

Dusting Off

Joint-service effort seeks ways to stem helicopter accidents caused by brownouts

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Efforts to prevent helicopter accidents in brownout conditions, caused by rotor-blown sand and dust, are receiving high-level attention within the U.S. Defense Dept. as the services evaluate different approaches to the problem.

"Brownout is now an OSD [Office of the Secretary of Defense] level joint effort," says Doug Isleib, head of the Navy/Marine Corps Rotorcraft Center of Excellence at NAS Patuxent River, Md. Joint meetings began in March, and initially the effort is cataloguing the different brownout, or degraded visual environment (DVE), projects already underway.

Brownout has been blamed for the loss of more than 20 helicopters and 50 lives since 2001. In these landing accidents, pilots enveloped in swirling sand kicked up by the rotors lost sight of the ground, and their aircraft collided with unseen obstacles or touched down with excessive drift and rolled over. Several solutions are being evaluated.

The Army Aviation Applied Technology Directorate (AATD) has flight-tested a 94-GHz. radar able to see through the sand cloud. The Office of Naval Research (ONR) is testing a laser system designed to "sense through" the obscuration, while the Air Force Research Labora-

A U.S. Marine Corps Sikorsky CH-53E kicks up sand to re-create brownout conditions on the dust range at Yuma, Ariz., where the services are evaluating solutions for operating in degraded visual environments.

tory has tested a "see-and-remember" system that images the landing zone before it's obscured by brownout. The Defense Advanced Research Projects Agency is developing a system combining a 94-GHz. radar, synthetic vision and advanced flight control laws. Other solutions are being pursued by industry.

"Different platforms have different needs," says Isleib, speaking at the AHS International forum in Montreal last week. "Solutions range from improving handling qualities to obstacle avoidance, see-and-remember systems and high-end see-through systems. The ongoing effort is to see what's out there, see their relative maturity, and provide the information to program managers. It's not to tell them what to put on their aircraft."

Early in April, AATD tested the Helicopter Autonomous Landing System (HALS) on a Sikorsky UH-60 Black Hawk on the dust range at Yuma, Ariz. The 94-GHz. radar, developed by Sierra Nevada, proved its ability to see through sand and dust, detecting obstacles and a

hovering helicopter, says Sikorsky technical fellow John Judge.

A similar 94-GHz. radar is part of the Sandblaster system being developed for Darpa by Sikorsky and Honeywell. This fuses real-time imagery from the see-through radar with onboard terrain and obstacle databases to generate an "evidence grid" that's presented to the

pilot on a dynamic perspective, or synthetic vision, display. The system also includes advanced flight control laws to automate the approach in fly-by-wire helicopters.

Sandblaster is being tested in a simulator at Sikorsky and is scheduled to fly on the U.S. Army's Rascal research helicopter, a fly-by-wire UH-60 testbed, in the fourth quarter. The system is being targeted initially at the Army's upgraded FBW UH-60M.

ONR, meanwhile, plans a further evaluation of the LandSafe system under development by Rockwell Collins and Optical Air Data Systems. This uses eye-safe fiber-optic lasers to both sense the ground in brownout conditions and provide accurate air data down to zero airspeed—a capability helicopters lack. Three or

four downward beams act as a laser altimeter and ground speed sensor, while three upward beams measure airspeed, wind direction and wind speed. This data drives an enhanced hover display.

LandSafe uses signal processing similar to a pulse-Doppler radar to pick out laser returns from the ground amid reflections from dust and sand particles. "It's sense-through, not see-through. Signal processing can find the ground through the wave of dust as the cloud approaches," says Steve Kennell, Collins's director of advanced sensor products.

Signal-processing software has been improved after issues were uncovered during evaluation of the system on a U.S. Marine Corps Sikorsky CH-53E in mid-2007, he says, and a further dust-range demonstration on the heavy-lift helicopter is planned for later this year. Kennell says initial production LandSafe systems could be available by mid-2009.

Although systems such as LandSafe and Sandblaster are in relatively advanced stages of development, for most rotorcraft the near-term solution to the brownout threat will involve upgrades to displays and automatic flight controls to enhance hover cueing and handling qualities to help pilots fly approaches in degraded visibility.