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**Question:** Tell us a little bit about yourself. Where did you get your degree/training? How did you get to where you are today?

**Answer:** Well, you are asking me to report on my "misspent youth" as Stan Roscoe often said. Got my BA in psych/math at the University of Basketball at Los Angeles. I actually stood next to Lew Alcindor, Curtis Rowe and Sidney Wicks in the Pauley Pavillion Parking lot during class-change time. Made me feel like a munchkin in comparison. MA (Engineering Psych) and Ph.D. (Exp. Psych) from U. of Illinois at Champaign-Urbana, although there was no champagne involved. Those were the days of streakers parachuting into the quadrangle. None, however, jumped out of the twin Beach research aircraft we were using at the Aviation Research Laboratory. How did I get here? Well, mostly by car, but sometimes by plane or bus (no more buses, that's for sure).

**Question:** What made you want to pursue the career path you have taken? Why aerospace? Why human factors? Was there a critical incident that led you to this career path? Was there any research that you found particularly interesting?

**Answer:** Started out as a music major. Was going to study harpsichord performance with Malcolm Hamilton at UCLA. The summer before I started undergrad, he left and went to USC (critical incident!). This led to the great rivalry between The Bruins and the Trojans... Changed to psych, became a pilot in 1969. Harry Case (Traffic Institute, UCLA) had me do a study on collision avoidance in aircraft for a senior project, and he then sent me to Hal Coleman at Northrop, who then sent me to U. of I. and the Institute of Aviation for graduate school. Senior project turned into a MA thesis. Liked to tinker with things, take things apart, sometimes actually got them back together, which led to playing with controls and displays. Built my first joystick control out of an aluminum cigar tube and some aluminum angle bracket. I think I still have it... Still like displays and controls, but am becoming even more fond of autopilots (lets you take a nap along the way).

**Question:** What is aerospace human factors to you? Why does aerospace human factors matter?

**Answer:** Does Aerospace Human Factors matter? I think it depends upon who one talks with. Although there appear to be fewer REALLY bad designs showing up in aircraft, there are still things that just aren't designed for the common human being (not that any of us are "common"...). It seems to me that things can still be made better to the degree that we can try to keep people from hurting themselves in aircraft, although some appear totally committed to self destruction no matter how good a system you give them.

**Question:** What struggles do you typically face as a human factors/aerospace professional?

**Answer:** Having credibility. Well, sure, you don't often have much with your adult kids (thank goodness for grandkids), but regarding human factors, it is often difficult to impress upon some people the degree to which simply being a human doesn't mean you know a lot about human factors. The continuing "struggle," as it were, seems to be continually demonstrating, over and over, that there actually is value added by implementing good design criteria at the outset BEFORE metal gets bent rather that afterwards. This is particularly important when it involves heavy metal...

**Question:** Where do you see aerospace human factors in 15-20 years? What questions will aerospace human factors be trying to answer? What will be the research focus?
**Get to Know Your Officers:**
**Dennis B. Beringer (continued)**

**Answer:** Space, the Final Frontier. Probably commercialized space tourism. Well, maybe space. It could also be that flying car stuff all over again, as there are now apparently three that are in development. Interesting how some ideas never die... OR fade away... and let's not forget about the potential for autonomous air transport systems, much as we'd like to...

**Question:** What questions are you trying to answer with your research?

**Answer:** Right now we are attempting to make piloting simpler and more straightforward, both with enhanced displays and perhaps envelope protection and different control strategies for general aviation. The thing I have been working on lately is how best to present obstruction information in a head-mounted display for use by Helicopter Emergency Medical Service pilots. It's great because it's kind of like toys for adults.

**Question:** What outlets do you use for your research? What journals do you use? What conferences do you present at?

**Answer:** Gee, let's be self serving and say HFES right up front as a useful meeting. Been doing that since Huntsville 1974. Was in a Holiday Inn as I recall and a rather small meeting. Then there is the ISAP in Dayton. The useful journals would seem to be HFJ, IJAP, and some of the AIAA and IEEE journals.

**Question:** What is the most exciting incident or research you have been a part of?

**Answer:** So much excitement, so little time. I guess the most gratifying (is that equal to "exciting?") experience was when we identified, through simulator research, what appeared to be a causal factor for Piper Malibu in-flight break-ups related to runaway pitch trim with inappropriate pilots responses. I was able to take the information and give a presentation at the annual meeting of the Malibu Owner's and Pilots' Association. However, maybe the most "exciting" moment was during grad-level research at Illinois in the Beach C-45H. I was way back in the aft section of the fuselage trying to calibrate the 8-channel strip-chart recorder (we had just installed that to replace the clay tablets...) and it was a little bumpy and the aircraft wasn't staying at a level attitude. Our safety pilot was at the helm up front. So, I kept saying, annoyingly, "Hey, Bob, are we level yet?" After about the third time, Bob says, "How 'bout this?" and promptly puts the aircraft into negative Gs. I didn't have my seat belt on... and so I closely inspected the headliner of the aft cabin with the top of my head. So, after we leveled off again, Bob says, "How's this?" to which I meekly replied, "Yep, that's just fine."

