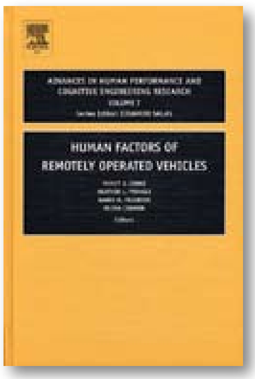
Piloting From the Ground

Human factors play an important role in the operation of unmanned aerial vehicles.



BOOKS

Human Factors of Remotely Operated Vehicles

Cooke, Nancy J.; Pringle, Heather L.; Pedersen, Harry K.; Connor, Olena (editors). Amsterdam, Netherlands: Elsevier JAI Press, 2006. 412 pp. Figures, tables, references, index.

Remotely operated vehicles (ROVs) include the category of unmanned aircraft systems, also called unmanned aerial vehicles (UAVs). In her preface, co-editor Nancy J. Cooke notes that the original term UAV could give rise to the mistaken belief among the public that no humans are involved or that their involvement is peripheral or insignificant.

"The fallacy is that the automation replaces the human; no humans — no need for human factors," she says. "However, over 30 years of research has shown that automation indeed changes the human's task, but not always in a positive manner . . . . The human's task simply changes from one of control to one of oversight. Many mishaps are attributed to the human being 'out of the loop.'"

The book offers a look at human factors challenges associated with ROVs and the research and development work that is addressing them. The first chapter is based on two presentations of the Human Factors of UAVs Workshop sponsored by the Cognitive Engineering Research Institute, comprising UAV developers, operators and researchers. Subsequent chapters look at UAV human factors issues from the perspectives of the operator, scientists and managers of national airspace systems. A section discusses "Errors, Mishaps and Accidents" from a human factors viewpoint, with a chapter on spatial disorientation of the operator as a factor in some errors.

Further sections examine the ROV-operator interface and control of multiple ROVs through modeling, design and intelligent automation. The issue of how many ROVs a single operator can control is "highly controversial," Cooke says. Other sections focus on team control of ROVs and ROVs on the ground.

"Taken together, this work represents the state of the art in our understanding of the human considerations associated with the operation of ROVs," Cooke says. "When viewed as systems, these human considerations go beyond the interface to vehicle control and extend to the tasks of sensor operation, command and control, navigation, communication, time-sensitive targeting and mission planning. Further, they extend to applications for training ROV operators, operator selection, integration into the national airspace and design of technologies to improve remote operation."

The chapter "UAV Operators, Other Airspace Users and Regulators" will be of particular interest to readers in the aviation safety field. The authors, Stephen B. Hottman and Kari Sortland, say, "From the [U.S. Federal Aviation Administration's] perspective, a UAV is an aircraft. The operator of a UAV is some type of 'pilot' who will need to be certified as having the knowledge base that is determined to be necessary and/or appropriate and who is also proficient and skilled." That proficiency and skill will depend in part on human factors research.

REPORTS

Child Restraint in Australian Commercial Aircraft

Gibson, Tom; Thai, Kim; Lumley, Michael. Australian Transport Safety Bureau (ATSB). B2004/0241. February 2006. 86 pp. Figures, tables, photographs, glossary, references, appendixes. Available via the Internet at <www.atsb.gov.au/publications/2006/crs_final.aspx> or from ATSB.*

Infants under the age of two are not required to occupy a seat of their own on commercial airline flights in Australia, but all passengers must be restrained during taxi, takeoff, landing and turbulence. Child restraint systems (CRSs) designed for automobile seats are typically used to meet the requirement for restraint of infants.

ATSB commissioned a study of 20 CRS models installed in a typical aircraft seat according to the manufacturers' instructions.

"Fourteen of the CRS models had difficulty fitting within the available space or could not be adequately installed due to interference with the aircraft seat lap-belt latch," says the report. "Additionally, one required a top leather strap (not normally available in commercial aircraft) to be used in the installation."

The remaining CRSs adequately restrained an infant dummy during a turbulence test that produced 1 g of vertical acceleration. In a dynamic sled test, 11 CRS models restrained the infant dummies in every case, but the CRSs themselves exhibited significant forward motion, rotation and rebound motion.

The report concludes that the use of CRSs by young children and infants in Australian aviation should be encouraged. To improve their effectiveness, a number of actions are suggested — for example, "An approval system should be established to ensure that any Australian automotive CRS to be used in aircraft fits the aircraft seat and is compatible with the aircraft lap belt."

Aircraft Accidents and Incidents Associated With Visual Disturbances From Bright Lights During Nighttime Flight Operations

Nakagawara, Van B.; Montgomery, Ron W.; Wood, Kathryn J. U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine. DOT/FAA/AM-06/28. Final report. November 2006. 9 pp. Figures, table, references. Available via the Internet at <www.faa.gov/library/reports> or from the National Technical Information Service.**

One of the remarkable properties of the human eye is its ability to adapt to different light intensities, from brilliant sunlight to nighttime darkness. Yet that accommodation does not take place instantly, as anyone knows who turns out the last light at bedtime and is temporarily nearly sightless. When a pilot's eyes are adapted to a low light level, typical of the flight deck at night, exposure to a sudden bright light can result in temporary visual impairment because of glare, flashblindness — a visual interference effect that persists after the source of illumination is extinguished — and afterimages. This, in turn, degrades reaction times in response to a visual stimulus.

This report describes an FAA study to investigate operational problems experienced by pilots exposed to bright light during nighttime operations. FAA and U.S. National Transportation Safety Board databases were searched for accident and incident records from January 1982 through February 2005 that included the term "night," as well as keywords such as "glare," "bright light," "flash" and "blind." A total of 58 discrete accidents and incidents were found that identified exposure to bright light during nighttime operations as a factor.

