

FORUM

ISASI

Air Safety Through Investigation

JANUARY-MARCH 2019

Journal of the International Society of Air Safety Investigators

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PRESIDENT'S VIEW

“TWO THINGS AN INVESTIGATOR MUST HAVE: INDEPENDENCE AND INTEGRITY. INDEPENDENCE TO DO THE WORK WITHOUT OUTSIDE INFLUENCE OR PRESSURE.... INTEGRITY, WITHOUT IT, TRUE PROGRESS IN ACCIDENT INVESTIGATION AND PREVENTION IS NOT POSSIBLE.”

WHAT AN ISASI TREASURE!



Tom McCarthy, an ISASI Life Member, started his aviation career when he joined the U.S.

Air Force on Feb. 15, 1951. He was a fighter pilot flying the F-106 Delta Dart with the 61st Fighter Interceptor Squadron stationed in Minot, North Dakota, USA. In the early 1960s, his commander appointed him the squadron flight safety officer, and he's been involved in aviation safety ever since.

In March 1973, Tom retired from the Air Force as a lieutenant colonel. Shortly after retiring, Tom accepted employment with the U.S. National Transportation Safety Board as an investigator in the New York field office and subsequently transferred to the Washington, D.C., office to be an investigator-in-charge (IIC) of the

investigations and was the IIC on most. He's responsible for many safety recommendations that have improved aviation safety worldwide.

Tom joined ISASI in 1981 and was a member of the ISASI Membership Committee before becoming committee chair in 1994—a position he held until recently. In 1994, Tom also accepted the position of Nominating Committee chair. In 1995, he agreed to assume the remainder of a term for ISASI treasurer, was elected to the position in 1996, and continued to hold that office until October 2012. In 1996, Tom convinced me to become ISASI secretary—a position I held for one two-year term—and then to become ISASI president in 1998. He was always ready to offer sound advice and assis-

go-team doing major catastrophic accidents around the world. In his career, Tom was involved in more than 100 accident

tance when I had questions or sought guidance.

Prior to 2000, ISASI rented office space in Sterling, Virginia. The landlord was raising the rent, and the new lease would have massive increases for the next few years. Tom and I discussed the possibility of ISASI buying a condominium to establish a new Society headquarters. Tom found a viable unit, and ISASI purchased the condo. Over the years, this purchase has been a major cost savings for ISASI and has even generated revenue from renting office space to other occupants. The condo is now worth more than twice what ISASI paid for it. Tom became the plumber, electrician, window washer, and performed other work to help maintain the new unit.

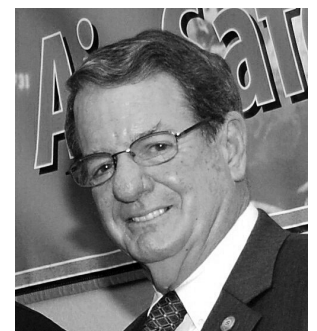
In 2007, ISASI presented Tom with its highest recognition for lifetime efforts to improve air safety through investigation—the Jerome F. Lederer Award. In accepting this award, Tom noted that he believes there are “two things an investigator must have: independence and integrity. Independence to do the work without outside influence or pressure.... Integrity, without it, true progress in accident investigation and prevention is not possible.”

Tom recently served as mas-

ter of ceremonies for a memorial dedication at the National Museum of the United States Air Force at Wright-Patterson Air Force Base in Dayton, Ohio, to honor of the 61st Fighter Interceptor Squadron and has served for many years as a volunteer senior docent for visitors to the National Air and Space Museum in Chantilly, Virginia, and trained other volunteers to become docents.

During Tom's tenure as ISASI treasurer, he spent much time and effort to obtain ISASI tax-exempt status from the U.S. federal government and then subsequently from the state of Virginia government. Tom's contributions to ISASI and aviation safety are truly monumental, and the membership is eternally grateful.

We wish Tom the best of health and much happiness in his retirement. He is now living the good life in Florida. ♦



Frank Del Gandio
ISASI President



ISASI HOLDS 2018 SEMINAR

More than 300 delegates, guests, and companions from 46 countries—a new record for states represented—gathered at the Intercontinental Hotel in Dubai, United Arab Emirates (UAE), Oct. 30–Nov. 1, 2018, for ISASI’s 49th annual international accident investigation and prevention conference. The theme for ISASI 2018 was “The Future of Aircraft Accident Investigation.”

