Developments in the fields of human factors, automation, UAS operations and a host of other topics critical to safety in the skies filled the agenda at the 62nd annual Business Aviation Safety Summit (BASS), held in Phoenix in early May. The event is organized by the Flight Safety Foundation (FSF) in partnership with NBAA, and board chairman Ken Hylander noted the foundation’s key role in safety initiatives as he welcomed attendees “to join us in our march to aviation safety.”

The concept of partnership, collaboration and teamwork as essential components of safety programs ran throughout the presentations, starting with Capt. Ron Mumm’s keynote observations on Teamwork and High Performance. Mumm, owner and managing director of Raven Aviation and former commander of the USAF Thunderbirds, attributed superior team performance to three principles: “resist less and assist more; include everyone; and be passionate about performance and critiquing.”

He used anecdotes, photos and video from his Thunderbirds career to illustrate his points, starting with a potential clash with Arnold Palmer, upset about an airspace closure the team’s performance created, that Mumm defused. (“In that brief moment, the paradigm shifted and we became a team,” Mumm recounted.) Upon taking command of the Thunderbirds, he learned prison inmates provided janitorial services for the squadron, and involved them in the team’s activities, with some surprising results. (“We all have inmates in our lives,” he said of the need for complete inclusion.)

Mumm explained that each Thunderbirds performance is recorded from multiple angles, and each maneuver is graded on a scale of zero to 10. In 225 shows before some 20 million people while he was Thunderbird 1, their average performance score was 4.2. Team members were sometimes “uncomfortable with the grading criteria,” he said, “but passionate about performance and critiques,” and those rigorous reviews kept the team aiming higher.
Accidents — and How To Reduce Them

Greg Marshall, vice president of the FSF’s global program, briefed attendees on last year’s key business aviation safety statistics (from the Ascend Insurance database): 20 accidents, seven of them classified as major and four of them fatal, resulting in 14 deaths.

Three of the major accidents were the result of loss of control in flight (LOC-I) and two were controlled flight into terrain (CFIT). Marshall noted that since 2003, business aviation has averaged 10.1 major accidents annually, a rate that has declined in recent years. Meanwhile, the FSF has added cabin safety to its focus, prompted by “events associated with turbulence,” Marshall said, citing a recent Moscow-Bangkok commercial flight in which clear air turbulence injured 27 passengers, some requiring surgery.

As the leading cause of aviation fatalities, LOC-I—an extreme manifestation of a deviation from the intended flight path in ICAO, CAST and EASA taxonomy—remains an area of intense aviation safety focus. From 2008 through 2016 the almost 60 accidents and more than 120 fatalities LOC-I caused in business aviation dwarfed those of any of 18 other fatal accident categories, with the exception of the number two killer, CFIT.

An NTSB analysis of accident data broken down by operator category released this year finds LOC-I accounts for 7 percent of Part 135 accidents and almost one-third of the fatalities (31.4 percent), Paul Ransbury, president of Aviation Performance Solutions, said in the presentation on upset recovery training for business aviation. For business operations (owner flown/crewed by unpaid pilots), LOC-I causes 9 percent of accidents and a third of the fatalities (36.4 percent); 12 percent of all corporate/executive (paid crews) aircraft accidents and half (46.7 percent) of the fatalities result from LOC-I.

John Cox, CEO of Safety Operating Systems, emphasized the need to “make loss-of-control training a priority,” with integrated programs that provide academic instruction and hands-on human-factors training. Moreover, upset prevention and recovery training (UPRT) needs “to focus on high-altitude stalls,” to address the effect reduced air density has on aircraft performance and aerodynamics, Cox said. “The instability [at high altitude] is something we’re not adequately addressing.” Many pilots have no experience hand flying aircraft at high altitudes because of RVSM mandates on the use of autopilots above FL290, he noted.

Cox and Ransbury cited the loss-of-control accident in January over the Arabian Sea involving a Challenger 604 at FL340 following a wake encounter with an A380 as underscoring the need for UPRT. The Challenger rolled several times and was reported to have lost 10,000 feet of altitude before recovery, resulting in serious injuries and the permanent grounding of the aircraft because of damage from exceeding operating limitations. Ransbury, who has discussed the accident with Bombardier investigators, told attendees they declined to say whether the Challenger crew had undergone upset training.

