Topical Storm Warning

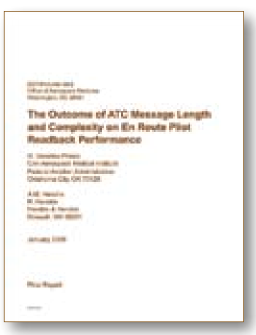
Including too many topics in one ATC clearance encourages readback errors.

REPORTS

Say No More

The Outcome of ATC Message Length and Complexity on En Route Pilot Readback Performance

Prinzo, O. Veronika; Hendrix, A.M.; Hendrix, R. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-09/2. Final report. January 2009. 38 pp. Figures, tables, references, appendixes. Available via the Internet at <www.faa.gov/library/reports/medical/oamtechreports/2000s/2009> or from the National Technical Information Service.*


The Outcome of ATC Message Length and Complexity on En Route Pilot Readback Performance

This study finds brevity to be a positive factor in the accuracy of pilot-air traffic control (ATC) communications. But more important than the duration of the message is the number of different items of information, or aviation topics (ATs), in each communication. The complexity of the information, regardless of the number of ATs, also matters.

The researchers analyzed 51 hours of ATC communication from air traffic route control centers. In addition to duration and number of ATs, communications were assigned a "complexity value," based on the number of elements that had to be understood and read back correctly. Each element, it was assumed, added another weight to the memory load. For example, "Contact Minneapolis center one one eight point eight" had a complexity value of six: one for the instruction "contact," one for the name of the facility and four for the frequency — two for the "one one eight," one for the decimal point and one for the number following the decimal.

In response to the total of 4,261 ATC messages, pilots responded to 89 percent with a complete or partial readback. A partial readback might, for example, omit numbers or letters in the aircraft call sign or be a simple acknowledgement rather than a readback of the clearance plus the full call sign. Of the 3,799 readbacks, 28.7 percent were correct, while the remaining 71.3 percent were faulty.

Faulty readbacks were categorized into three types. In errors of omission, part of the information was missing, although what was read back was correct. In readback errors only, the information was read back incorrectly. The third error type was a combination of the two. The majority of errors, 67.4 percent of all readbacks, were errors of omission.

Among the errors of omission, the largest proportion concerned altitude — 34.4 percent — and the next largest concerned radio frequency — 32.24 percent. Of pilot transmissions with readback errors, 2 percent were a combination of transposition of letters or numbers; 19.9 percent were a substitution of an incorrect for the correct letter or number; and 78.1 percent were a combination of transposition and substitution.

"The increase in faulty readback performance was attributed to a steady rise in errors of omission brought on by the added complexity of ATC messages," the report says. "This is not altogether surprising, given the high memory load imposed on the pilot's working memory capacity and the fact that verbatim recall of ATC messages is not a requirement."

Message length affected both errors of omission and readback errors, the report says: "There were more errors of omission as ATC message length increased from short (one aviation topic), to moderate (two aviation topics) and long (three aviation topics). … Readback errors increased once ATC messages included two or more aviation topics. The most common readback errors involved altitude and altitude restrictions, followed by radio frequency, route/position clearance and altimeter settings. These findings agree with research investigating the capacity limitations of verbal working memory … ."

The report concluded with recommendations:

"No more than three aviation topics [should be] present in any ATC transmission.

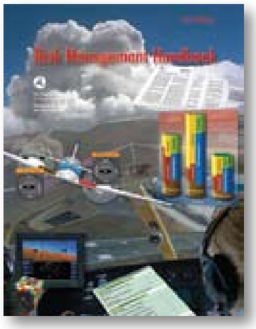
"If a route clearance is given, it should be given separately as a stand-alone transmission. This is especially important when complex route clearances are transmitted by ATC.

"The names of all fix, waypoint, location, etc., identifiers [should] be repeated, and if necessary, spelled out following their first recitation.

"Slang should not be accepted as part of a pilot readback.

"Reduce excessive words/phrases — on, your, to, is, etc. The phraseology created by the FAA is precise and needs no further embellishment."

Weighing Risk



FAA Risk Management Handbook 2009

U.S. Federal Aviation Administration (FAA) Flight Standards Service. FAA-H-8083-2. 112 pp. Figures, appendixes, glossary, index. Available via the Internet at <www.faa.gov/library/manuals/aviation/media/FAA-H-8083-2.pdf> or from the GPO.**

Many accidents "are the result of the tendency to focus flight training on the physical aspects of flying the aircraft by teaching the student pilot enough aeronautical knowledge and skill to pass the written and practical tests. Risk management is ignored, with sometimes fatal results," the handbook says. It adds, "A key element of risk decision making is determining if the risk is justified."