Tutorials and the President’s Welcome Reception

On Monday, October 29, more than 100 safety and accident investigation representatives participated in three preseminar tutorial programs covering military and civilian aviation safety issues. Military air safety representatives attended an all-day session that covered a wide variety of investigation and safety issues, including case studies of specific military air safety investigations and tools



ISASI 2018 participants attend the President’s Reception on the hotel patio.

and techniques unique to military air operations. Civilian air safety personnel had two options: a morning session on recognizing metal fatigue issues at an accident site or an all-day multipresentation session on future developments and challenges to air safety investigation.

That evening, tutorial and seminar participants were invited to the President’s Reception—a welcoming gathering held outside on the hotel patio. This event is an opportunity to greet longtime friends and colleagues and to



ISASI President Frank Del Gandio welcomes ISASI 2018 participants to Dubai for the Society’s 49th annual seminar.

Photos: J. Gary DiNummo



N DUBAI, UAE

BY J. GARY DINUNNO, EDITOR, *ISASI FORUM*

meet new air safety professionals from all over the world.

ISASI 2018 Opens with a Flourish

Speaking to a packed crowd in the Intercontinental Hotel ballroom, Moderator Mohammed Aziz, Middle East North Africa Society of Air Safety Investigators (MENASASI), welcomed delegates and officials to Dubai for ISASI 2018 and introduced Society President Frank Del Gandio for his traditional opening presentation.

Del Gandio provided a short history of the region. He said, “For those who are not from this region of the world, permit me to offer a brief tutorial on the UAE. The UAE was formed in December 1971 as a federal state of seven emirates: Abu Dhabi, Ajman, Dubai, Fujairah, Ra’s al Khaymah, Sharjah, and Umm al-Quwaun. The various emirates have long been self-governing; but beginning in the 1820s and culminating in 1853, the seven emirates plus Oman, Bahrain, and Qatar entered a series of treaties with the UK and became British ‘protectorates’ but continued to self-govern. When the UK announced its intention to terminate its treaty in 1968, seven of the emirates

formed a sovereign, federal state.

“For North Americans, the land area of the UAE is comparable to South Carolina or Maine; for Europeans, it is comparable to Austria; and for Asians, it is comparable to Japan’s northern island of Hokkaido.

“The changes that have occurred since the UAE was founded have been breathtaking. To appreciate the change, just look around the city here. In 1971, this region was sparsely populated with several relatively small port cities, including Dubai. Today, the city is home to more than 3 million.

“For more than three decades following independence, oil and international finance drove the national economy. Though the prosperity of the UAE still is significantly affected by energy, the UAE has worked hard to diversify its economy by making major investments in infrastructure, health care, education, tourism, business, and—not coincidentally for an organization like ISASI—aviation. Those efforts were accelerated in response to the international banking crisis and falling oil prices in 2008–2009. In short, the UAE has transformed itself in a very



MENASASI President Ismaeil Al Hosani welcomes delegates and guests to Dubai and provides an outline of air safety investigation in the UAE.

short time into a major international player and into a rich country, with one of the world’s highest GDPs per capita.” (See “President’s View,” *ISASI Forum*, October–December 2018, for more of Del Gandio’s opening comments.)

Ismaeil Al Hosani, president of MENASASI, the host society, welcomed all participants and companions to the UAE and Dubai. He noted that in the UAE, the Air Accident Investigation Sector (AAIS) investigates aircraft accidents and

incidents. He observed, “AAIS is still very young.” The agency was established in 2012 and now has a director, eight investigators, one technical assistant, and four administrators.

“Most of our activities,” Hosani said, “involve investigation of accidents and incidents occurring to commercial transport aircraft.” He pointed to two notable accident investigations as examples: a B-747 lithium battery fire accident in September 2010 and a B-777 go-around accident in August 2016. “The UAE has a large fleet of helicopters,” said Hosani, “and helicopter incidents and accidents feature significantly in our workload.” He added that other investigations involve recreational aircraft and hot air balloons. AAIS “has a modern flight recorder lab,” Hosani observed, “where we can download and analyze data from almost 100 percent of the flight data recorders in use today.” He noted that the lab is continually improving to ensure that investigators have use of the latest computer software and hardware.