In “industry breakthroughs” in the field, last year ICAO published an “Aeroplane Upset Prevention and Recovery Training” manual, IATA released a UPRT best practices Specialist Paper, and the NBAA safety committee is involved.

FSF data indicates more than half (54 percent) of all aviation accidents could be corrected “by a simple decision to go around,” Marshall said in presenting details of the FSF-sponsored Go-Around Decision-Making and Execution Project report, conducted by Presage Group and released in March.
New Emphasis on UAS

With their exponential increase in number and sudden integration into the National Airspace System (NAS), unmanned aerial systems (UAS) have leapt to the front ranks of safety issues and were the subject of a quartet of presentations at BASS. Some 670,000 UAS are currently registered with the FAA, and an estimated seven million will be sold in the U.S. by 2020, Harrison Wolf, president of Wolf UAS and instructor at USC’s Aviation Safety and Security Program, said in his presentation on the systems.

Given these trends, “it’s highly likely your organization will get involved with UAVs in the next decade,” predicted attorney Camille Khodadad, a partner in Hall Prangle and Shoonveld, in discussing legal liability implications of UAV use. Art Dawley, CEO of Wyvern, urged flight departments to take the lead in integrating UAS into corporate operations and implementing best practices for their use. He pointed to ICAO Document 10019, “Manual on Remotely Piloted Aerial Systems (RPAS),” published in 2015, and FAA Advisory Circular 107-2, “Small Unmanned Aircraft Systems (sUAS),” published last year, as setting best practice methods for developing operational programs.

Companies that employ outside UAS service providers should develop assessment criteria for oversight based on standards and recognized practices (Sarps), Dawley said, and engage recognized and experienced third-party SMEs or organizations.

Wolf noted that the FAA will issue new operational guidance for FAA personnel in October, superseding FAA JO (Job Order) 7200.23, which prescribes procedures for the planning, operation and services of UAS in the NAS. It’s particularly critical that operators observe rules when flying near airports, Wolf said. He displayed a rendering of New York’s complex Class B airspace created by a UAS app that, in contrast to a sectional chart, “makes information very easy to understand.”

Johnny Young, director of the UAS program at Embry-Riddle Aeronautical University’s Prescott campus, explained practices established to ensure safe operations in the program, which is focused “not necessarily on learning how to fly, but on planning, risk assessment, the conditions they can fly in, and what to do with the data once it’s off the aircraft.” He displayed a preflight risk assessment form students must complete before every flight and added, “As both a manned and unmanned pilot I can attest that the training required for safe UAS operation is not drastically different from manned flight training.”

Citing a “trend to the criminalization of aviation accidents,” Khodadad said UAS operators and companies that employ them need to mitigate the risk of potential civil and criminal liability that could follow a UAS mishap. At least 26 states have passed laws regulating UAS, and municipalities are enacting more rules, beyond the FAA’s Part 107 FARs issued last December. She suggested obtaining liability insurance for UAS operations; having an emergency response plan in place for accidents, as companies do for manned aircraft operations; ensuring all contracts with third-party providers of UAS services are vetted by an aviation attorney; and reviewing all federal regulations and applicable state and local statutes governing UAS operations. FAA enforcement actions can also be costly, Khodadad noted. Earlier this year the agency reached a $200,000 settlement with a drone company for illegal operations.

Safety, Security and Technology

This year the FSF added aviation security to its Top Ten list of safety issues, in recognition of the potential safety impact of security breaches. “Cyber security is going to be more and more important,” said John Zban, Satcom Direct chief information officer, addressing vulnerabilities of business aircraft and their connected cabins, and how to mitigate the risks. Wi-Fi systems on aircraft should have strong passwords, as otherwise they’re vulnerable on the ground, Zban said. Satcom’s...
The NTSB has listed loss of control in flight as one of its “Most Wanted” safety improvements, and the International Civil Aviation Organization has also listed it as a priority. In addition, NBAA has formed a committee to study the subject and develop mitigation strategies, to reduce the number of accidents and fatalities.