**Question:** Is there any advice you would give to a person wanting to pursue a career in aerospace human factors?

**Answer:** Same as I told my daughter when she expressed an interest in psychology: Don't do it. The big bucks are in the internet or someplace else. If you are absolutely compelled to do HF work, dabble with a bunch of the subareas first, or do some internships or the like, and find out what seems to be the most fun. After all, there's making money and then there's having fun. Ideally you should be able to do BOTH, but sometimes not together in the same vocation. Get excited about what you're doing as it can be contagious to those with whom you work. HAVE FUN REGARDLESS.
The Journal of Cognitive Engineering and Decision Making is pleased to announce a forthcoming special issue that will focus on improving the design of automation systems that aim to assist skilled humans at work. Most of the articles in the issue deal specifically with the automation systems found onboard modern transport aircraft.

An article by Asaf Degani and colleagues traces through the events of an airline incident that occurred following a serious breakdown in communication between the flight crew and the onboard automation systems. Degani's primary aim is to propose methods for designing visual displays that help make automation system statuses and actions more transparent to the user.

Two articles by Grant Taylor and Kathleen Mosier and their colleagues look past existing "one size fits all" automation systems and make a case for the design of automation systems that can adapt to the characteristics of the task and even the state of the user.

Ed Hutchins and colleagues introduce an analysis tool that is able to combine video, audio, eye tracking data, flight simulator data, and even informal notes into a single integrated time-series presentation. After making a case for the multidimensionality of human-automation interaction, the authors step through the events of a typical airline flight to demonstrate how their tool allows researchers to look at the same activity in many different ways at a glance.

Stayed tuned for this interesting special issue coming this fall.

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**Treasurer’s Report**  
**Submitted by: Angel Millan**

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Student papers awarded on last meeting:
- Alicia Fernandes: (200)
- Andrew Clare: (150)

Members as of 12/31/12: 481
Members as of 5/29/13: 410
Members as of 08/7/13: 425
Upcoming Events

HFES Annual Meeting: September 30—October 4 San Diego, California

Go to http://www.hfes.org/Web/HFESMeetings/2013annualmeeting.html for more information

IEEE Aerospace Conference: March 1-7, 2014 Big Sky, Montana

Go to http://www.aeroconf.org/ for more information

Aerospace Medical Association Annual Meeting: May 11-15, 2014 San Diego, California

Go to http://www.asma.org/annual-meetings/future-annual-meetings for more information.

SAE International Aerospace Events can be found at http://www.sae.org/events/aerospace/

For more conferences and meetings go to http://www.hfes.org/web/calendar/calendar.html

Air Shows. Feel like catching an air show. Go to http://www.milavia.net/airshows/ for a calendar of events
### Know It All: Aerospace Trivia

What is the name of the person who has flown, as a passenger, the highest number of different types of aircraft and how many?

*(Question Submitted by Valerie Gawron)*

Everyone that can correctly answer all parts to this trivia question will be acknowledged in the next edition of the newsletter. However, the first person that correctly answers all parts to this trivia question will receive a special prize.

Please email responses to:

ericjstearman@gatech.edu

Please write “ASTG Trivia” in the subject line.

Persons that correctly answered the last Know It All question (submitted by Dennis Beringer) included:

- **Valerie Gawron** (MITRE) July 9th 2:59pm
- **Shawn Pruchnicki** (The Ohio State University) July 9th 4:21 pm
- **Amy Pritchett** (Georgia Tech) July 10th 6:35am

Who was on the SECOND Apollo mission to land on the moon?

**Apollo 12** was crewed by C. Peter Conrad, Richard Gordon, Alan Bean

Who was the mission commander?

C. Peter Conrad was the mission commander

Where, exactly, did that lunar lander set down on the moon's surface?