The majority of accidents, 17 of 30, or 57 percent, occurred during the approach and landing phase of flight. Accidents in other phases of flight, in descending order of frequency, occurred during taxi, en route, and takeoff and departure. Incidents occurred most frequently during taxi, followed by approach and landing, takeoff and departure, and en route.

"Flight crewmembers were more susceptible to night vision problems during the approach and landing phases of flight, possibly due to prolonged exposure to low-light levels prior to being illuminated by airport lighting systems or other bright light sources," the report says. "In the texts of these reports, pilots commented that they lost the ability to judge distances (depth perception) after experiencing glare or from being flashblinded by approach or runway lights."

Taxiing aircraft were involved in the second largest numbers of night-vision impairment accidents, six, and incidents, 21.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"Ineffective lighting configurations in the airport environment appear to be a root cause of these visual difficulties while taxiing," the report says. "The majority of these [occurrences] involved pilots who strayed off ramps, taxiways and runways, hitting obstacles or other aircraft due to the effect of glare and/or flashblindness. In several of these mishaps, the pilots reported that inappropriate or poorly positioned ramp or apron lighting hampered their ability to distinguish runway markings or determine exactly where the taxi surface began or ended."

The report says that the researchers conducted a similar search of the U.S. National Aeronautics and Space Administration Aviation Safety Reporting System (ASRS) reports submitted from 1988 through November 2004 for reports of night vision problems resulting in unsafe conditions. Those reports are anonymous and subjective, and do not represent the findings of any accident investigation.

"The ASRS database contained 153 reports where night vision problems resulted in unsafe conditions," the report said. "Fifty-nine percent of these events occurred during taxiing operations, while 27 percent involved approach and landing maneuvers."

The report said that, although it was not the primary cause of the accident, air traffic control personnel were hampered by glare from airport lighting in the runway collision between USAir Flight 1493 and Skywest Flight 5569 at Los Angeles International Airport in February 1991, which resulted in 34 fatalities.

The report concludes with recommendations to pilots for reducing the risk of accidents caused by bright light during nighttime, such as:

- "Keep one eye shut should you look in the direction of a bright light source to maintain dark adaptation in at least one eye."
- "Use the glare shield (sun visor), bill of a cap or other opaque objects to shield your eyes from harsh ramp lighting."
- "To avoid flashblinding other pilots, dim aircraft landing lights as soon as safety concerns allow."

WEB SITES

National Aerospace FOD Prevention Inc. (NAFPI), <www.nafpi.com>

NAFPI, comprising members from the aviation and aerospace industries — including airlines, airports, manufacturers, support organizations and the military — says, "We are committed to a common goal: to educate, create awareness and promote FOD (foreign object debris/damage) prevention in all aspects of aerospace operations and manufacture."

Its mission is to "be a resource for information, training and support, and to provide an effective forum for the exchange of ideas, solutions and expertise." NAFPI's educational library supports the mission with online resources:

- The "FOD Prevention Guideline" addresses general workmanship practices, standard terminology, control methods, design considerations, operational environments, reporting, and investigation for ground and flight safety.
- Presentations from the past eight national FOD prevention conferences and a lengthy report of the inaugural self-inspection summit provide the equivalent of an instruction manual on FOD issues — what it is; practical information

on ways organizations prevent it; how to design and implement prevention programs; procedures and controls to mitigate risk; and related topics.

Information is free and can be printed or downloaded to the user's computer. Files are large and contain colorful Microsoft PowerPoint presentations, with figures, tables and photographs of FOD examples and related equipment.

Also on the Web site is the NAFPI member directory, listing contact information for its extensive network of people from Argentina to Zimbabwe who are "FOD focal points" in their organizations.

European Regions Airline Association (ERA), <www.eraa.org>

ERA identifies itself as a member-supported organization that "represents the interests of organizations involved in intra-European air transport." Nevertheless, its Web site has information for members and nonmembers alike.

The publications section links to several documents, handbooks and magazines produced by ERA. The "Emergency Planning Handbook" serves as a model for organizations with existing emergency and crisis plans, or can be used as a guide in establishing such plans. The handbook addresses responsibilities, training, staffing, security, threat assessment, contingency plans, media relations, accident and incident reporting and investigation, and related topics. The handbook is available to nonmembers for a fee.

Two featured magazines are *Fly Safely* and *Regional International*.

- *Fly Safely*, ERA's flight safety e-journal, is described as providing "authoritative information on a wide range of safety issues that affect the regional aviation industry. It is suitable for crewmembers, airline and airport employees, and management alike." Access is free.

- The monthly journal, *Regional International*, summarizes technological and regulatory information for senior management at airlines, airports, manufacturers and support services. The current issue is available in full text and color at no charge.

ERA's Air Safety Work Group provides safety-targeted awareness reports, called STARS, in full text. STARS offer generic guidelines for pilots and operators on topics such as landing overruns, crosswind landing limits and just culture. Some reports are supported by information that has appeared in *Fly Safely*. The STARS introductory page suggests uses such as reproducing the guidelines in an organization's own safety or operational publications. Nonmembers can read the STARS at no cost although they are accessed via the "Membership Center" menu. ●

Sources

* Australian Transport Safety Bureau
P.O. Box 967, Civic Square
ACT 2608
Australia
Internet: <www.atsb.gov.au>

** National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161 U.S.A.
Internet: <www.ntis.gov>

— *Rick Darby and Patricia Setze*