NTSB Data Analysis 2017

LOC-I Contributions to Fatal Accidents and Fatalities 2008 to 2016
(On Demand Part 135, Business, Corporate/Executive)
policy: passwords must be “sixteen characters, at least one capital letter, at least two numbers and at least one special character, changed every 60 days,” he said, adding that “security makes things inconvenient.”

The networked devices we carry have safety issues of their own, as Michael Givens, a hazardous materials specialist with the FAA made clear in Risks of Lithium Batteries: Events and Consequences. “If you have not had an event in your operations, chances are you’re going to have one soon,” Givens said. As of late March, the FAA had reports of 152 lithium battery fires on commercial aircraft, 85 of them over the last five years, and these are likely just a “fraction” of worldwide incidents, according to the agency. Most were spontaneous “smoke fire events,” with the remainder occurring while charging; in e-cigarettes; attributable to battery short circuits; or by combusting in “a thermal runaway” after getting crushed in the automatic seats in first-class airliner cabins. Givens noted business aircraft are at greater risk because in their smaller cabins “the smoke a laptop can produce will quickly affect the whole aircraft.”

Photos and videos of lithium battery fires showed the ferocity of these blazes and the quantities of toxic smoke they produce, with the unseen explosive hydrogen produced by these battery fires multiplying the hazard. Understanding the risk, how to mitigate it, and what to do in the event of a lithium battery fire will help crewmembers “make it out on the other side of incident,” Givens said, citing FAA Order 8040.4A on Safety Risk Management Policy as an example of the available guidance. But there is no standard method of dealing with these fires and no regulations regarding equipment or training for business aviation, Cox said in the same seminar. “The FAA can do a better job” of providing guidance to flight crews on handling these fires and ensuring there is “better standardized training” from providers, he said.

Laser attacks are another global safety concern, with their number growing exponentially in the last decade. In 2004, 46 laser attacks were reported to the FAA. A decade later, the agency received reports of 3,894 attacks. In 2015 that number nearly doubled, to 7,703. Last year 7,442 attacks were reported, an average of 20 per night, said Tony Reed, president of ST Laserstrikes. The FAA made reporting easier starting in the early part of this decade, and in 2011 said it would start imposing civil penalties, showing it is serious about cracking down.

“If you haven’t been hit yet, you probably will be or know somebody who has been,” he said. Twenty percent of affected pilots and flight crewmembers required medical attention after the attacks, Reed said in Laser Attacks Against Aircraft—Trends and Solutions. Nine out of 10 attacks are with green lasers, the color that most affects vision. Moreover, lasers can emit infrared radiation at wavelengths the eye can’t see but that cause ocular damage. Most of the lasers, Reed said, are from China and don’t observe the five-milliwatt limit placed on lasers in the U.S. by the Food and Drug Administration, which regulates the devices.

Lasers up to 100 milliwatts of power have reportedly been taken from people arrested for attacks. Last October the FDA proposed eliminating all lasers outside the red spectrum, but Reed is “not really confident” the ban will be effective in stopping the influx of illegal devices. Some glasses, including optical products made by ST Laserstrike, can filter laser light, reducing the danger.

Perpetrators face little deterrence. Out of 17,725 reported incidents between 2005 and 2013, only 134 arrests were made and 80 convictions obtained, Reed said. (A large percentage of those arrested were minors who were not subsequently charged.) Sentences ranged from probation to several years in prison.
Accounting for Human Factors
It’s often said you can’t manage what you can’t measure, and Sonnie Bates, vice president and COO of Baldwin Aviation, married metrics to safety performance in a session on managing human factors. “We need to be human-factors geeks,” Bates said, referencing an FSF and Eurocontrol document published last year finding 85 percent of all aviation accidents and serious incidents involve human error, with human factors the primary cause in 60 percent of them.