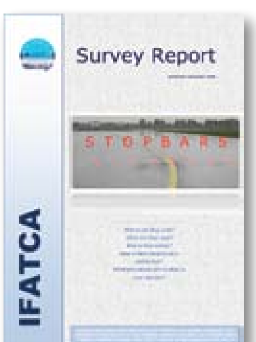
The handbook begins by defining risk management as "a formalized way of dealing with hazards … the logical process of weighing the potential costs of risks against the possible benefits of allowing those risks to stand uncontrolled."

What this means more specifically is spelled out in subsequent chapters, including "Human Behavior," "Identifying and Mitigating Risk," "Assessing Risk," "Aeronautical Decision Making," "Automation" and "Risk Management Training."

Although the material is clearly aimed at small-airplane general aviation pilots, commercial pilots — particularly those with relatively few flight hours — will find its principles worth reviewing as a refresher.

The handbook is illustrated with full-color figures, many of which have a realistic "three-dimensional" look. An appendix includes the Flight Safety Foundation CFIT Checklist for estimating a flight's vulnerability to controlled flight into terrain.

Stop Right There



Survey Report: Stopbars

International Federation of Air Traffic Controllers' Associations (IFATCA). December 2008, released on the IFATCA Web site, March 4, 2009. 17 pages. Figures, tables, appendix. Available via e-mail to <office@ifatca.org> or the Internet at <www.ifatca.org/docs/stopbar_report.pdf>.

When, where and how are stopbars used? Who owns the stopbars, and who operates the on/off switches? Does air traffic control (ATC) ever instruct pilots and vehicle drivers to cross illuminated stopbars?

What happens if a pilot or driver refuses to cross an illuminated stopbar? Are there contingency plans when a stopbar or switch malfunctions?

These are some of the questions in an IFATCA survey about stopbar usage at major international and regional airports. The survey was conducted by the organization's airport domain team (ADT) and delivered to 39 of IFATCA's global member associations. Twenty-nine of the associations, representing 70 airports, responded to the survey, resulting in data from airports in each of IFATCA's four regions: 51 in Europe, two in Africa and Middle East, seven in Asia and Pacific, and 10 in the Americas region.

The report compiles IFATCA observations and recommendations based on survey responses and its review of existing International Civil Aviation Organization (ICAO) provisions. The report identifies respondents with stopbars and outlines their responses to the questions about activation times (i.e., in low visibility only versus always in use), ownership (airport versus air navigation service provider), on/off switching authority, contingency plans or alternate routing when an illuminated stopbar cannot be switched off, and other issues. Airports without stopbars are also identified.

The report says, "The use of stopbars that are permanently on appears to be more common at the major international airports than at the other international/regional airports." It also says that "the use of stopbars during nighttime appears to be applied by a relatively low number of airports in this survey" — eight of 56.

Nearly all airports reported that stopbars are owned by airport authorities. ATC operates stopbar switches, with a few exceptions. The report says comments on survey forms appear to indicate a mismatch between some stopbar owners and their operators regarding how stopbars should be used, resulting in pilots and vehicle drivers sometimes being expected or instructed to cross active stopbars.

Responses indicated that 35 of 56 airports with stopbars have no contingency procedure for when an aircraft or a vehicle is situated in front of an active stopbar that cannot be switched off. Of those 35 airports, 10 have alternative routes available. Procedures vary at airports with contingency plans. For example, ATC tells the pilot/driver to cross by following a designated vehicle, or ATC uses specific phraseology to instruct pilot/driver to cross the illuminated stopbar or electrical power to the circuit is temporarily switched off.

In its conclusion, the report says, "There is considerable diversity in the application of stopbars and the associated procedures around the world," and notes that differences in procedures could become a safety issue. The organization is concerned that "as long as there are airports where pilots are instructed or expected to cross an active stopbar, the integrity of the protection that stopbars are intended to provide is breached."

Based on the findings, the IFATCA ADT has recommended remedies, including better guidance from ICAO on stopbar-related procedures and improved consistency across various ICAO documents. Stopbar illumination should be switchable at taxiways and intersections where aircraft and vehicles are intended to operate.

"Pilots and vehicle drivers should be trained to never cross an active stopbar, except when under the guidance of a 'follow me' vehicle as part of a contingency measure," the team says, and controllers should not instruct a pilot or driver to violate that rule. Airport and ATC authorities should have or develop contingency plans and apply them uniformly when stopbars are inoperable. "This contingency procedure should comprise the use of a 'follow me' vehicle to guide the aircraft or vehicle over the stopbar," the ADT says.