Hosani said AAIS is engaged in international safety investigation activities through participation in International Civil Aviation Organization (ICAO) working groups and ISASI and MENASASI corporate membership. He remarked that AAIS assists other regional state investigation authorities with their investigations and provides training to state and industry organizations. In addition, AAIS has established memorandums of understanding with many regional and international air safety investigation entities.

Opening Keynote Address

Yannick Malinge, senior VP and chief product safety officer, Airbus, provided the opening session keynote address. He discussed accident investigation information, data sharing, and communication in the world of instant news and social media and the need to investigate systemic issues. Regarding the accident information aspect, he noted that the real starting point for air safety investigation is accident data, but the questions for future investigators must be what will the data sources be and who will have access?

Looking at data sources, Malinge observed that early “black boxes” produced a metal sheet with a limited number of parameters and reduced sampling rate and that it took time to identify the big

picture. In comparison, today’s solid-state recorders produce a huge amount of data with a high sampling rate—3,500 parameters, 1,024 words per second—and offer the capability for almost “real time” identification of the big picture. And tomorrow’s data sources may include digital flight data recorder traces, replay devices, video, and data streaming from an aircraft.

“What about other sources that are not sent from the aircraft but are publicly available?” he asked, noting that nearly all passengers on an aircraft or in or near an airport terminal have video and photo capability on their smartphones and can instantly link their data to global social media platforms. “With all the data collection and information sharing means available today and even more in the future, we need to be ready for nearly real-time and open investigations as we face millions of self-appointed investigators among the public—worldwide—who



Yannick Malinge, Airbus, provides the opening day keynote address.

expect instant publicity and information sharing.

“This sizable population leads to our next challenge—the buzz society with all its inherent issues descending on an aircraft accident,” Malinge observed. “Think about the speed of information flow in today’s world and the consequences of having a huge number of nonaviation people who feel the need to be the first to record any event for a buzz feed regardless of any validation process. What seems to count in today’s world is the need for speed of communication, not the accuracy—no

time to double-check the facts or you lose; a need to feed websites, TV, or radio; a need to grow and keep a large audience; and a need to generate controversy.

“Who are these people? They are generally self-appointed experts, bloggers, social media participants, journalists, and politicians who all want to be a part of the buzz society and gain the visibility they believe the buzz provides them,” said Malinge. “The buzz loves an information void—simply because a void allows space for speculation. The only proven means to minimize speculation is to fill the information void. For future investigations, starting today, accident investigation boards should communicate the big picture as soon as possible. Experience tells us that this is the only effective means to minimize the buzz.

“As air safety investigators, we face a large paradox about the power of information sharing,” Malinge noted. “While unsubstantiated information sharing may interfere with our investigations, we still recognize that data sharing is one of the most powerful tools we have to prevent accidents through identifying trends and examining prior events. But this requires trust among all interested parties. ASIAS [the U.S. Aviation Safety Information Analysis and Sharing program], for example, took eight to 10 years to define governance and obtain a cruise level. Why so long? Participants feared punitive action. Where there is no trust, there is no effective data sharing. A day will come when an accident investigation board will want to gain access to data from these information sharing systems as part of an investigation. If yes, think twice about such an action—it could indeed kill the trust such systems require if the information is used in an accident context.

“Finally, investigating systemic issues is important,” observed Malinge. “As experienced air safety professionals, we have all participated in investigations with factors that we’ve seen before—many accident types and their typical contributing factors are usually well known, and their mitigating actions are also known from a technical or operational view. So is there something we need to investigate differently to ensure we address the underlying factors that lead to the ‘déjà vu’ syndrome?”

“For future accident investigation, is it not time to ensure we address safety governance aspects—to investigate all

SMS ingredients? Is it not time, while keeping typical accident categories (LOC, CFIT, etc.), to also identify cluster factors according to SMS elements to make sure underlying factors are well established so they can be addressed? Is it also time for accident investigation boards to set up their own SMS?” Malinge asked.