Moreover, the FAA, EASA and “Dirty Dozen” lists of safety concerns are all topped by four human-factors issues: distraction; fatigue; lack of compliance with SOPs; and lack of skill, qualification and knowledge. Bates suggested mitigating these risks organizationally in a fashion similar to management of personal health: by capturing events, monitoring metrics and promoting positive behaviors. Simple, regular employee surveys on specific human-factors items can yield actionable safety performance data addressing all four of these issues. He urged attendees to adopt Flight Operations Quality Assurance (FOQA) programs. “If you’re not hooked up to a flight data analysis program, you need to do it.” Noting the inevitability of driverless vehicles and other self-learning systems (“The train’s left the station for AI [artificial intelligence], and we’re all on it”), Bates said human factors will play a bigger role in safety as automation increases.

NTSB member Christopher Hart picked up on that theme in a session on the challenges of wider automation. While acknowledging the benefits automation provides, Hart said system designers often don’t take adequate account of human factors, a problem the NTSB is trying to understand and address better. Accidents attributed to human error “used to be the end of the investigation,” Hart noted. “Now it’s the beginning.”

Laser Incidents Reported to FAA

Laser incidents represent a serious threat for pilots, with the number of reports rising exponentially over the last decade. In that time frame, the FAA has also put an increased emphasis on reporting such incidents.
He identified three key drawbacks of automation. First, systems are so complex that if they’re not operating as intended, users don’t understand what they’re doing. Second, systems are so reliable that should an unexpected problem occur, the operator has likely never seen the error, even in training, and doesn’t know how to respond. Third, when automation works properly, operators face “loss of skills and complacency.” Automation also involves ethical issues. Hart cited a driverless car facing an out-of-control “80,000-pound truck coming at you. Is the car going to save you and take out people on the sidewalk,” he asked, or remain in the truck’s path?

Fatigue, a perennial human factors topic, seems to be gaining more recognition from corporate leadership, which has long appeared to fear the disruptions fatigue-management programs could cause. But only 2.5 percent to 4 percent of flight operations are at fatigue risk, and they can be identified and mitigated, said Dr. Daniel Mollicone, president and CEO of Pulsar Informatics, which provides fatigue risk assessment and remediation tools. “Fatigue risk management has matured” and is based on “objective science and quantitative measures,” as exemplified by the Psychomotor Vigilance Test, Mollicone said. Using these tools, fatigue-management programs can reduce disruptions. Mollicone cited a program Pulsar implemented for Alaska Airlines that cut by one third the incidence of crew shifts canceled by fatigue calls.

But management’s concern with fatigue needs to extend beyond the cockpit and into the maintenance hangar, Fred Calvert, vice president of safety, security and standards for Executive Jet Management, said in one of the three fatigue management presentations. No duty-time regulations for Part 91 or Part 135 maintenance technicians, and no fitness-for-duty requirements exist, although “a fatigued maintenance technician can kill you and your passengers just as fast” as can a fatigued pilot, Calvert said.

Casting the issue in ethical and moral terms, Calvert recounted his early maintenance career and subsequent realization that an overextended schedule and sleep apnea were putting others at grave risk. He advocates non-punitive fatigue reporting, and said in answer to a question that his company’s maintenance technicians are salaried (“most are paid very well”) rather than paid hourly wages, removing pressure to extend work hours. (EJM maintenance techs are not allowed to hold second jobs.)

Leadership’s ultimate role in attaining safety goals is to set standards, provide resources and empower the policies and practices, said Pete Agur, chairman and founder of the VanAllen Group, but gaining support can be a challenge. In addressing Your Executive’s Impact on Safety Performance, he said senior executives have difficulty “translating our needs for risk management and safety versus how they do business” because “safety is amorphous to them.” Benefits must be expressed in terms leadership understands: “Money, or true physical harm to facilities or people,” he said, illustrating his points with anecdotes from his dealings with anonymous clients. Agur suggests flight departments can better understand senior executives’ attitudes regarding safety versus risk by viewing them in the context of the organization’s business sector (from conservative financial services to swashbuckling raw materials producers), as well as the executives’ individual personality traits and positions within the organization. If dealing with stubbornly risk tolerant and Sarp-resistant executives, Agur suggests calling in a consultant to deliver the same message. If that doesn’t work, “As a last resort, you’re known for who you work with. Fire them, by leaving.”