WEB SITES

Playing Safe With Rotors

National EMS Pilots Association (NEMSPA), <www.nemspa.org>

NEMSPA's Web site contains a large amount of free information for viewing online or downloading — training resources; publications; links to materials on other safety organization Web sites, such as "Guidelines for a Robust Safety Management System" by the International Helicopter Safety Team; presentations (e.g., "Safety and the Safety Officer for Dummies") and the video, "Heliport Safety Training."

This 16-minute video is in color with audio, and was developed by the Illinois (U.S.) Association of Air and Ground Critical Care Transport and the Illinois Department of Transportation, with contributions by several hospitals and helicopter organizations.

The video is designed to benefit hospital staff and medical, security and maintenance personnel. It focuses on hazards and safety precautions of helipad operation with the intent of providing safe air transport of medical patients and protecting patients, pilots, personnel and the public from accidents. Much of the information delivered in the video can be applied to heliports located in environments similar to hospitals where limited space, limited assistance from ground personnel, proximity to adjacent

equipment (especially magnetic and flammable hazards) and ground traffic are all challenges.

Using special effects, the video illustrates rotor wash from main and tail rotors, blade tilt/droop effect and the arc of rotors in motion. Differences in rotor designs are also discussed.

Viewers learn how to safely approach a helicopter, from a front quarter only, and to properly enter and exit the helipad environment. Techniques for transferring patients safely are demonstrated. Viewers are instructed about different door styles and warned not to be "helpful," as inadvertent damage or injury may occur. "Hot spots" and other sensitive areas of the aircraft are identified with warnings to personnel not to touch such areas.

The video discusses foreign object debris awareness, the importance of proper protection including goggles, headphones and vests for personnel working in the vicinity of a heliport, and on-site navigation aids and lighting.

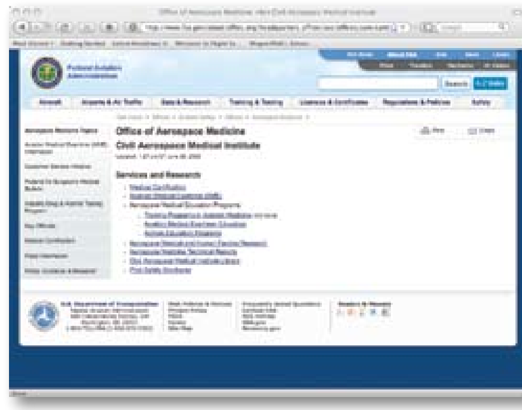
A companion to the video is "Hospital Helipads: Safety, Regulatory and Liability Issues Hospitals Must Know and Consider." The resource is available as 92 PowerPoint slides or a 92-page document in Adobe portable document format. It is heavily illustrated and addresses helipad and adjacent landscape designs, best practices and standard operating procedures, regulatory information, fire protection standards, navigable airspace and navigation aids, proactive safety training, and more.

Aviation Medicine Research Central

Federal Aviation Administration (FAA), Office of Aerospace Medicine, Civil Aerospace Medical Institute, <www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/cami/>

Regular readers of InfoScan will recognize the Civil Aerospace Medical Institute (CAMI), part of the Office of Aerospace Medicine (OAM), as the source of many reports noted here. CAMI, through its divisions, pursues its mission "to ensure civil aerospace safety in the U.S. through excellence in medical certification, aerospace medical education, human factors research, aerospace medical research and occupational health services," says the FAA.

The medical certification division administers the medical certificate program for pilots. Educational and training programs for flight crew and aviation medical examiners are addressed by the medical education division. Field and laboratory performance research are conducted by the human factors and aerospace medical research divisions.



The human factors research division studies organizational and individual human factors in aviation work environments, such as man-machine relationships, human performance under conditions of impairment, training analysis, and the impact of advanced automation on personnel requirements and performance. The Web site says the aerospace medical research division focuses on "enhancing human safety, security and survivability in civilian aerospace operations." It conducts bioaeronautical research to establish injury and death patterns in accidents, determines cause and prevention strategies and makes recommendations for equipment to protect flight and cabin occupants, among other responsibilities.

CAMI publishes its research findings in technical reports that are available in full-text online to read, print or download at no cost. Reports date from 1961 to the present. Chronological, author and subject indexes appear in a separate document. From the OAM/CAMI Web site shown in the header, choose "aerospace medical technical reports," or go directly to the Institute's publications Web page at <www.faa.gov/library/reports/medical/oamtechreports/index.cfm>.

Sources

* National Technical Information Service <www.ntis.gov>

** U.S. Government Printing Office <bookstore.gpo.gov>

— Rick Darby and Patricia Setze