The lunar lander set down on the Ocean of Storms

As you can see, Valerie Gawron barely beat out Shawn Pruchnicki by 1hr 22min and Amy Pritchett by 15hr 36min in being the first person to correctly answer the question. Although Valerie will be the only one to receive the special prize, so the next time you see one of them please greet congratulate them for being a Know It All.
Tuesday 10/1/2013

10:30am-12:00pm (AS1 - Aviation Fatigue: Issues in Developing Fatigue Risk Management Systems)

Discussion Panel

Chair: Monica Z. Weiland

Aviation Fatigue: Issues in Developing Fatigue Risk Management Systems

Panel Members: Monica Weiland (The MITRE Corp.), Thomas Nesthus (FAA), Carlos Compatore (U.S. Coast Guard), Stephen Popkin (Volpe Nat. Transportation Systems Ctr.), Jim Mangie (Delta Air Lines), Lisa Thomas (Boeing Commercial Airlines), & Erin Flynn-Evans (NASA Ames Research Ctr.)

In its 2011 rule amending flight crew duty and rest requirements, the FAA states that both the carrier and the pilots are ultimately responsible for mitigating fatigue risk. To underscore this point, the first three parts of the new rule focus on understanding fitness for duty criteria, receiving effective fatigue education, and implementing successful fatigue risk management systems. In order to summarize the current state of the art in tools and models and identify the research needs for aviation fatigue, a research community of aviation researchers and operations professionals has been formed and has identified the following areas as high priority areas for research: 1. Strategies for changing the culture for fatigue self-report and self-monitoring. 2. Policy shifts to account for consecutive nights worked and the effects of circadian rhythms. 3. Tools for self-fatigue assessment, particularly based on objective measures. 4. Tools for minimizing fatigue in scheduled operations and on-demand operations planning. 5. Fatigue models that account for individual differences and account for the dynamic nature of fatigue in different operational contexts. 6. Benchmarking and validation of proposed fatigue risk management systems in operational settings. This panel is intended to expand this discussion of the human factors-related issues in fatigue of specific concern to the aviation community to a wider audience of human factors professionals. Five expert panelists from the FAA, the United States Coast Guard, Delta, Volpe, and Boeing will address these issues.

1:30pm-3:00pm (AS2 - Performance in Simulators and Cockpits)

Lecture

Chair/Co-chair: K. Michael Dresel & Michael Sawyer

A Human-in-the-Loop Simulation of High-Performance Routes

Authors: Erin Higgins (TASC Inc.) & Randy Sollenberger (Federal Aviation Admin.)

A human-in-the-loop simulation was conducted to examine the High-Performance Routes (HPRs) concept in High Altitude (HA) Airspace as part of the Next Generation Air Transportation System (NextGen) initiative. HPRs will be dynamic, wind-optimized, RNAV-2 routes that will allow for greater flexibility and additional routing options compared with current jet routes. We recruited 12 air traffic controllers for the simulation, which involved two experiments, one designed to investigate the usefulness of HPRs in an arrivals scenario, and the other designed to examine HPRs in an overflight scenario. We identified human performance issues related to HPRs by comparing HPRs to current jet routes using objective system performance data and subjective ratings. In Experiments 1 and 2, we found some evidence for the benefits of HPRs compared with Jet Routes, though in Experiment 1 subjective feedback indicated difficulties with the HPRs concept. In Experiment 2, controllers felt more comfortable with the HPRs concept.

A Human-in-the-Loop Simulation of the Generic Sector Concept and Controller Information Tool

Authors: Erin Higgins (TASC Inc.) & Randy Sollenberger (Federal Aviation Admin.)

A human-in-the-loop (HITL) simulation evaluated the Generic sector concept proposed for High Altitude (HA) Airspace as part of the Next Generation Air Transportation System (NextGen) initiative. Currently, Certified Professional Controllers (CPC) gain certi-
fication in a specific area of specialization (AOS) after a time-consuming and expensive training process. The Generic Sector concept would allow controllers to certify for multiple “generic” sectors upon achieving their area rating, resulting in increased staffing flexibility. The purpose of this HITL was to demonstrate that controllers can safely and efficiently manage traffic in a generic sector with support tools and minimal training. Participants managed traffic in four 30-minute scenarios. Performance measures showed no safety violations. By the end of the third scenario, 11 out of 12 participants reported they controlled a safe sector. Participants’ subjective workload was low across all scenarios, though there was a noticeable reduction in workload between the first and third scenario.

Head-Mounted Displays for Civil Helicopter Navigation and Obstacle Avoidance: Is What You See What You Don’t Get, or Is Seeing Not Believing?

Authors: Dennis Beringer (FAA Civil Aerospace Medical Inst.) & Gena Drechsler (FAA Civil Aerospace Medical Inst.)

