Ascent Into the Maelstrom

Pilots and researchers test fierce storms … and themselves.

VIDEO

Extreme Meteorology

Thunderheads

Australian Broadcasting Corp. and Smithsonian Networks. DVD. Approximately 47 minutes. 2010.

Pilots normally go out of their way, literally, to avoid thunderstorms in flight. This video follows an experiment in which, for scientific research, a group of highly qualified pilots fly toward some of the largest thunderstorms the Earth has to offer. They go as close as possible to collect data while still — they hope — avoiding forces that could tear their aircraft apart.

The pilots bring with them specialized airplanes, designed for gathering weather information, from Australia, Germany, Russia, the United Kingdom and the United States. They, and scientists who control the flights and design the research, are part of the International Cloud Experiment (ICE). Their goal, the narrator says, is "to catch a cloud — but not just any cloud. They want to catch a thunderstorm."

And not just any thunderstorm. The experiment is based in Darwin, Australia, in the country's tropical north. Australia is a big country and it has big storms.

The region is known for mega-storms, collectively called "Hector." Hector can reach to twice the altitude of Mt. Everest.

Perhaps partly because Hector is a no-go area for other pilots — at least those who return safely — much remains unknown about their activity. "We are trying to track an ice cloud and see how it evolves," one of the ground-based researchers says.

Not even the project's experimental pilots and their airplanes of different types, modified for the ICE, dare to fly into the core of the thunderstorms. But they reach Hector's high-altitude periphery. One mission flies through an "anvil" — the horizontal top above the whirling air — that is 60 mi (97 km) long.

The experimental flights begin promisingly. But as might be expected considering the extreme conditions, danger is never far away. Two airplanes' airspeed indicators fail in flight on the same day, drastically increasing the pilots' task load and placing them in greater peril than they routinely face in the ICE. Delays ensue for repairs, which necessitate ordering new equipment. The project is behind schedule.

Once repairs and testing are complete, the flights resume. But time pressure mounts because of budgetary constraints. The frequency of flights must be increased.

The video camera and microphones record not only views inside and outside the cockpits at altitude, but also the discussions at the base between the pilots and the researchers in charge. Professionalism continues on all sides but the easy comradeship of the early days begins to fray at the edges. The scientists want to keep the pilots out of danger but have to reckon with the reality that the closer the approach to the thunderheads, the more valuable the data are likely to be.

Despite temporary setbacks and a few close calls, all is well in the end. The multi-national team has done its job successfully. Fortuitously, a cyclone develops and heads over land, its birth and development captured for the first time by the ICE team.

The video's production values are first-class. The narrator mentions several times the financial limitations the project is working under, and one has to wonder whether more resources were spent taping the experiment than performing it.

Dark pillows of cloud sag over the Darwin skyline. We see close-ups of Hector that few people will ever see, or want to see, in person. It must have been quite an undertaking to rig the cameras for the in-flight shots so they wouldn't be damaged or made inoperable by the expected turbulence. The time-lapse cinematography of the clouds' shape shifting is lovely, although perhaps overused, eventually coming to seem like filler.

The video will provide heady entertainment for aviation enthusiasts. The experiment it pictures will help scientists understand extreme meteorology.

— Rick Darby

WEB SITES

Human Factors, Maintenance Division

Aircraft Maintenance Human Factors Web Portal, <hfskyway.faa.gov/HFSkyway/index.aspx>

The Aircraft Maintenance (MX) Human Factors (HF) Web Portal has been evolving since 1995 and will continue to be refined to improve its usability and effectiveness, says the U.S. Federal Aviation Administration (FAA). The Web site is set up to give researchers direct access to the site, without entering the FAA's main Web site, thus the designation "portal."

The home page highlights several frequently requested manuals. One is "A Practical Guide to Maintenance ASAP Programs," published by the FAA in 2009, which defines a maintenance aviation safety action program or ASAP; outlines steps in developing an ASAP and measuring success; and discusses the relationships between maintenance ASAPs, just culture and safety management systems. The manual is the result of collaborative research by the FAA, St. Louis University, several airlines and repair stations, and other industry representatives.

Another popular manual is the FAA's "Operator's Manual: Human Factors in Airport Operations," available in English, Spanish and Chinese. Developed by the FAA at industry request, the manual reflects contributions from industry and government representatives in the United States and within Transport Canada, the U.K. Civil Aviation Authority, the European Aviation Safety Agency and the International Air Transport Association. The eight major topics addressed in the manual are procedural compliance; injury prevention; HF training; fatigue/alertness management; shift/task turnover; event investigation; auditing and assessment; and sustaining and justifying an airport operations HF program.

The MX HF presentation system, available online or in DVD format, is a "tool to help explain what human factors is, its value to the maintenance process and how it can be effectively applied in the maintenance environment," says the introduction. The presentation system includes videos accompanied by PowerPoint presentations, speaker notes, animations and other information. Multiple videos discuss HF, fatigue issues, sleep requirements, human error, and use of maintenance accidents and incidents to improve safety. Computer system requirements and instructions are available online, as is information for ordering the DVD.

Links and drop-down menus lead to more information. For example, tucked under the MX research projects tab is information on personnel management and fatigue. There are links to educational calendars and posters designed to bring awareness of human fatigue in aviation maintenance. Free downloads (in high resolution PDF format) may be printed and displayed in work and rest areas to help maintenance personnel change their lifestyle and work habits to improve safety and quality of life. Likewise, current and past issues of the quarterly newsletter, *MX Fatigue*

Focus, written for technicians and managers by a multi-disciplinary maintenance fatigue workgroup, can be found under the MX research tab.