The Nigerian accident investigation board delegation to ISASI 2018 poses outside the hotel during a break in the proceedings. From left are Olupomile Joseph Alao; Abdulsalam Abuakar Sadik; Dayyabu Mustapha Danraka; Akinola Olateru, board commissioner; Simon Okwaokei, board consultant; and Bartholomew Shoshan.

“Thank you, and I wish all of you a good ISASI 2018.”

More Introductions

Before the formal technical presentations began, Del Gandio announced that recent elections returned all incumbent Society officials to their posts for the next two-year term. He introduced Vice President Ron



The recent ISASI election returned all of the incumbent international officers to another two-year term. From the left are Bob MacIntosh, Frank Del Gandio, Ron Schleede, and Chad Balentine.

Schleede, Treasurer Bob MacIntosh, and Secretary Chad Balentine.

Del Gandio then recognized all of the ISASI councilors and society presidents attending the seminar and introduced Professor Anthony Brickhouse, Embry–Riddle Aeronautical University and coordinator of ISASI’s Outreach and Mentoring Program, and Marcus Costa, chief AIG, ICAO. As chairman of the ISASI Rudy Kapustin Scholarship Committee, Balentine then introduced the four recipients of the Kapustin 2018 scholarships: Katherine Ertman, Delft University, the Netherlands; Avery Katz, Embry–Riddle Aeronautical University, Florida, USA; Ian Low, University

ISASI 2018 Technical Program

Monday, Oct. 29, 2018

Tutorial 1:

Basic Failure Analysis

900–1300

“Failure Mode Identifications at the Accident Site”—Andy

McMinn

Tutorial 2:

Future Developments and Challenges to Investigations

900–930 “Overview and Introduction”—Anthony Brickhouse,

ERAU

930–1030 “Improving Safety with Few Accidents Occurring”—Bertrand de Courville, Air France, Ret.

1045–1145 “Augmented Reality in Future Investigations”—

Chris Lowenstein, Sikorsky

1145–1245 “Current and Future Challenges of Recorded Data”—Ismail Kaskkash, KSA AIB

1400–1530 “Selecting and Training the Next Generation of

Air Safety Investigators”—Keith McGuire, NTSB, Ret., and

Mohammed Aziz, Middle East Airlines, Ret.

1545–1645 “Artificial Intelligence in Accident Notification”—Abdulla Mohammed Al Blooshi, Dubai Civil Aviation Authority

Tutorial 3:

Military Aircraft Accident Investigation

900–1600

“Overview and Introduction”—Jim Roberts, UK Defence AIB

“EA-6b Ejection Mishap—No Second Thoughts”—Chris Field,

Boeing Air Safety Investigations (U.S.)

“Selected Case Studies of the Use of S&T to Assist Investi-

gations”—Sqd. Ldr. David Palmer, Australian Defense Fight

Safety Bureau

“Investigating a Fatal Mishap of a Chartered Airplane Performing a State Mission from Malta”—Brdg. Gen. Bruno Caitucoli, BEA

“Update European Investigators Operating Guidance (IOG)—

Lt. Col. Weidemann, Aviation Safety Brundeswehr (Germany)

“Mishap Case Study—Denmark”—Lt. Col. Martin Aarestrup,

Danish MAAIB

“Australia’s System for Classification and Tracking of Aviation

Safety Events”—Australian Defense Flight Safety Bureau

“Open Forum, How Your Organization Captures, Tracks, and

Implements Safety Recommendations from a Mishap”—Jim

Roberts, Boeing, and Olivier Ferrante, BEA

Tuesday, Oct. 30, 2018

0830

Opening Moderator—Mohammed Aziz, Middle East Airlines, Ret.

