Waveguide Calibrator for Multi-Element Probe Calibration
Acoustic waveguide technology produces the same acoustic field at each of the sensing elements.
Stennis Space Center, Mississippi

A calibrator, referred to as the “spider” design, can be used to calibrate probes incorporating multiple acoustic sensing elements. The application is an acoustic energy density probe, although the calibrator can be used for other types of acoustic probes. The calibrator relies on the use of acoustic waveguide technology to produce the same acoustic field at each of the sensing elements. As a result, the sensing elements can be separated from each other, but still calibrated through use of the acoustic waveguides.

Standard calibration techniques involve placement of an individual microphone into a small cavity with a known, uniform pressure to perform the calibration. If a cavity is manufactured with sufficient size to insert the energy density probe, it has been found that a uniform pressure field can only be created at very low frequencies, due to the size of the probe. The size of the energy density probe prevents one from having the same pressure at each microphone in a cavity, due to the wave effects.

The “spider” design probe is effective in calibrating multiple microphones separated from each other. The spider design ensures that the same wave effects exist for each microphone, each with an individual sound path. The calibrator, referred to as the “spider” design, can be used to calibrate probes incorporating multiple acoustic sensing elements. The application is an acoustic energy density probe, although the calibrator can be used for other types of acoustic probes. The calibrator relies on the use of acoustic waveguide technology to produce the same acoustic field at each of the sensing elements. As a result, the sensing elements can be separated from each other, but still calibrated through use of the acoustic waveguides.

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This work was done by Marvin Simon and Andre Thachenko of Caltech for NASA’s Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-42540
Four-Way Ka-Band Power Combiner
A prior X-band design has been adapted to Ka band.

NASA’s Jet Propulsion Laboratory, Pasadena, California

A waveguide structure for combining the outputs of four amplifiers operating at 35 GHz (Ka band) is based on a similar prior structure used in the X band. The structure is designed to function with low combining loss and low total reflected power at a center frequency of 35 GHz with a 160 MHz bandwidth.

The structure (see figure) comprises mainly a junction of five rectangular waveguides in a radial waveguide. The outputs of the four amplifiers can be coupled in through any four of the five waveguide ports. Provided that these four signals are properly phased, they combine and come out through the fifth waveguide port.

This work was done by Raul Perez and Samuel Li of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

NPO-41291

Loss-of-Control-Inhibitor Systems for Aircraft
Excessive commands are resisted by feedback in the form of damping forces.

Langley Research Center, Hampton, Virginia

Systems to provide improved tactile feedback to aircraft pilots are being developed to help the pilots maintain harmony between their control actions and the positions of aircraft control surfaces, thereby helping to prevent loss of control. A system of this type, denoted a loss-of-control-inhibitor system (LOCIS) can be implemented as a relatively simple addition to almost any pre-existing flight-control system. The LOCIS concept offers at least a partial solution to the problem of (1) keeping a pilot aware of the state of the control system and the aircraft and (2) maintaining sufficient control under conditions that, as described below, have been known to lead to loss of control.