Civilian helicopter pilots flew simulated Helicopter Emergency Medical Service (HEMS) scenarios using a head-mounted display (HMD) with guidance and/or obstruction imagery. Obstructions were detected and avoided earlier when shown in the HMD than those shown only out the win-dow, and highway-in-the-sky (HITS) guidance reduced subsequent maneuvering in the terminal phase of arrival. The HMD depictions of power lines (passive representation) reduced wire strikes but did not eliminate them. An active warning presentation (red warning fence) overlaid on the power-line graphic at the point it transected the flight path completely eliminated flights into that obstruction. Pilots preferred the active warning representation, indicating that the passive one was ambiguous. Pilots’ preference tended towards the simplified representations of power lines but towards the complex “realistic” representations of broadcast towers. A strong preference was also expressed for integrated cockpit systems (HMD, MFD, PFD) that depicted the same obstruction information and warnings on each display.

Effects of Modern Primary Flight Display Clutter: Evidence from Performance and Eye Tracking Data

Authors: Nadine Moacdieh (U. of Michigan), Julie Prinet (U. of Michigan), & Nadine Sarter (U. of Michigan)

Many complex domains, including aviation, experience a continued increase in the amount of information that is needed and available to operators. One example of this trend is modern primary flight displays (PFD), some of which now include weather, terrain, and navigation data. The addition of information to already busy displays has raised concerns about clutter. In this experiment, our goal was to investigate the performance and attentional costs associated with PFD clutter during a simulated flight and to determine to what extent pilots are aware of clutter and its effects. Low-, medium-, and high-clutter PFDs were created, and pilots flew a simulated flight scenario containing periods of high and low workload using one of the three PFDs. Pilots were asked to detect various visual alerts and notifications that appeared on the PFD throughout the flight. Performance, eye tracking, and subjective measures were recorded. Clutter significantly increased the response time to alerts, and high workload resulted in more alerts being missed. The eye tracking data provided insight into pilots’ monitoring strategies and efficiency in the different clutter conditions. Spatial density and the number of transitions were found to be larger in the case of higher clutter, whereas the number of fixations on flight mode annunciators was higher in the low-clutter condition. Importantly, pilots rated clutter as being relatively low even in the high-clutter condition. In combination, these results suggest that pilots may benefit from real-time clutter detection and reduction techniques that are based on eye tracking metrics.

Wednesday 10/2/2013

8:30 am-10:00 am (AS3 - Human Factors in Commercial Human Space Operations)

Discussion Panel

Chair/Co-chair: Haydee M. Cuevas & Rebecca A. Zgorski

Human Factors in Commercial Human Space Operations

Panel Members: Haydee Cuevas (Embry-Riddle Aeronautical U.), Rebecca Zgorski (Embry-Riddle Aeronautical U.), Jason Kring (Embry-Riddle Aeronautical U.), Barrett Caldwell (Purdue U.), Cynthia Null (NASA Engineering and Safety Ctr.), Brienna Hen-
ASTG Program for the 2013 HFES Annual Meeting

wood (Nat. Aerospace Training and Research Ctr.), & Stephen Fiore (U. of Central Florida)

What was unthinkable as little as five years ago now seems to be on the brink of becoming a reality in the foreseeable future – a world in which commercial space travel is as commonplace as commercial aviation travel is today. The scientific research community will play a vital role in achieving this reality while supporting the safety of both passengers and crews. This will require the application of sound human factors theories, principles, and practices to develop effective training programs and countermeasures as well as to design viable habitats on board commercial space vehicles for these new space travelers. Accordingly, the objective of this multidisciplinary discussion panel will be to identify and discuss the human factors issues that warrant investigation to support the safe and efficient advance of commercial human space operations.

of sound human factors theories, principles, and practices to develop effective training programs and countermeasures as well as to design viable habitats on board commercial space vehicles for these new space travelers. Accordingly, the objective of this multidisciplinary discussion panel will be to identify and discuss the human factors issues that warrant investigation to support the safe and efficient advance of commercial human space operations.

1:30 pm-03:00 pm (AS4 - Automation and Unmanned Systems)

Lecture

Chair/Co-chair: Divya Chandra & Tim Barry

The Effects of Predictive Displays on Performance in Driving Tasks With Multi-Second Latency: Aiding Tele-Operation of Lunar Rovers

Authors: Adrian Matheson (U. of Toronto), Birsen Donmez (U. of Toronto), Faizan Rehmatullah (U. of Toronto), Piotr Jasiobedzki (MacDonald-Dettwiler Space and Advanced Robotics Ltd.), Ho-Kong Ng (MacDonald-Dettwiler Space and Advanced Robotics Ltd.), Vivek Panwar (MacDonald-Dettwiler Space and Advanced Robotics Ltd.), & Mufan Li (U. of Toronto)

Tele-operation of a Lunar rover from a control station on Earth involves a latency of several seconds due primarily to the finite speed (light-speed) of command and sensor signals, and this latency creates a difficult control task for the human operator. Two predictive displays, which seek to aid viewer perception of present events, were designed and evaluated for the specific task of driving a rover with multi-second latency. These displays provided visual information to the human operator on the rover’s real-time locomotion, as predicted from control inputs executed by the operator. A human-subject experiment with 12 participants was conducted in which the participants navigated an actual rover through obstacle courses. There were four experimental conditions repeated by each participant: (1) delayed video feed only, (2, 3) two predictive displays based on delayed video feed, and (4) a reference condition of video feed with no delay. Inferential statistics show that both predictive displays significantly improved performance in terms of time taken to complete the courses, and one of the displays facilitated performance approaching that with no delay. No trends were observed in terms of collisions with or encroachments near obstacles.

