
News Release

Oct. 23, 2012

VIDEO ALERT: A video interview with Dr. Steinkraus is available for journalists to download the [Mayo Clinic News Network](#).

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For Immediate Release

Fit to Fly? From F-22s to Jumbo Jets, Real-Time Info on Pilots Needed, Mayo Experts Say

ROCHESTER, Minn. — Anyone who has followed news coverage of a plane crash has probably heard of a black box, an onboard device analyzed for clues into a flight's demise. What if there were a black box for pilots that could determine, in real time, whether they are fit to fly, helping to head off cognitive and physical failures that could take a jet down? Recent issues with the physically demanding F-22 fighter jet show it's time for in-flight pilot monitoring, Mayo Clinic and other aerospace medicine physicians say.

Their commentary is published this month in the journal *Aviation, Space, and Environmental Medicine*. The authors are part of a panel that met to address whether the tools now used to assess whether a pilot is physically fit to take to the skies are still adequate. They're not, they concluded.

That is illustrated to dramatic effect by the Air Force's F-22, grounded after pilots had flight-related medical problems including cognitive abnormalities, the authors wrote. Common aeromedical problems, such as oxygen deprivation, spatial disorientation, fatigue and stress aren't assessed by standard tools, aren't in play during pre-flight physicals and can't be found in autopsies after a crash, they say.

For example, as a pilot's oxygen level drops, it can happen subtly, and several planes have been lost after a pilot passed out or otherwise became unable to make the right decisions, says co-author Lawrence Steinkraus, M.D., a Mayo Clinic aerospace medicine physician who served on the panel. If something on board alerted the pilot to that developing hypoxia and directed him or her to take specific actions, it could prevent a crash, he says.

Another common problem in fighter jets is gravitational-force-induced loss of consciousness, or G-LOC, Dr. Steinkraus says. There is a period of time before consciousness is lost when the pilot could be warned and told to intervene, or the aircraft could take action, if the right systems were in place, he says.

"Our argument is that the human being is the most important, the critical piece in aircraft performance, whether it's a commercial airliner, whether it's a fighter, you're talking about the human being,

the brain, the decision maker, being the one who drives it,” Dr. Steinkraus says. “If we have something go wrong with that central processing unit, we need to have some sort of backup or warning, and it would be wonderful if we could add that information flow back to the pilot.”

Dr. Steinkraus is joined in the commentary by Mayo aerospace medicine physician Clayton Cowl, M.D.; Russell Rayman, M.D., of Aerospace Medical PLC in Alexandria, Va.; William Butler, M.D., of the Air Force Research Laboratory Institutional Review Board at Wright-Patterson Air Force Base in Ohio; Royden Marsh, M.D., of the U.S. Air Force School of Aerospace Medicine in San Antonio; and William Ercoline, Ph.D., of the Wyle Integrated Science and Engineering Group in San Antonio.

A change in philosophy in the aviation community is needed for monitoring to catch on, Dr. Steinkraus says. Fighter pilots and others have resisted the idea as “Big Brotherish” and potentially punitive, and effective systems also have been lacking, he says.

However, the F-22 problems have pilots, the military and aerospace medicine experts alike hungry for answers, Dr. Steinkraus says. That, combined with the growth of on-board tracking in some modes of transportation, such as the use of GPS by trucking companies to monitor truck drivers, and advances Mayo Clinic and others are making in the technology, may be turning the tide in favor of it, he says.

“Acceptance is a big deal, and the smaller and easier we can make this and the more reliable, the easier it’s going to be to get pushed out into the world and people will be willing to do it,” Dr. Steinkraus says. “When the first cell phones came out they looked like giant bricks, and now you look at them and everyone’s carrying them. It’s the same thing with monitoring units.”

A Mayo Clinic research team went to Mount Everest earlier this year to study how extreme altitude affects humans and the effectiveness of remote monitoring units under those conditions.

In-flight pilot monitoring also could help prevent physiological failure-related commercial jetliner crashes; pilot fatigue, for example, is a common problem, Dr. Steinkraus says. The concept also could head off medical emergency-related semi crashes and train disasters, he says.

Mayo Clinic has long been engaged in aviation research. During World War II, Mayo’s Earl Wood, M.D., Ph.D., helped improve safety for pilots by developing a five-bladder G-suit, known as “speed jeans,” to help pilots tolerate G-forces by pushing blood up toward the brain. Among recent projects, Mayo helped develop drop-down oxygen mask systems for higher-altitude jets.

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