

(The Air Force Research Laboratory's Autonomous Collision Avoidance Technology, or ACAT, program, which includes the current Fighter Risk Reduction Project at NASA Dryden Flight Research Center, is a follow-on research effort to the Automatic Ground Collision Avoidance System, or Auto-GCAS, project. The program seeks to enhance and transition automatic collision avoidance technologies, including both ground and air collision avoidance, throughout the aviation industry. The following news release issued by the Armed Forces Press Service in August 2007 details Auto-GCAS technology and its potential benefits to aviation.)



AMERICAN FORCES PRESS SERVICE **NEWS ARTICLES**

Technology to Save Pilots' Lives Ready for Take-off

By Kim Sears

American Forces Press Service

WASHINGTON, Aug. 2, 2007 – What began as a chance discovery in aviation research has evolved into a complex technology that helps save pilots' lives by preventing airplane crashes.

The Automatic Ground Collision Avoidance System, known as Auto-GCAS, is a software-based technology that has demonstrated a 98 percent effectiveness rate at eliminating aircraft crashes into the ground. The system is ready for operational integration on several types of fighters: F-16 Fighting Falcons, F-22 Raptors and F-35 Lightning Joint Strike Fighters, officials said.

"We in Air Combat Command are excited about the promise of Auto-GCAS," said Air Force Maj. Gen. Jack Catton, director of requirements for Air Combat Command, at Langley Air Force Base, Va. "This isn't just a safety issue for us, it's a warfighting issue. This technology will allow us to save both lives and combat resources. It is clearly the right thing to do."

Auto-GCAS evaluates a variety of factors including aircraft weight, and performance, and uses aircraft navigation positional information, the Global Positioning System, and digital terrain elevation data to constantly calculate an aircraft's 3-D position relative to the earth, the amount of time available before impact, and the maneuver required to prevent a collision with the ground.

The program differs from current crash-avoidance systems in that it doesn't create nuisance warnings and activates only at the last instant to take control and recover the aircraft when it determines collision is imminent. The determination is made when the aircraft is within 1.5 seconds of the "point of no return" and no action has been taken by the pilot.

"Manual or warning-only systems don't prevent many of our (controlled flight into terrain) mishaps. That's because situations like pilot spatial disorientation, target fixation, loss of situation awareness, or G-induced loss of consciousness may render a pilot unable to process the warning and/or perform the necessary maneuvers to prevent a collision with the ground," said Col. "Tex" Wilkins, senior Air Force readiness analyst with the Office of the Undersecretary of Defense for Personnel and Readiness. "Current programs rely on a pilot's ability to manually

respond to its warnings. Auto-GCAS, however, is specifically designed to prevent a collision in situations where a pilot cannot.”

Experts at the Defense Safety Oversight Council, formed in 2003 to help reduce safety mishaps within the Defense Department, believed the technology was worth pursuing, and the organization teamed with the Air Force Safety Center to find a cost-effective and efficient way to integrate the technology across multiple platforms. The collaborative effort became the Fighter Risk Reduction Program led by the Air Force Research Laboratory, at Wright-Patterson Air Force Base, Ohio.

Backed by about \$2.5 million in seed money for 2006-07 from the Defense Safety Oversight Council, the Fighter Risk Reduction Program is operating on schedule, officials said.

“Getting this program to the point it is at today has been years in the making. A lot of time and dedication has gone into this project, and I hope we can keep moving it forward,” Wilkins said.

A team of specialists from the Air Force Research Laboratory, the National Aeronautics and Space Administration, and defense contractor Lockheed Martin realized the need for Auto-GCAS technology in the early 1980s while conducting research on other automated aviation systems.

“Initially, we put the [GCAS] program on aircraft for flight safety during other tests, but discovered it may have a lot more importance than for just the prime things we were asked to look into. We realized we might have a technology that’s very useful and that nobody even considered was feasible at that point in time,” said Mark Skoog, who was Auto-GCAS test director and chief engineer for the project at NASA’s Dryden Flight Research Center at Edwards Air Force Base in California.

Initially, the technology only worked over flat terrain. Eventually, digital terrain was incorporated onto aircraft and later integrated into the Auto-GCAS program giving it all-terrain capability.

After about 2,500 automated recoveries over flat terrain and over 700 automated recoveries using digital terrain, the program was declared “technologically mature” in 2000, officials said.

“The main focus of our testing is to make sure we have a nuisance-free system that isn’t going to come on when an aggressive pilot doesn’t want it to,” Skoog said.

He said tests have also helped provide information to pilots who may be skeptical about the system. “Our primary goal is to make sure people base their opinion (of the system) on good information and data,” Skoog said. “I want pilots to realize this isn’t someone trying to sell something, it’s someone who’s honestly trying to give pilots good, solid information to base decisions on.”

Defense Department experts estimate that more than 130 fighter aircraft could be lost and their crews killed due to ground collisions over the next 25 years. Wilkins said the Auto G-CAS program could virtually eliminate “controlled flight into terrain” as a mishap category.

“That preserves a lot of combat capability and will obviously make a huge difference in the department,” Wilkins said. “We’re pleased the technology to curb this trend and save pilot lives is ready to go.”

(Kim Sears works for the New Media branch of American Forces Information Service.)