Welcome—Frank Del Gandio, ISASI President

Welcome—Ismaeil Al Hosani, MENASASI President

Introduction of the Kapustin Scholars

0900

Keynote Address—Yannick Malinge, Airbus

0930

“Timeliness of Investigations”—Marcus Costa, ICAO

1000

“EK521 Boeing 777-300 Accident Investigation Process”—

Fazal Aibaksh, GCAA

1100

“Service Providers Safety Investigations and the Link to the

State Safety Program”—Richard Davies and Paula Gray

1130–1200

“Mars Journey, Climb Phase”—Ismail Kashkash, KSA AIB

1330

Afternoon Session Moderator: Salah Mudura—MENASASI

“MH370—Multiple AUVs in Search Mode”—Oliver Plunkett

and Trevor Hughes, Ocean Infinity

1400

“Challenges of Investigating an Experimental Unmanned

Demonstrator Aircraft Incident”—James G. Buse and Jeffery J.

Kraus, Boeing

1430

Kapustin Scholar Presentation: “Off the Accident Site and into

the Hangar: Incident Investigation Using Structural Health

Monitoring”—Katrina Ertman, Delft University of Technology

(Continued on page 29)



ISASI Secretary and Kapustin Scholarship Committee Chairman Chad Balentine, left, introduces all of the 2018 scholars to the seminar participants.



MENASASI board members conduct a short business meeting following Tuesday's final technical presentation.



Seminar participants and guests enjoy a buffet dinner while watching the evening sights of Dubai.



of New South Wales, Sidney, Australia; and Nicolette Meyer, Embry–Riddle Aeronautical University, Florida, USA. During ISASI 2018, participants donated more than \$3,500 to the 2019 scholarship fund.

Following Tuesday's technical presentations, regional and national societies held business meetings. That evening, seminar participants and their guests boarded buses to travel to the center of Dubai where they boarded a two-deck dhow for a buffet dinner and a cruise to see the sights along Dubai Creek.

ISASI 2018, Day Two

Morning session Moderator Abdulelah O. Felimban, Accident Investigation Board, KSR, opened the gathering and introduced the speakers for the first and following technical presentations. Prior to the lunch break, ISASI held a short business meeting to discuss the Society's finances, membership status, and future projects. Following lunch, Afternoon Moderator Ibrahim Al Koshy, Saudia Airlines, introduced additional technical presentation speakers. At the end of the day, ISASI committees and working groups met to discuss ongoing and future projects. Seminar participants then gathered for the ISASI Awards Banquet on the hotel patio and enjoyed traditional and modern dancing and a wide variety of international cuisine.

ISASI 2018, Day Three

Morning Moderator Mark Burtonwood, Emirates, opened the third day of ISASI 2018 with the introduction of Graham Braithwaite, Cranfield University, who gave the final keynote address.

Braithwaite said, "I would like to thank the seminar organizers for inviting me to be today's keynote speaker. I was unable to attend the first day, but I heard great things about the presentations. I thoroughly enjoyed yesterday's sessions.

"I do talk a bit about the future, and the great thing about that is that you cannot be wrong now. You can only be wrong later. I want to talk about how we prepare investigators for what is a really exciting and rapidly developing aviation transformation. As a university, we do not just get involved in training accident investigators, we also get involved in a whole range of areas, including designing things in which we may become involved in the future.

"For example, we did some work with



Moderator Abdulrahman O. Felimban, Accident Investigation Board, KSA, opened the Wednesday morning session.

Boeing, NASA, and the U.S. Air Force on a blended-wing concept aircraft,” Braithwaite noted. “We designed a prototype for a UAV rather than one that would be flying passengers. Our new research center at Cranfield is a collaboration among Airbus, Rolls Royce, and the UK government where we are looking at aerospace integration. And the concept of integration goes far beyond putting the physical engineering systems together. It actually gets into trying to change more radically the concept of what we might look at as aircraft. You get to a point where you must not only think about how the aircraft looks different, but also how the infrastructure must look different.

“Again, in a collaboration between Cranfield University and our offshoot, Aerospace Solutions, and two brands you may have heard of—Rolls Royce and Aston Martin—there is the Volante Vision aircraft, which is a three-seat, elec-

tric-powered, luxury, vertical takeoff and landing vehicle that I hope to see flying within a very short time,” Braithwaite said. “The concept debuted at the Farnborough Air Show this year. We hope to have a flying prototype within two years for the next Farnborough.

