

NASA develops enhanced search and rescue technologies

May 24 2010

NASA, which pioneered the technology used for the satellite-aided search and rescue capability that has saved more than 27,000 lives worldwide since its inception nearly three decades ago, has developed new technology that will more quickly identify the locations of people in distress and reduce the risk of rescuers.

The Search and Rescue Mission Office at NASA's Goddard Space Flight Center in Greenbelt, Md., in collaboration with several government agencies, has developed a next-generation search and rescue system, called the Distress Alerting Satellite System (DASS). NASA, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Air Force, the U.S. Coast Guard and other agencies, are now completing the development and testing of the new system and expect to make it operational in the coming years after a complete constellation of DASS-equipped satellites is launched.

When it goes online, DASS will be able to almost instantaneously detect and locate distress signals generated by 406 MHz beacons installed on aircraft and vessels or carried by individuals, greatly enhancing the international community's ability to rescue people in distress, said NASA Search and Rescue Mission Manager David Affens. This improved capability is made possible because the satellite-based instruments used to relay the emergency signals will be installed on the U.S. military's Global Position System (GPS), a constellation of 24 spacecraft operating in mid-Earth orbit (MEO).

Under the current system, which first became operational in the mid-1980s as part of the international COSPAS-SARSAT system, the so-called "repeaters" are placed on NOAA weather satellites operating in low-Earth (LEO) and geostationary orbits. Although it has proven its effectiveness, as evidenced by the number of persons rescued over the system's lifetime, the current capability does have limitations, Affens said.

The LEO [spacecraft orbit](#) the Earth 14 times a day and use the [Doppler effect](#) to help pinpoint the location of the signal. However, a satellite may not be in position to pick up a distress signal the moment a user activates the beacon.

NOAA's geosynchronous weather satellites, on the other hand, orbit above the Earth in a fixed location over the equator. Although they do provide continuous visibility of much of the Earth, they cannot independently locate a beacon unless it contains a navigation receiver that encodes and transmits its position. Emergency beacons are offered both with and without GPS location data. Furthermore, the beacon-to-satellite link can be obstructed by terrain.

DASS overcomes these limitations, said Mickey Fitzmaurice, space systems engineer for the NOAA Search and Rescue Satellite-Aided Tracking (SARSAT) program, the organization that operates the U.S. component of the COSPAS-SARSAT system now comprised of 40 nations. "With a mid-Earth orbit search and rescue capability provided by GPS, one emergency signal goes off, and six satellites will be in view," he said. "Almost instantly, I can begin processing the signal to determine its precise location. Right now, it can take an hour or more before we can even act on a signal," he said.

Goddard began work on the new system in 2002, a few years after studies revealed that repeaters placed on a constellation of satellites

operating in mid-Earth orbit would significantly enhance search and rescue efforts. With NASA funding, Goddard engineers developed a proof-of-concept instrument and worked with the Air Force to fly it on GPS satellites to demonstrate and evaluate its effectiveness. Currently, nine GPS satellites are flying the proof-of-concept technology and an additional 12 are planned. Goddard is using the testing to fine tune the technology before transitioning to a final system after 2015, which will be deployed on the Air Force's Block III GPS satellites.

As part of their research and development effort, Goddard engineers also designed and built a new ground-tracking station on the Goddard campus to receive, decode, and locate the 406 MHz distress beacons worldwide. NOAA plans to use the design when it begins constructing a DASS ground station in Hawaii next year and perhaps another in Florida in the future, Fitzmaurice said.

The U.S. will not be alone in using mid-Earth orbiting spacecraft for its search and rescue instruments. Europe has begun development of a search and rescue capability on its Galileo system, Russia, its GLONASS system, and China, its Compass system. All are modeled after the NASA-developed DASS.

"DASS technology is the future of international satellite-aided search and rescue," Affens added. "A few years ago, we looked to see how we could improve the system and we concluded that the international search and rescue community would benefit from new technology installed on GPS. We would be able to identify distress signals faster and with a greater level of precision. In the end, this will save more lives, reduce risk to rescuers, and save money because less time will be spent searching."

NOAA, as the lead U.S. agency for the SARSAT program, maintains a national registration database of 406 MHz emergency beacons. "The

database is a vital part of the SARSAT program and is used to expedite the search process, especially if the location of the beacon is not immediately known," said Mickey Fitzmaurice, space systems engineer for the NOAA SARSAT program.

Should NOAA receive an alert, the agency can contact names listed on the database to validate the signal and get probable locations of the person in distress. This enhances the overall rescue coordination process and prevents unneeded rescue attempts if the beacon is accidentally activated.

Although commercial vessel and aircraft operators are required by law to carry emergency beacons, recreational users are not. However, anyone who owns an emergency beacon is required to register their names, addresses, vessel or aircraft information and emergency phone numbers with the registration database. Fitzmaurice encourages recreational boaters, aviators, and hikers to buy beacons and register their information to help assure rapid rescue.

More information: For more information about the beacon registry, go to: beaconregistration.noaa.gov/rgdb

Provided by NASA's Goddard Space Flight Center

Citation: NASA develops enhanced search and rescue technologies (2010, May 24) retrieved 1 May 2024 from <https://phys.org/news/2010-05-nasa-technologies.html>

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