Adaptable Automation Interface for Multi-Unmanned Aerial Systems Control: Preliminary Usability Evaluation

Authors: Gloria Calhoun (Air Force Research Lab), Mark Draper (Air Force Research Lab), Christopher Miller (Smart Information Flow Technologies), Heath Ruff (Ball Aerospace & Technologies Corp.), Chad Breeden (Air Force Research Lab), & Joshua Hamell (Smart Information Flow Technologies)

With advances in automation technologies, systems are now being considered wherein a single operator supervises multiple unmanned aerial vehicles. Supervisory control of highly autonomous systems will require a new interface design. The present effort extends a delegation control concept to enable a pilot to flexibly change the role of automation during the course of a mission, seamlessly transitioning between four different control modes ranging from manual (pilot controls the vehicle’s flight with stick and throttle control) to high level “plays” (pilot’s command initiates a series of automated tasks). This novel concept was instantiated into a dynamic laptop simulation to support a usability evaluation in which participants employed the multi-level control architecture during ninety minute sessions. Data include comments recorded with a think-aloud paradigm and questionnaire responses. Results indicated that this adaptable pilot-automation interface for multi-unmanned systems control is promising. The findings include perspectives from both pilot and gamer participants that will help advance design of multi-level control for future aviation systems.
Unmanned Aircraft System Response to Air Traffic Control Clearances: Measured Response

Authors: Robert Shively (NASA), Kim-Phuong Vu (California State U. Long Beach), & Timothy Buker (SAIC)

In the National Airspace System (NAS), Air Traffic Control (ATC) expects aircraft to complete ATC clearances in a timely manner in order to maintain minimum separation between aircraft. The end-to-end response time for an aircraft to complete a clearance, as measured from the end of ATC instructing the pilot of the clearance to the just noticeable difference (JND) on the ATC display of the aircraft satisfying the clearance (i.e., initiation/completion of an altitude climb), can be referred to as measured response (MR). This MR is not quantified in Federal Aviation Administration (FAA) standards, regulations, or policy; however, as manned aircraft have developed along with the Air Traffic Management System, a shared understanding of reasonable and timely response has evolved. By contrast, the introduction of unmanned aircraft systems (UAS) into the NAS has highlighted this issue. This paper seeks to define MR and its components, and describe a methodology, with an example, that can be used to investigate it.

Examining Relationships of Human Automation Interaction Consequences on Pilots

Authors: Eric Stearman (Georgia Institute of Technology), Vlad Pop (Georgia Institute of Technology), Francis Durso (Georgia Institute of Technology), Dan Morrow (University of Illinois Urbana Champagne), & The Hart Group

Understanding the relationship between dimensions affecting human automation interaction is an important aspect in determining how a new piece of automation designed to affect one dimension will affect other dimensions as well. The current report examined pilot judgments of 11 HAI dimensions (e.g., Workload, Task Management, Stress/Nervousness, Monitoring Automation, and Cross-checking Automation) across 48 scenarios that required pilots to interact with automation on the flight deck. We examined the inter-correlations of these dimensions and found 3 major clusters of the 11 dimensions identifying subsystems on the flight deck. We identify a workload subsystem, a management subsystem, and an awareness subsystem. Additionally, we found that stress only correlated with cross-checking of automation. It is our hope that the understanding of these subsystems will help determine how a piece of automation will affect other dimensions that are in the same subsystem.

