



AAR-100

Human Factors Newsletter # 02-14

July 27, 2002 – August 16, 2002

Research Report – *Runway Incursions* (note: the following information was extracted from the FAA’s 2002-2004 Runway Safety Blueprint).

Both the severity and the frequency of runway incursions were decreased in Calendar Year (CY) 2001 from CY 2000. However, it is far too soon to declare that a trend towards a systemic reduction is underway. The NAS continues to experience about one Category A or B runway incursion per week at towered airports, thereby making runway incursions a continuing threat to aviation safety. While work continues to identify why incursions happen and what steps can be taken to prevent them, there is enough fundamental information known to provide clear direction for planned interventions. Key points are:

- Operational performance in the airport movement area must be further improved to reduce runway incursions.
- Runway incursions are systemic, recurring events that are unintentional by-products of NAS operations.
- Operations must be standardized to reduce risk at a time when growth is challenging runway and infrastructure expansion.
- Collision-avoidance safeguards need to be developed for the high-energy segment of runways, where aircraft are accelerating for take-off or decelerating after landing.
- Human factors is the common denominator in every runway incursion.

On the basis of data analyses carried out by the FAA and its partners in the aviation community, a core strategy has been developed for improving runway safety. It is structured around eight long-term goals and a set of supporting objectives.

The first edition of the Runway Safety Blueprint, published in 2000, presented FAA’s corporate approach to reducing runway incursions. This second edition, Blueprint 2002-2004, updates the earlier document based on the results of data collection and analyses carried out during the past year, presents an overview of the accomplishments in Fiscal Year (FY) 2001, and defines the objectives to be achieved in 2002-2004. It summarizes the nearly 50 activities carried out during the past year that relate to our overarching goals and supporting objectives.

Through the Safer Skies Initiative, several safety goals and issues have resulted from the work of the Runway Incursion Joint Safety Implementation Team (RI JSIT). The RI JSIT is a collaboration of the Commercial Aviation Safety Team (CAST) and the General Aviation Joint Steering Committee (GA JSC). The final report of the RI JSIT identifies 11 enhancements with detailed implementation plans that have been incorporated into the objectives of Blueprint 2002-2004. The RI-JSIT report will continue to be a source for ensuring that the industry/government data-driven, consensus based process provides a substantial input to the systematic mitigation of runway incursion risk.

The diversity of organizations and aviation professionals participating in various aspects of the runway incursion program clearly demonstrates the pervasiveness and complexity of the problem. It also underscores the necessity for broad collaboration throughout the aviation community if success is to be achieved.

The purpose of Blueprint 2002-2004 is to: (1) define and prioritize many of the coordinated efforts between the FAA and the aviation community to reduce runway incursions, and (2) to create engagement and alignment between FAA headquarters/regional staffs and the aviation community, which is essential to achieve success. Blueprint 2002-2004 is an FAA document that has been developed in consultation with the CAST and supports government and industry efforts to improve runway safety. It presents the current state of runway safety at towered airports in the NAS, and identifies those areas where progress needs to occur.

A runway incursion is defined as “any occurrence in the airport runway environment involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of required separation with an aircraft taking off, intending to takeoff, landing, or intending to land.” The National Transportation Safety Board (NTSB) considers the reduction of runway incursions to be one of its most wanted transportation safety improvements. The Department of Transportation (DOT) Office of Inspector General has identified runway incursions as one of the most difficult management challenges facing the DOT. Runway safety remains a top FAA safety priority.

Runway safety can only be improved through the concerted effort of individuals and organizations throughout the agency and industry. This Blueprint reflects many of the activities initiated by airport managers, airline operations, maintenance, safety personnel, pilots, air traffic controllers, industry associations, labor organizations and others. While the Blueprint originated in the FAA and presents an FAA perspective, it acknowledges the critically important contributions of everyone working in the aviation industry, especially pilots, controllers, aircraft mechanics, and airport vehicle drivers.

Key Points

Recognition of the following key points is fundamental to formulating and implementing solutions to improve runway safety for the nation:

- Operational performance in the airport movement area must be further improved to reduce runway incursions. The NAS involves enormously complex interactions among air traffic

controllers in the tower and people who operate on the airport surface, including pilots, mechanics, maintenance technicians, and airport employees. Improved awareness efforts and compliance are required to reduce runway incursions. A frequent reason runway incursions occur is loss of situational awareness. The major breakdowns in operational performance that result in runway incursions at towered airports are:

Pilots who:

- a) enter a runway or cross the hold short line after acknowledging hold short instructions,
- b) take off without a clearance after acknowledging “taxi into position and hold” instructions.