“The question is how do we integrate all this change into the aerospace system in a safe manner?” asked Braithwaite. “First, when we think about what future aviation might really need, we get excited about this type of airplane. What we also see is a need—a need to move people and cargo around safely, efficiently, and to minimally impact the environment. We [the air transport industry] have not been so good at the latter. What we are really delivering is an ability or a service. We are delivering people and cargo to a particular destination, at a particular cost, at a particular time, and at a certain level of safety.

“So how do we fit into where air transport is heading or where this concept of an ability is heading? This is quite significant to you as safety investigators,” Braithwaite observed. “We are working within the UK, among the big carriers, manufacturers, research councils, and universities, through a system called the catapult. Now in case you think we are going to fire people and cargo from catapults, what the catapult system is all about is how we take transformational ideas and turn them into reality. The UK has one such program called Transport Systems, and it recently merged with another called Smart Cities because we



Moderator Mark Burtonwood, Emirates, opens the third day of ISASI 2018.

recognize that transport is part of a working infrastructure. In this process, there is a lot of emphasis on the user-centric experience—you, the traveler, can tailor your journey to whatever you want in terms of demand. We look at it in a way that can be done in the future.

“So here is a challenge that the European community is examining through this program: what will flying look like in 2050? One goal is to have 90 percent of travelers in Europe be able to complete their journey, door-to-door, within four hours,” Braithwaite noted. “Europe may be smaller next year so that becomes a little easier. Now, if I budget my travel time from North Hampton, my journey by air in Europe starts with two hours to get to the airport and two hours to get through the airport. So to have my flight arrive on time at its destination is basically irrelevant because it is the beginning of my journey that slows me down. However, what if ticketing says instead of driving, my taxi is already booked, the train you are getting on is running on time, the parking you were paying for has been transferred into this journey, and you will arrive more quickly this way than any other way. That’s a user-centric experience in which your journey managed everything for you—including the ticketing and so on. But as soon as we start doing things



Mohammed Abdul Bari, Air Accident Investigation Sector, UAE, joins traditional male dancers during the Awards Banquet.



Professor Graham Braithwaite, Cranfield University, gives the final keynote address.

like this, I must ask what about my level of comfort and my level of safety? What is the carrier I am now on for the minibus leg I am starting as part of my journey?

“Looking at a much bigger community, we have to provide a journey that is safe and also resilient. Airport capacity in certain parts of the world is becoming absolutely critical,” remarked Braithwaite. “If the weather is bad or if there is a disruption from a security concern or something else, people face missing their journey and airports run out of capacity to divert aircraft. So some of the challenge is to consider that resilience at airports impacts what we are doing.

“In talking to some of the innovators, they want to disrupt the current system even more significantly,” Braithwaite said. “They ask why do you need to spend two hours at an airport?” An airline rep said we think three or four minutes is all

a passenger needs to spend in an airport. He said we would really like this autonomous vehicle to collect a passenger from home—we know where it is. We can security screen in the vehicle. We can know exactly the size and weight of the baggage. And we can start the in-flight entertainment experience on that part of the journey. Passengers can order the duty-free items that will be placed in the back of the vehicle that picks them up at the other end. So why do passengers even need to go to an airport? I don’t know how many people here have had the experience of being late for their flight or had other passengers want to cut into the security line because their flight was at final boarding. Your autonomous vehicle could do this for you by putting you in the right place at the right time.

“So you are probably thinking what does this all have to do with

me as an air safety investigator? The picture that I am trying to paint for you is that future destruction of the current transport environment will be really quite significant, particularly if we think in terms of personal mobility,” Braithwaite observed. “We get nervous when people get excited about the possibility of flying taxis. We try to remind everyone that these need to be at least 10 times safer than traveling in a car. Can you imagine going back to your aviation organization and saying what we now need to aim for is a level of safety that is 10 times safer than it currently is in a car?”

“You may want to look at a document that the International Air Transport Association published about a year ago about what the aviation industry might look like in 2035. They talk about drivers in changes in society, technology, environment, economy, and politics,” noted Braithwaite. “Aviation does not exist in a bubble. It exists within the context of everything else. So it is entirely correct when we talk about the electrification agenda—we need access to efficient power sources—a power depends upon the availability of fuel and water. We are competing for resources while setting ambitious targets about how we become less polluting, more efficient, and serve this demand for air travel.