ASTG Business Meeting

Thursday 10/3/2013

8:30 am-10:00 am (AS5 - Ground Crew and General Performance Issues)

Lecture

Chair/Co-chair: Thomas Z. Strybel & Michael Vincent

Effects of Type and Strength of Force Feedback on Movement Time in a Target Selection Task

Authors: R. Conrad Rorie (San Jose State Foundation), Kim-Phuong Vu (California State U. Long Beach), Panadda Marayong (California State U. Long Beach), Jose Robles (California State U. Long Beach), Thomas Strybel (California State U. Long Beach), & Vernol Battiste (San Jose State Foundation)

Future cockpits will likely include new onboard technologies, such as cockpit displays of traffic information, to help support future flight deck roles and responsibilities. These new technologies may benefit from multimodal feedback to aid pilot information processing. The present study investigated the effects of multiple levels of force feedback on operator performance in an aviation-related task. Participants were presented with two different types of force feedback (gravitational and spring force feedback) for a discrete targeting task, with multiple levels of gain examined for each force feedback type. Approach time and time in target were recorded. Results suggested that the two highest levels of gravitational force significantly reduced approach times relative to the lowest level of gravitational force. Spring force level only affected time in target.
Postures and Motions Library Development for Verification of Ground Crew Human Factors Requirements

Authors: Damon Stambolian (NASA), Gena Henderson (NASA), Mariea Dunn Jackson (NASA), & Charles Dischinger (NASA)

Spacecraft and launch vehicle ground processing activities require a variety of unique human activities. These activities are being documented in a primitive motion capture library. The library will be used by the human factors engineering analysts to infuse real to life human activities into the CAD models to verify ground systems human factors requirements. As the primitive models are being developed for the library, the project has selected several current human factors issues to be addressed for the Space Launch System (SLS) and Orion launch systems. This paper explains how the motion capture of unique ground systems activities is being used to verify the human factors engineering requirements for ground system used to process the SLS and Orion vehicles, and how the primitive models will be applied to future spacecraft and launch vehicle processing.

Shift Turnover Strategy and Time in Aviation Maintenance

Authors: William Warren(Embry-Riddle Aeronautical U.)|Beth Blickensderfer(Embry-Riddle Aeronautical U.)|Jessica Cruit(Embry-Riddle Aeronautical U.)|Albert Boquet(Embry-Riddle Aeronautical U.)

Ineffective shift turnover strategies are a contributing factor in aviation accidents and incidents that involve shared maintenance tasks between shifts. Furthermore, a constant demand for available aircraft places time pressure on technicians to complete these tasks. This study examined the effect of shift turnover strategy and time pressure on error capture, accuracy, and completion time of a shared maintenance task between two maintenance shift technicians. Forty aviation maintenance students completed a maintenance task while subjected to conditions of shift turnover strategy and time pressure. The researchers measured three levels of performance; i.e., skill-based errors, trigger event errors, and task completion time. Results indicate that the face-to-face shift turnover strategy was significantly more effective in preventing trigger event errors than the written strategy. Additionally, technicians under time pressure completed the task significantly faster than technicians without time pressure. Results support the need of face-to-face shift turnovers within aviation maintenance procedures.

Controller Use of a Block Occupancy-Based Surface Surveillance Display for Surface Management

Authors: Emily Stelzer (MITRE CAASD), Ronald Chong (MITRE CAASD), Ronald Stevens (MITRE CAASD), & Vilas Nene (MITRE CAASD)

Advanced surface surveillance capabilities cannot be economically justified at small and medium airports, though these airports continue to suffer from runway incursions. A block occupancy-based surface surveillance approach, in which runways and taxiways are divided into blocks and the occupancy of a block is displayed to the controller, may provide a low cost solution to these airports. A medium fidelity simulation was conducted to examine controller situation awareness, workload, and aircraft identification performance with the use of the block occupancy display. Results indicate that the presence of the display improves controller detection of safety critical runway events. However, controllers indicate that associating occupied blocks with aircraft identification is burdensome.

10:30 am-12:00 pm (AS6 - Human Factors in General Aviation and Air Traffic Applications)

Lecture

Chair/Co-chair: Angie Sebok & Emily Stelzer

Human Factors Hazards of iPads In General Aviation Cockpits

Author: Robert Joslin (Embry Riddle Aeronautical U.)

The rapid proliferation and application of portable iPads in General Aviation (GA) aircraft has outpaced the human factors hazard analyses that is normally associated with the introduction of new cockpit technology. Insights into human factors hazards associated
with iPad cockpit technology were derived from an information synthesis of archival publically available narratives from anomalous events that were voluntarily and anonymously self-reported by pilots through the Aviation Safety Reporting System (ASRS). The most prevalent types of anomalous events in which pilots reported iPad use as the primary problem were airspace/procedural violations, with situational awareness and human-machine-interface as the most common human factors causal categories. A narrative analysis revealed improper use of zooming/panning, data selection/reading/entry errors, data currency, and workload due to unfamiliarity with the iPad as the specific themes informing the human factors causal categories that should be considered in hazard mitigation strategies for iPad use in GA cockpits.

