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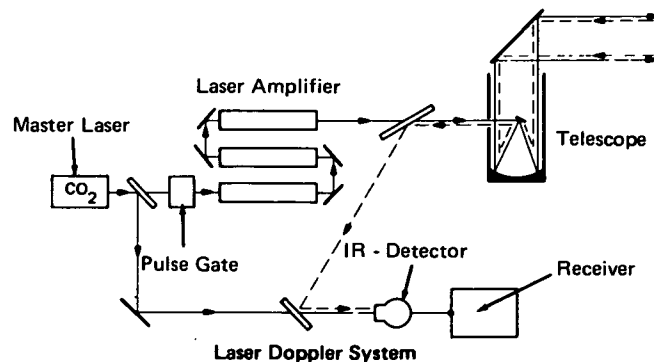
# NASA TECH BRIEF

## Marshall Space Flight Center



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### Laser System Detects Air Turbulence



A prototype Doppler laser system can remotely measure atmospheric wind velocity and detect air turbulence. The system employs a laser beam that is emitted from a pod on the side of the aircraft. The beam is aimed ahead of the aircraft. All along its path the beam is scattered by airborne particles (e.g., dust, water droplets, ice crystals, smog, etc.). Some of this scattered light returns to the aircraft, but at a shifted frequency caused by the Doppler effect from local air speeds.

A beam from the CO<sub>2</sub> master laser (see figure) is split into two parts. One part is pulsed and laser amplified to increase the range and is aimed by a telescope. The second part serves as a "reference" beam. The scattered and frequency-shifted light is recombined with the reference beam causing a beat frequency in the detector. This signal is processed in the receiver and displayed for on-board evaluation.

The system can detect a change in air velocity indicating the presence of a wind shear up to about 9 nautical miles ahead. Current work focuses on extending this range, including investigations of the effects of particle density, focusing, back scatter efficiency, absorption, and other factors.

#### Note:

Requests for further information may be directed to:  
Technology Utilization Officer  
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#### Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development may be addressed to:

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