaling of the BBSN allows for this noise component to be predicted in both convergent and convergent-divergent nozzles.

Configurations considered in this study consisted of convergent and convergent-divergent nozzles. Velocity exponents for the jet mixing noise were evaluated as a function of observer angle and jet temperature. Similar intensity laws were developed for the broadband shock-associated noise in supersonic jets.

A computer program called "sJet" was developed that provides a quick estimate of component noise in single-stream jets at a wide range of operating conditions. A number of features have been incorporated into the data bank and subsequent scaling in order to improve jet noise predictions. Measurements have been converted to a lossless format. Set points have been carefully selected to minimize the instability-related noise at small aft angles. Regression parameters have been scrutinized for error bounds at each angle. Screech-related amplification noise has been kept to a minimum to ensure that the velocity exponents for the jet mixing noise remain free of amplifications. A shock-noise-intensity scaling has been developed independent of the nozzle design point.

The computer program provides detailed narrow-band spectral predictions for component noise (mixing noise and shock associated noise), as well as the total noise. Although the methodology is confined to single streams, efforts are underway to generate a data bank and algorithm applicable to dual-stream jets. Shock-associated noise in high-powered jets such as military aircraft can benefit from these predictions.

This work was done by Abbas Khavaran and James Bridges of Glenn Research Center. Further information is contained in a TSP *(see page 1)*.

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18600-1.