Air traffic controllers who:

- a) lose required arrival/departure separation on the same or intersecting runways,
- b) make runway crossing separation errors.

Vehicles drivers and pedestrians who:

- a) cross a runway without any communication or authorization,
- b) enter a runway after acknowledging “hold short” instructions.

- Runway incursions are systemic, recurring events that are unintentional by-products of NAS operations. Runway incursions are systemic because they are related to existing aviation procedures, airport geometry, training, operations, communications, and NAS infrastructure components. Improvements to the NAS will be required to reduce risk and improve safety performance.
- Operations must be standardized to reduce risk at a time when growth is challenging runway and infrastructure expansion. Aviation in the United States is a mass transportation system with thousands of unique components. There are more than 480 towered airports (and thousands of non-towered airports), over 15,000 air traffic controllers, in excess of 650,000 pilots, and greater than 240,000 aircraft, all conducting millions of operations around the clock. Improvements that standardize operations and reduce risk on the airport surface will be essential to foster improved performance and safe growth.
- Collision-avoidance safeguards need to be developed for the high-energy segment of runways. Fatalities are most likely to occur in the first two-thirds of the runway (typically called the high-energy segment) where aircraft are accelerating for takeoff or decelerating after landing. Approximately 65 million takeoffs and landings, plus millions of crossings, occur annually in this segment of the runway. Improvements to airport geometry, airport and aircraft technology, operating procedures, and airport usage patterns that address incursion risk on this runway segment will be required to reduce collision risk in the future.
- Human factors is the common denominator in every runway incursion. A systematic attack on this aspect of the problem will require detailed analyses of the causes of these errors and the design of approaches to mitigate them.

These five conclusions, drawn from the ongoing analyses of runway incursion reports, will direct our systematic search for solutions. Given the constraints of time and resources, however, it is

necessary to assign priorities. The guidance is to first invest our assets to resolve the problem of collision avoidance on the high-energy areas of runways – potentially the most lethal of the risks.

For more information about the human element in runway incursions, please go to the FAA's Runway Safety Web site at <http://www.faarsp.org/> or contact Larry Cole/ARI-100

Airway Facilities Human Factors: A researcher from the William J. Hughes Technical Center/ACB-220 briefed AOP-1 and several representatives from AOP-30 on Airway Facilities human factors research. The briefing described past and current human factors research projects related to Airway Facilities as sponsored by AAR-100, who was also represented at the briefing. Included was a description of capabilities that could be leveraged for future research. Discussions following the briefing focused on improving ways of disseminating the research results and ensuring that the research needs of Airway Facilities are being met. (V. Ahlstrom, ACB-220)

Aviation Maintenance: Nicole Nelson/CAMI attended the annual gathering of the Experimental Aircraft Association at *AirVenture* in Oshkosh, Wisconsin. Dr. Nelson participated in several general aviation (GA) maintenance-related forums. A particularly informative session was conducted by Paul McBride of Lycoming Engines. He focused on common maintenance concerns of GA pilots and the need to actually read the maintenance materials furnished by the manufacturer. One theme that repeatedly surfaced at maintenance related forums was the fact that GA aircraft are aging (most are 25 years or older).

Dr. Nelson received a training record endorsement certifying course completion of a FAA sponsored safety forum. The forum was titled, "High Altitude Physiology Training". The purpose of this class was to educate pilots on the physiological changes that occur when flying above 12,500 feet. Pilots were instructed to be aware of many possible dangerous physical changes that occur when flying at high altitudes, such as hypoxia and altitude sickness. It was also emphasized that individuals are highly variable in their reactions to high altitude flight. The instructor recommended that all pilots get tested in a high altitude chamber so they could learn to recognize the onset of high altitude physiological changes while flying.