“There are many factors that impact us, including where do we find the talent and the people who work in aviation and are attracted to aviation careers? People who have now been in aviation for a long time often say it is not like it used to be,” Braithwaite remarked. “The job has changed, and there are many other exciting jobs out there with which we compete for talent, particularly in areas such as electrification, digitalization, and artificial intelligence, for example.

“So whatever we now think is aviation will start to blur, to change. When we start to talk about drones and UAVs, we are only just beginning to image what people might do with such vehicles. It has not been so long ago when people were talking about developing drones to clean your windows, to deliver your pizza, to deliver an organ for transplant,” said Braithwaite. “There are new players coming into the aviation market. The consumer is increasingly buying products direct from a service provider, and they do not always know who that is. Consumers simply recognize a brand. When we talk about these commercial applications and small drones, you know that regulators across the world are wrestling with how do we govern this? How do we approach that task where these small vehicles do not belong to a big airline where you recover the cost of regulating quite as simply as you might at the moment? So economics and regulations start to change. By the way, which regulators should cover this? Just because these vehicles fly does that mean they get covered by a civil aviation authority? What about all the communication factors? There is a lot of data streaming involved and other regulators who now start to get

(Continued on page 30)

To celebrate ISASI 2019 being held in the Netherlands, Host Committee Chairman Daan Zwart presents ISASI President Frank Del Gandio with a pair of wooden shoes.



ISASI Kapustin Scholarship Essay

The following article is the second of four essays from the 2018 Kapustin Scholarship winners. The number of scholars selected each year depends upon the amount of money ISASI members donate annually to the scholarship fund. Details about scholarship applications and additional information can be found on the ISASI website at www.isasi.org. Application and essay deadlines are mid-April of each year.—Editor

BIG DATA: THINKING BIG FOR AIRCRAFT ACCIDENT PREVENTION

By Ian Low
University of New South Wales

Big data is a ubiquitous term today with an array of applications across industries. The aviation sector is no different, and big data has been used successfully by some airlines to improve on-time performance, increase fuel efficiency, and manage maintenance requirements (Bellamy, 2017). In this essay, it will be argued that big data can offer much more: a new paradigm for aviation safety—a proactive, data-focused approach to accident prevention.

Demystifying big data

Although the precise origins of the term “big data” are uncertain, the first references to it in academic articles were in the late 1990s in the fields of statistics and econometrics (Diebold, 2012). Big data can be defined as “large volumes of high velocity, complex, and diverse types of data that require advanced techniques and technologies to enable the capture, storage, distribution, management, and analysis of the information” (TechAmerica Foundation’s Federal Big Data Commission, 2012, p. 10).

Data is only valuable if insights can be extracted and used to aid in decision-making (Gandomi & Haider, 2015). Huang, Wu, Wang, and Ouyang (2018) proposed that big data analytics could be understood through four distinct processes. In brief, these four processes include 1) acquiring and classifying the

data, 2) cleansing the data, 3) modelling and analyzing the data, and then finally, 4) generating useful information leading to improved decision-making. Big data analytics has been successfully used for predictive maintenance, thereby allowing users to forecast/predict potential maintenance issues based on historical data (Gandomi & Haider, 2015).

The current approach to accident investigations

Accident investigation is an “occupational safety analytical tool” that seeks to understand the factor(s) that lead to the accident (Salguero-Caparros, Suarez-Cebador & Rubio-Romero, 2015). Accident investigations have typically been performed through a process of hypothesis testing, in which a hypothesis is first proposed, followed by the collection of evidence, and finally supporting or rejecting the hypothesis (Huang et al., 2018).

According to the International Civil Aviation Organization (ICAO), the principle purpose of investigations is “the prevention of accidents and incidents” (ICAO, 2016, p. 16). In this regard, accident investigators, past and present, have made significant contributions to improving aviation safety. Through a better understanding of the causal factors behind aviation accidents, the aviation sector has been able to respond by developing and implementing safety programs to avoid future accidents;



Ian Low

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for example, crew resource management training was implemented to address failures in interpersonal communication (Helmreich & Foushee, 2010).

