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NASA TECH BRIEF



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Computer Program Determines Performance Efficiency of Remote Measuring Systems

The problem:

To develop a procedure for control and evaluation of instrumentation system performance for numerous rocket engine test facilities and to prescribe calibration and maintenance techniques to maintain the systems within process specifications.

The solution:

A set of computer programs for rapidly processing measurement system calibration data. The input is a set of measurements of transducer responses, and the output is a listing of all transducer calibration states in the system or the test stand. The results indicate quantitative measures of instrument performance. Corrective action is recommended when necessary.

How it's done:

The Measurement Systems Analysis (MSA) program consists of a series of digital computer programs that prescribe calibration and maintenance for the following measurement systems:

1. Thrust (force)
2. Pressure
3. Temperature
4. Flow rate
5. Vibration
6. Current and voltage

The MSA program combines automated "inventory-type" control with modern statistical techniques to provide easily assessable information attesting to the status of thousands of measuring systems. The program output listing or "roadmap" is a comprehensive report of the status of each of the measuring systems (about 40) at each respective test stand.

An MSA program can be used on a typical pressure measurement in the following manner: (1) transducer is subjected to periodic laboratory calibrations per

specification, (2) precision of the transducer is calculated by a computer program, (3) original measurement system is resynthesized, (4) recording element is calibrated and precision obtained by automatic data processing, (5) computer program appropriately combines the precisions of the system elements for a system precision, (6) MSA roadmap apprises test personnel of the precision of their pressure measuring system, and (7) test personnel can now decide, in light of customer requirements, whether the system is excessively error prone. Corrective action is taken for "out-of-precision" systems.

Notes:

1. Similar programs can be written for other test equipment in an industry such as the petrochemical industry.
2. The detailed calibration, maintenance, and statistical techniques for the various pressure, thrust, and temperature measuring systems can be used by many organizations toward establishment of methods for measurement in a standard calibration analysis laboratory.
3. Inquiries concerning this innovation may be directed to:
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Patent status:

No patent action is contemplated by NASA.

Source: E. K. Merewether
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Category 01