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Large Sensor Network Architectures for Monitoring Large-Scale Structures

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In order to monitor large-scale structures, such as the heavy-lift launch vehicle payload shroud, propellant tanks, and aircraft fuselage, practical methods to install and connect large sensor networks are being developed. Traditional means to build such sensor networks require careful sensor placement, sensor attachment, and network wiring. Since these tasks are inherently serial and cannot easily be automated, the integration of dense sensor networks into structures is often an expensive proposition. Furthermore, large-scale structures can have numerous egress ports for umbilical attachments, power connections, fuel tank ports, and structurally complex features such as stiffeners, flanges, gaps, etc. Conventional approaches for individual sensor installation are impractical given the structure's size and geometric complexities.

This paper discusses large sensor network architecture concepts and associated trade studies on the various options. All the architecture options are modular in design, i.e. they are applicable to localized areas requiring large number of sensors and scalable to large areas. Also, the architecture options consist of different components that can be considered to be on-board (permanently integrated with the vehicle structure) or off-board (detachable from the vehicle structure). Example applications and test results for composite tanks and aircraft fuselage will be presented.

Ключевые слова:

Содержание.

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