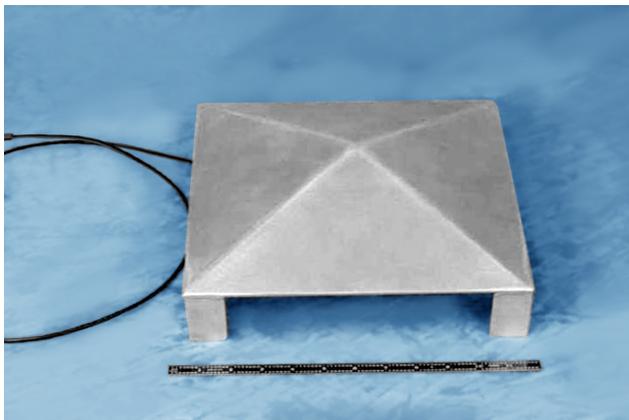




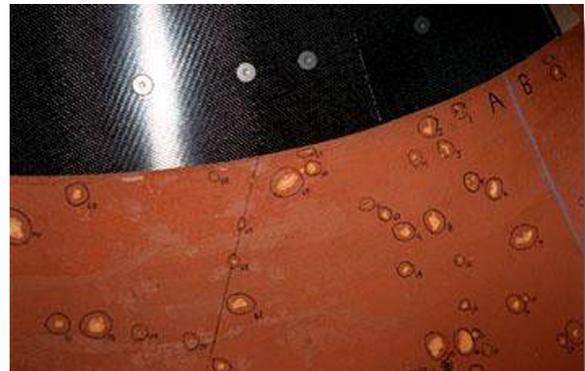
Technology Opportunity

Hail Monitor Sensor

The National Aeronautics and Space Administration (NASA) seeks to license a Hail Monitor Sensor Design For Shuttle Launch Safety. A simple, inexpensive hail monitor sensor was designed by engineers at John F. Kennedy Space Center (KSC), FL, using a metal plate as a sounding board. The hail monitor sensor was developed in 2003 for use at KSC shuttle launch pads A and B. Because of the potential for hail damage to the external tank and Space Shuttle, KSC remotely monitors hailfall in the vicinity of the pads. If hail of sufficient size and quantity is detected while the space shuttle is parked at one of the launch pads, then the external tank is thoroughly inspected for damage. NASA has installed several of the monitors – aluminum plates shaped like miniature rooftops – that record hail impacts based on sound amplitude around the launch pads.



Sloped surface prevents water from collecting on the sensor



Hail damage on the back surface of the External Tank near the nose cone

Potential Commercial Uses

- National Weather Service
- Federal Agriculture Agencies
- Insurance Companies

Benefits

- Real-time hail monitor
- Durable
- Improved impact response
- Differentiates between rain and hail
- Pyramid design prevents hail and rainwater from accumulating on the sensor.

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The Technology

This design has several advantages including reduced cost and complexity, increased durability, and improvement in impact response uniformity over the active surface. Hail is mostly recorded using hail pads (Styrofoam sheets with an aluminum foil cover). Hail pads do not allow online transfer of the recorded data. The new hail monitor sensor offers real-time transfer and evaluation of the recorded data and a chronological resolution of single hail events. A shallow pyramid structure is used so that hail bounces away from the sensor so as not to be counted more than once. In addition, the final prototype version included a mounting box for the piezo-ceramic sensor, offset from the pyramid apex, thus reducing nonuniformity of response. The most important characteristic of this design is its potential to utilize frequency discrimination between the sound spectrum created from raindrop impact versus a hailstone impact. In other words, the sound of hail hitting a metal plate is distinctly different than the sound of rain impacting the same plate. This fortuitous behavior of the pyramid sensor may lead to a signal processing strategy inherently more reliable than one depending on amplitude processing only.

Options for Commercialization

NASA seeks qualified companies to commercialize the Hail Monitor Sensor technology. This and other technologies are made available by the KSC Technology Transfer Office. NASA transfers valuable technology to industry through patent and copyright licenses, cooperative agreements, and reimbursable and nonreimbursable Space Act Agreements.

Contact

If your company is interested in the Hail Monitor Sensor technology or if you desire additional information, please reference Case Number KSC-12594 and contact:

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Commercialization Checklist

- Patent Pending
- U.S. Patent
- Copyrighted
- Available to License
- Available for no-cost transfer
- ✓ Seeking industry partner for further codevelopment

www.nasa.gov

John F. Kennedy Space Center, FL

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