

“Lightning Electric Current Measurement On-Board the Storm Penetrating Aircraft”

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Abstract

NASA is developing a prototype lightning strike measurement system that is suitable for installation onto research aircraft that operate in thunderstorms. The primary focus is to capture airframe electric current waveforms during attachment, but may also consider pre and post-attachment current, electric field, and radiated field phenomena. New sensor technologies are being developed for this system, including a fiber-optic Faraday polarization sensor that measures lightning current waveforms from DC to over several Megahertz, and has dynamic range covering hundreds-of-Amperes to tens-of-thousands-of-Amperes. For this project, NASA is evaluating flight instrumentation that will leverage recent advances in high-speed, high dynamic range, deep memory data acquisition equipment, and fiber-optic interconnect. As a secondary system, the measurement system will leverage operational safety risks already considered for storm hazards. The prototype system will provide new data about the natural lightning environment and how it interacts with airframes. Data will improve the effectiveness of analysis and measurement needed for lightning certification of aircraft, and will lead to new lightning damage detection and diagnosis tools. Valuable meteorological science data for peak current, stroke multiplicity and charge transfer will also now be possible during lightning attachment to research airplanes.