Dr. Nelson spoke with amateur-built airplane pilots and aviation vendors about maintenance issues. She also gathered informational brochures and literature on homebuilt aircraft from aviation vendors and interest groups. (N. Nelson, CAMI)

Direct Current BUS System: Human factors practitioners met with Program Office representatives to provide human factors evaluation criteria for an Operational Capability Demonstration and Test (OCD/T) to be conducted at the manufacturing sites of three potential vendors for procurement of the commercial-off-the-shelf (COTS) Direct Current (DC) BUS System. The system will be installed in the National Airspace System (NAS) at facilities designated as Remote Transmitter/Receiver (RTR), Remote Communications Air/Ground (RCAG), Remote Communications Outlets (RCO), Backup Emergency Communications (BUEC), Level I and II Air Traffic Control Towers (ATCT) and other locations as specified by the FAA. During the OCD/T, the weighting for the Human Factors portion of the evaluation is significant and important. Element weightings are: Technical (Salient) Characteristics – 30%;

Training – 20%; Logistics – 20%; Safety – 15%; Human Factors – 15%. These weightings in which **human factors, safety, and training account for 50% of the evaluation score** provide an exemplar demonstration of how human-system integration elements can be incorporated into system procurement activities and system evaluations. Statement of work procurement weightings are similarly skewed toward operational performance and system engineering (including human factors). (G.Hewitt/R.Gray AAR-100)

Human-Computer Interaction: Information on the following publication is available from the William J. Hughes Technical Center/ACB-220 - Truitt, T. R. (2002). Human-in-the-Loop Simulation for Airway Facilities Operations, *Proceedings of the International Conference on Human-Computer Interaction in Aeronautics, 2002*, Cambridge, MA. (Earl Stein, ACB-220)

Human Factors Seminar: The Human Factors Program (AAR-100) sponsors a continuing series of seminars and short training courses on topics of significance to the FAA ARA community. As part of this series, Professor Michael Crognale of the University of Nevada-Reno gave a well-received seminar on Lighting, Illumination and Human Vision at the FAA on August 7, 2002. There were 21 attendees from AND, ASU and AAR. Professor Crognale discussed concepts of light, luminance and illuminance measurement, human visual capabilities (including developmental changes), and color vision in the context of aviation human factors and engineering. His presentation was enhanced by the ample and pertinent audio-visual graphs, slides and video footage used to illustrate the material. (G. Hewitt, AAR-100)

Safe Flight 21: A CAMI researcher attended a meeting in Washington, DC to brief representatives of Embry-Riddle Aeronautical University (ERAU), Prescott, AZ campus on the results of recent interviews of pilots using Capstone Phase I avionics. The interviews were conducted by members of the Safe Flight 21 Human Factors Group. The ERAU representatives intend to ask the FAA to fund a similar project in the Prescott, AZ area to reduce the number of near misses reported around that airport. (K. Williams, CAMI)

Laboratory Tour: Representatives of the William J. Hughes Technical Center's Human Factors Group and the laboratory support groups conducted a briefing and tour for representatives of the Civil Aviation Administration of China, CAAC. Participants included people involved in training, administration, air traffic control, and aviation psychology. (E. Stein, WJHTC)

More information on human factors research can be found at the FAA Human Factors (AAR-100) web site: <http://www.hf.faa.gov>

Mark D. Rodgers
FAA (AAR-100)



August 22-25, 2002 – 110th Convention of the American Psychological Association, Hilton Chicago Hotel/Hyatt Regency McCormick Place Hotel, Chicago, IL
<http://www.apa.org/convention>

August 25-29, 2002 – 25th European Conference on Visual Perception, Glasgow, UK

August 27-29, 2002 – 4th Workshop on Risk Analysis and Safety Performance, Atlantic City, NJ
<http://aar400.tc.faa.gov/aar424/workshop2002>

August 27-30, 2002 – Measuring Behavior 2002, 4th International Conference on Methods and Techniques in Behavioral Research, University of Amsterdam, Amsterdam, The Netherlands
<http://www.noldus.com/events/mb2002/index.html>

September 16-18, 2002 – Conference on Aerospace Materials, Processes and Environmental Technology, Huntsville, AL <http://ampet.msfc.nasa.gov/>

September 17-20, 2002 – International Air Cargo Forum, Hong Kong <http://www.tiaca.org/>

September 29- October 4, 2002 – Human Factors and Ergonomics Society 46th Annual Meeting, Baltimore Waterfront Marriott Hotel, Baltimore, MD <http://www.hfes.org/>