Researchers can walk through the MX HF library menu or use its search engine to locate articles, presentations, reports, regulations and other documents with titles such as, "Use of Computer-Based Training to Improve Aircraft Inspection Performance," "The Current Picture of Rest Among Aviation Maintenance Technicians in Airline Environments" and "Shift Management: The Role of Fatigue in Human Error." Documents have been collected from Australia, Canada, the United Kingdom, the United States and other international sources. The conference materials section and the MX FAA section of the library contain HF and fatigue presentations delivered by FAA staff at various industry conferences, symposiums, meetings and workshops. Materials are free online and may be printed or downloaded.

Much information on fatigue and HF is already on the Web site, and many more topics are identified as *under development* or *coming soon*. Repeat visits to the Web site may yield new data and ideas.

— *Patricia Setze*

Laser Points to Remember

LaserPointerSafety.com, <www.laserpointersafety.com/index.html>

The Web site of the International Laser Display Association (ILDA), <www.laserist.org/index.htm>, a membership organization, says that it "is the world's leading organization dedicated to advancing the use of laser displays in the fields of art, entertainment and education." In addition to the ILDA site, which has a considerable amount of free information about laser shows, laser graphics, atmospheric laser effects and safety, ILDA co-sponsors another Web site devoted to aviation safety — LaserPointerSafety.com.

ILDA says that it "is providing some resources for [LaserPointerSafety.com] as a public service. One reason is that, if the general public sees pointers as dangerous, this could have a negative impact on laser show productions." The LaserPointerSafety.com home page says in bold

letters, "Use laser pointers safely — don't get them banned."

LaserPointerSafety.com can be accessed directly or from the ILDA Web site. At either location, researchers can view or download at no charge two presentations from the ILDA 2009 conference — the 17-page report "Lasers and Aviation Safety" and its accompanying PowerPoint presentation with 68 slides. The report and slides discuss and illustrate hazards to pilots and ways to reduce them, a U.S. Federal Aviation Administration (FAA) study, FAA regulations, laser-related incidents and more.

LaserPointerSafety.com is a gold mine of laser safety information specific to aviation and tailored to pilots and laser pointer users. This site is a collection of reports, news stories, questions and answers, recommendations and articles about laser pointer use and eye safety. There is also a long list of downloadable files and documents, such as these two full-text reports: a 2009 study comparing the effects of searchlights and lasers, and a 2004 FAA simulator study of aircraft that were targeted by laser beams on short final approaches.

Most articles and reports are full text and free online. Many contain photographs, graphics and references. Some contain videos and simulations. The news section contains international articles from 2003 to the present. Entries are aggregated by categories, such as aircraft incidents, arrests or a country or organization name.

The safety site contains information on U.S. and non-U.S. laws and regulations related to

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laser pointers. The page is not intended to be all inclusive and says, "This list is intended to provide a starting point for additional research and to illustrate how legislators attempt to define various terms and regulate various actions."

— *Patricia Setze*

REPORTS

SMS Basics

Twelve Steps to an Effective Safety Management System: A Review of the Fundamentals

National Business Aviation Association (NBAA). 5 pp. Winter 2010. Available via the Internet at <links.mkt779.com/ctt?kn=19&m=4343794&r=NTMzNTExOTk4MwS2&b=0&j=MTU2NTExNjgxS0&mt=2&rj=MTU2NDgyMDk0S0&rt=0>.

Business aviation accident rates have "fallen dramatically over the past several decades due in large part to embracing new technologies like simulator training, [enhanced ground proximity warning system] and [terrain awareness and warning system], and by improved crew resource management techniques," this "white paper" from NBAA says.

The rate of improvement has leveled off recently, and one of the next frontiers in risk management is reducing "organizational deficiencies," the paper says. But "business aviation can prevent many of the current accidents and mishaps through the development of a 'safety culture' that emphasizes a systematic approach to identifying and minimizing hazards — a safety management system (SMS)."

The paper's purpose is to "describe the basic steps necessary to develop a comprehensive and effective SMS. It is based on real-world experiences and best practices in business aviation."

NBAA advises, as a first step, becoming familiar with the concepts and philosophy underlying SMS. "Visit <www.nbaa.org/admin/sms> to get more background information and learn about successful SMS programs at other flight departments," the paper says.

Some of the further steps, and excerpts from their descriptions, include the following:

Obtain senior management commitment. "Securing senior management support for SMS early in the program should help to resolve more challenging questions about resources and priorities."

Establish an SMS team. "Involve every member of the flight department, as well as company passengers, customers and other lines of business. Wide participation in the formulation of the program not only increases employee buy-in, it also enhances the quality of the program."

Determine what resources you have and what you need. "The level of resources available to you — both internal and external — will dictate your SMS implementation timeline."

Conduct hazard identification and risk assessment, and develop a safety risk profile. "By producing an overview of the risks generally experienced by your flight operation (e.g., possible exposure to an accident, incident or regulatory violation), you can ensure that risk mitigation strategies are targeted in such a way as to optimize safety."

Identify safety accountabilities. "Defining precisely who is responsible for delivering specific goals is an important step to ensure that your SMS functions properly. It's not a 'blame game.' It's also not just another job for the 'safety guy' or 'safety gal.'"

Amend existing safety programs, procedures and documents as required. "As you make changes, make sure that the linkages are maintained and that everything operates as a system. Document your new plan and ensure everyone understands any changes made."

Conduct staff training and education. "Initial instruction and regular recurrent training are keys to ensuring that personnel are properly prepared for any likely contingency."

Track and evaluate safety management activities. "The only way to know if you are improving is to measure and periodically evaluate your performance. … Be sure to keep senior management engaged in the SMS evaluation processes."

The paper concludes, "Registration of your flight department under the International Standard for Business Aircraft Operations (IS-BAO) is the ultimate SMS solution."

— *Rick Darby*