**Air and Ground-Based Methods for Absorbing Delay in Four-Dimensional Trajectory-Based Operations**

Authors: Amy Alexander (MIT Lincoln Lab) & Thomas Teller (MIT Lincoln Lab)

This paper focuses on pilot and controller issues linked to alternatives for absorbing delay in metering conditions under four-dimensional trajectory-based operations (4D TBO). We specifically explored combining two robust and complex tools, Required Time of Arrival (RTA) and three-dimensional Path Arrival Management (3D PAM) Efficient Descent Advisor (EDA) to yield more accurate and reliable delivery to the meter fix while maintaining operational efficiency. This represents the first time that these two robust and complex tools, one airborne (RTA) and one ground-based (EDA) have been used together. The data demonstrated that the combination of RTA (for speed) and EDA (for path) offered significant capacity for absorbing delay, and these two tools seemed to work well together. Specifically, the speed management of RTA was sufficiently stable and accurate to preserve 3D PAM conflict detection and avoidance and active conflict probe functionality. Potential safety and operational impacts/mitigations and human factors issues requiring further exploration are presented.

**Accuracy Assessment of Air Traffic Conflict Probe Prototype for Operational Evaluations**

Authors: Anthony Masalonis (Spectrum Software Technology Inc.), Jonathan Rein (Spectrum Software Technology Inc.), Jay Messina (Behavioral Science Assoc. Inc.), & Ben Willems (Federal Aviation Admin.)

This study is part of the Separation Management research program, whose goals include improving the FAA’s operational Conflict Probe function. Conflict Probe alerts air traffic controllers to conflicts, or situations where aircraft will be too close to each other. The present study is one link in a chain of research efforts. We used the results of a meta-analysis of Human Factors literature on automation accuracy (Rein, Masalonis, Messina, & Willems, in press) in conjunction with FAA mathematical studies on the accuracy of the current Conflict Probe prototype (Crowell, Fabian, Young, Musialek, & Paglione, 2011; Crowell & Young, 2012) and determined the acceptability of the prototype’s conflict detection performance. The present results will feed upcoming operational research including a human-in-the-loop (HITL) simulation in which the prototype will be used, by helping establish whether the prototype was “good enough” to improve joint human-automation system performance. In addition, the present analysis enhances the methodology for determining the accuracy of the operational Conflict Probe, although for this paper we did not evaluate or report on operational data. We obtained data from the aforementioned FAA mathematical analysis, which reported the prototype’s performance on some of the standard SDT metrics. We further analyzed their data to generate values on a wider set of accuracy metrics, and compared the results to the findings of Rein et al. regarding how accurate automation “should” be, as well as considering the results from an operational/face validity perspective. We focused on reliability, a measure of overall percent correct by the automation, which has been used in past multi-experiment analyses of automation accuracy (Wickens & Dixon, 2007), and which Rein et al. found have a relationship to system performance. With a “best case” estimate of Conflict Probe reliability, its performance far exceeds that needed to improve system performance. However, the estimate may have been too liberal from an operational perspective, because the input data included many correct rejections where the proximity of the aircraft was well beyond the distances defining a conflict. In such cases, the automation’s failure to alert would have been technically correct, but not useful to the controller, who would know without any automated assistance that no conflict was present. We conclude that the current Conflict Probe prototype is suitable for conducting the HITL research, but that additional scenario evaluation research should be run to determine for what kinds of conflicts and near-conflicts the automation can complement rather than duplicate controller skill. This scenario evaluation research, and related follow-up mathematical analysis, will answer the question “how accurate is Conflict Probe?” The HITL will answer “how accurate does Conflict Probe need to be?” These answers will be evaluated in conjunction with each other to improve the operational Conflict Probe.

**Conflict-Resolution Heuristics for en Route Air Traffic Management**
This paper describes the first study in a PhD program examining the effect of mental workload on conflict resolution decisions in Air Traffic Control. This study focussed on the heuristics controllers use when resolving potential conflicts between aircraft and highlighted contextual factors that affect perceived workload. Using static maps of novel scenarios, controllers were interviewed about how they would resolve potential conflicts and what factors contributed to their workload. Controllers reported that they scanned in a clockwise and top-bottom pattern; grouped aircraft with similar characteristics and used a range of different lateral and vertical conflict resolution heuristics. This research expands on previous conflict resolution heuristics and identifies the sources of complexity, which influence decision choices.

