

# NASA SBIR/STTR Technologies

A1.01-9906 - Spatial Heterodyne Spectrometer for Aviation Hazard Detection

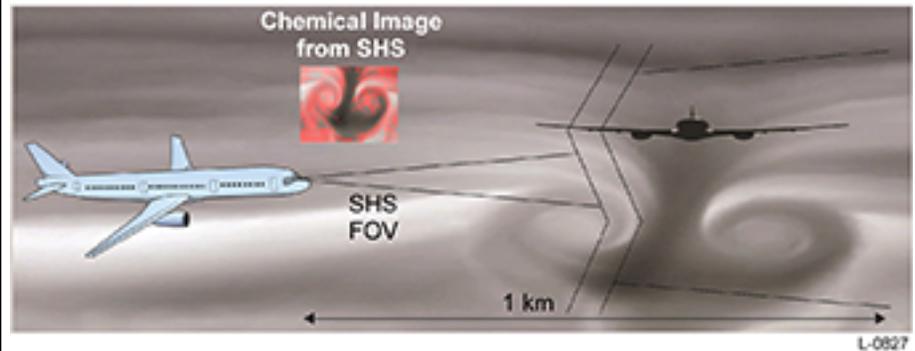


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## Identification and Significance of Innovation

Physical Sciences Inc (PSI) proposes the development of a longwave infrared (LWIR) imaging spatial heterodyne spectrometer (I-SHS) for standoff detection of clear air turbulence (CAT) and wake vortices from an airborne platform. PSI will team with Georgia Tech Research Institute (GTRI) who has produced substantial research on the application of LWIR hyperspectral imaging for detection of these and other air hazards. The research has produced extensive simulations, however, the predicted spectral radiance signatures are an order of magnitude below the noise floor of state of the art in LWIR hyperspectral imagers. The proposed LWIR I-SHS will offer this order of magnitude improvement in noise equivalent spectral radiance through a combination of high throughput and minimal noise-inducing sampling errors owing to the stationary interferometer. A preliminary systems analysis predicts a per-pixel NESR of  $1E-9$  W/( $cm^2$  ster  $cm^{-1}$ ) at  $16$   $cm^{-1}$  spectral resolution.



Estimated TRL at beginning and end of contract: ( Begin: 2 End: 3 )

## Technical Objectives and Work Plan

Technical Objectives are to: refine a system level, develop a breadboard system and demonstrate the predicted NESR, acquisition rate, and spectral and spatial resolution, and demonstrate a relevant dynamic molecular imaging measurement using the breadboard system. The Work Plan tasks are as follows: Kickoff, System model, Breadboard design, Breadboard build and characterization, Algorithm development, Molecular imaging demonstration, Phase II conceptual design, and Management and reporting.

## NASA Applications

The primary NASA commercial application for the proposed system is airborne and ground based aviation hazard detection, including clear air turbulence, wake vortices, runway icing, volcanic ash, visibility, and runway obscurants.

## Non-NASA Applications

Non-NASA commercial applications include multi-aviation hazard detection for commercial airlines (airborne) and airports (ground based). The solution will also support high frame rate hyperspectral imaging applications including information, surveillance, and reconnaissance. The technology is also ideal for chemical and biological plume imaging for DoD, DoE, and DHS applications.

## Firm Contacts

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**NON-PROPRIETARY DATA**