September 30 – October 1, 2002- FAA R,E&D Advisory Committee (REDAC) Meeting, Holiday Inn Westpark, Rosslyn, VA http://research.faa.gov/aar/redac_meetings.asp

October 10-19, 2002 – The World Space Conference, Houston, TX www.aiaa.org/wsc2002

October 14-16, 2002 – Third LOSA Week, Dubai, United Arab Emirates
<mailto:dmaurino@icao.int>

October 21-24, 2002 – 2nd Annual FAA Centers of Excellence Meeting, Wichita, KS
<http://www.niar.twsu.edu/faacoe>

October 23-25, 2002 – International Conference on Human-Computer Interaction in Aeronautics, Massachusetts Institute of Technology, Cambridge, MA <http://www-aurisco.onecert.fr/events/hci-aero2002.html/>

October 27-31, 2002 – 21st Digital Avionics Systems Conference, Hyatt Regency Hotel, Irvine, CA <http://www.dasconline.org/>

November 21-24, 2002 – 43rd Annual Meeting of the Psychonomic Society, Hyatt and Westin Hotels, Kansas City, MO <mailto:psp@psychonomic.org>

December 10-14, 2002 – Neural Information Processing Systems 2002, Vancouver, Canada
<http://www.nips.cc/>

April 2-8, 2003 – Sun ‘n Fun EAA Fly In, Lakeland, FL <http://www.sun-n-fun.org>

April 5-10, 2003 –CHI 2003 Conference on Human Factors in Computing Systems, Broward Convention Center, Ft. Lauderdale, FL <http://www.chi2003.org/>

April 7-27, 2003 – Aviation World’s Fair, Newport News/Williamsburg, VA
<http://www.worlds-fair.com/> or <http://aviation-worlds-fair.com/>

April 27-30, 2003 – Symposium on Interactive 3D Graphics, Monterey Marriott, Monterey, CA
<mailto:Pausch@cmu.edu>

May 3-10, 2003 – International Conference on Software Engineering, Hilton Portland, Portland, OR
<mailto:ldillon@cse.msu.edu>

May 4-9, 2003 – 74th Annual Scientific Meeting of the Aerospace Medical Association, Convention Center, San Antonio, TX <http://www.asma.org/>

May 12-17, 2003 - 2003 IEEE International Conference on Robotics and Automation, The Grand Hotel, Taipei, Taiwan <http://www.icra2003.org/>

June 15-22, 2003 – 45th Paris Air Show le bourget <http://www.paris-air-show.com/index3.htm>

June 22-27, 2003 – 10th International Conference on Human-Computer Interaction, Institute of Computer Science Foundation, Research and Technology, Science and Technology Park of Crete, Heraklion, Crete, Greece <mailto:info@hcie2003.gr>

June 24-26, 2003 – Human Systems Integration Symposium “Enhancing Human Performance in Naval and Joint Environments”, Sheraton Premier Hotel, Tyson’s Corner, VA
<http://www.navalengineers.org/>

July 14-17, 2003 – AIAA/ICAS International Air & Space Symposium and Exposition, Dayton Convention Center, Dayton, OH <http://www.flight100.org/>

July 29-August 4, 2003 – 51st Annual AirVenture, Oshkosh, WI <http://airventure.org/>

August 7-10, 2003 – 111th Convention of the American Psychological Association, Toronto, Ontario, Canada <http://www.apa.org/convention>

October 13-17, 2003 – Human Factors and Ergonomics Society 47th Annual Meeting, Adams Mark Denver Hotel, Denver, CO <http://www.hfes.org/>

July 27-August 2, 2004 – 52nd Annual AirVenture, Oshkosh, WI <http://airventure.org/>

May 2-7, 2004 – 75th Annual Scientific Meeting of the Aerospace Medical Association, Egan Convention Center, Anchorage, AK <http://www.asma.org/>

*July 28 – August 1, 2004 – 112th Convention of the American Psychological Association.
Honolulu, Hawaii <http://www.apa.org/convention>*

September 20-24, 2004 – Human Factors and Ergonomics Society 48th Annual Meeting,
Sheraton New Orleans Hotel, New Orleans, LA <http://www.hfes.org/>

Note: Calendar events in Italics are new since the last Newsletter



Comments or questions regarding this newsletter?
Please contact Bill Berger at (334) 271-2928
or via e-mail at bill.ctr.berger@faa.gov