Friday 10/4/2013

8:30 am-10:00 am (AS7 - NextGen Human Factors)

Chair/Co-chair: Valerie Gawron & Jennie Gallimore

Understanding the Human Component of Area Navigation Procedures Across the National Airspace System

Authors: Katherine Berry (Fort Hill Group LLC) & Michael Sawyer (Fort Hill Group LLC)

The FAA intends to considerably increase the usage of area navigation (RNAV) approach and departure procedures in order to achieve the proposed NextGen goals for improved efficiency and capacity. RNAV procedures enable aircraft to have better access and flexibility for point-to-point operations. In an effort to better understand the potential impact of increased RNAV usage, a human factors safety assessment was conducted to identify the key human factors issues present in current RNAV operations. An analysis of 100 RNAV narrative-based safety reports from the Air Traffic Safety Action Program (ATSAP) and 68 narrative-based safety reports from the Aviation Safety Reporting System (ASRS) was conducted to identify key causal factors. The analysis found several key causal factors related to RNAV procedure design, controller-pilot communication, automation systems, and track deviations. Specific human performance concerns and mitigation strategies for each causal factor were developed. These results should drive future requirements associated with the implementation of future RNAV procedures.

In-Cockpit NEXRAD Products: Training General Aviation Pilots

Authors: Michael Vincent (Embry-Riddle Aeronautical U.), Elizabeth Blickensderfer (Embry-Riddle Aeronautical U.), Robert Thomas (Embry-Riddle Aeronautical U.), MaryJo Smith (Embry-Riddle Aeronautical U.), & John Lanicci (Embry-Riddle Aeronautical U.)

Recent developments in avionics have allowed pilots of General Aviation (GA) aircraft to access more in-flight information than ever before, among them being data link weather services. However data link resources, namely next generation radar (NEXRAD), possess discrete limitations which can lead pilots into dangerous situations if they do not interpret the information correctly. The present study evaluated a training module designed to help pilots interpret and use data link NEXRAD weather information. GA pilots in the Midwest and Northeastern U.S. completed a face-to-face lecture course which covered the capabilities and limitations of NEXRAD based weather products and included paper based scenarios to give course participants practice using NEXRAD as a tool for decision making. A comparison of Pre- vs. post- test performance indicated that pilots had significant increases in radar knowledge, performance on application scenarios, and self-efficacy after completing the training.

Evaluation of a Technique to Simplify Depictions of Visually Complex Aeronautical Procedures for NextGen

Authors: Divya Chandra (USDOT Volpe Center) & Rebecca Grayhem (USDOT Volpe Center)

Performance based navigation supports the design of more precise flight procedures. However, these new procedures can be visually complex, which may impact the usability of charts that depict the procedures. The purpose of the study was to evaluate whether there are performance benefits from simplifying aeronautical charts that depict visually complex flight procedures by separating the
procedures onto different chart images. Forty-seven professional pilots participated. They used high-fidelity current and modified charts to find specific information from approach and Standard Instrument Departure (SID) chart images that were shown one at a time on a computer monitor. Response time and accuracy were recorded. Results show a consistent and significant reduction in the time to find information from the simplified chart images. Response time varied linearly with a simple clutter metric, the sum of visual elements in the depiction, indicating serial visual search. Most questions were answered with high accuracy, but some questions about altitude constraints yielded low accuracies.

The Insertion of Human Factors Concerns Into NextGen Programmatic Decisions

Authors: Bettina Beard (NASA), Rachel Seely (FAA), Jon Holbrook (San Jose State U.), & Margaret Galeon (San Jose State U.)

Since the costs of proposed improvements in air traffic management exceed available funding, FAA decision makers must select and prioritize what actually gets implemented. We discuss a set of methods to support cost-benefit assessments of operational and human performance before new automation is introduced. This strategy should assist decision makers in selecting and prioritizing potential improvements, make the process more transparent, and strengthen the link between the engineering and human factors domains.

Message From the Editor
Eric Stearman

I hope you enjoyed this newsletter. It was made possible by several people and I would like to give them all a special thanks.

Dennis Beringer for taking the time to answer my interview questions and for serving as Chair for the ASTG this year. He has been invaluable in helping me to put together these newsletters.

Paul Havig for taking the time to answer my interview questions in the last issue of this newsletter and for serving as the Program Chair for the ASTG this year

Stephen Casner for submitting a story about articles being published in JCEDM.

Valerie Gawron for submitting a new Know It All: Aerospace Trivia question.

Valerie Gawron, Shawn Pruchnicki, and Amy Pritchett for submitting answers to the Know It All question in the previous issue.

And a special thanks to Angel Millan who serves as the Treasurer and Secretary for the ASTG, submitted the Treasurer’s Report, and has also stepped up to take the position of WebMaster in addition to his regular duties when we needed someone. Make sure to send you a thank you for all the hard work he does. If you do not see him in person, email him at angel.millan@faa.gov.

If you ever come across an interesting article or event you would like to share with the members, do not hesitate to contact me at ericjstearman@gatech.edu. I would be more than happy to spread the information through the newsletter. Just make sure to include ASTG Newsletter it the subject line to make it easier for me to find.