Although air travel has increased significantly over the past few decades, the number of fatal accidents has decreased; 2017 marked the safest year on record for the commercial aviation sector with zero fatalities (BBC, 2018). This positive trend can be attributed to the increased reliability of new aircraft designs, and the aviation sector's addressing of identified failures in aviation safety (Helmreich & Foushee, 2010).

However, with increasingly congested airports and skies, aviation accidents will inevitably increase unless the accident rate decreases further (Airbus, 2017). Hence, while the current approach to accident investigations has been successful thus far, it is important to innovate and ensure that complacency does not set in. One possibility is leveraging technology advancements in data analysis to identify potential safety issues and prevent aviation accidents; this could be achieved by linking the databases of accident authorities and airlines around the world.

The opportunities for big data in accident investigation

Due to the complex and diverse nature of accidents, accident investigations are often a long process, sometimes lasting years. The limited number of aircraft investigators also means that safety agencies must prioritize accident cases; for example, the NTSB has four different categories of accident investigations, ranging from the lowest priority "C Form Investigation," which is primarily used for data collection and relies on the operator to self-report, to "Major Investigation," where a full team of accident investigators is allocated (Sumwalt & Dalton, 2014). Leveraging big data could aid this process by comprehensively analyzing the database of accident records to quickly identify trends with previous accidents; it could also pick out plausible accident causal factors, aiding in hypothesis generation and ultimately the accident investigating process.

While accident investigators strive to be objective and thorough in their accident investigations, traditional accident investigation findings are always qualitative (Huang et al., 2018) and contingent on the investigators' training and experience. Furthermore, Yodice (1984) suggests that there are often competing interests, such as tort litigation, the enforcement process, and the news media, that could interfere with the accident investigation. Big data analysis offers an alternative quantitative approach to accident investigation that could analyze all available information, not just the factors that are obvious to accident investigators; this could result in investigators uncovering other accident causal factors that may have otherwise been overlooked.

In terms of accident prevention, big data could also help the aviation sector shift from a traditionally reactive approach to one that is more proactive and forward looking; this is possible due to the real-time nature of big data analysis. For example, WayCare, an Israeli technology company that specializes in transport management systems, has conducted its own analysis of road data and claims it is able to predict more than 70 percent of traffic crashes two hours before they occur (WayCare, 2017). It leverages existing infrastructure, tapping on existing real-time data sources such as localized weather data, road closures, camera feeds, and accidents to make predictive recommendations with the ultimate objective of minimizing road congestions and preventing road accidents.

The aviation sector is already awash with data sensors, and the extent of data generation is expected to increase significantly in the future as more new

generation aircraft come into service. Wyman (2016) predicted that the global fleet could generate 98 million terabytes of data by 2016. Operators have been quick to capitalize on this trend for aircraft health monitoring and predictive maintenance; this also provides a valuable opportunity to extract safety-related data.

A practical example of how big data may be used to proactively manage safety in aviation is utilizing a "Rule of Three" principle, similar to that proposed by Hudson and van der in the oil industry. Hudson and van der (1998) argued that the criteria for go/no-go decisions often failed to consider the interaction between various factors. In their proposed Rule of Three, major dimensions, such as weather, are broken down into minor dimensions, such as rain, wind, and lightning. These sub-dimensions are then color coded based on their historical contribution to accidents. Dimensions with no direct link to an accident are coded green. Dimensions with a broken link are coded orange, and dimensions with a direct link are coded red. Similar to a traffic light, any dimension in red halts operation—as do three or more dimensions coded orange. The decision criteria, shown in Table 1, would then be applied. The Rule of Three's objective is a simple rule-of-thumb tool that is designed to remove the ambiguity out of decision-making (Hudson & van der, 1998), which is importantly based on factual information, in this case gleaned from using big data. Hence, big data has the potential to improve decision-making, as illustrated in the above example. Such data can be extracted from real-time weather information, flight schedules and durations, crew rosters, and crew composition, to name a few.

Table 1. The Rule of Three Decision Criteria (Hudson & van der, 1998)

Number of critical dimensions	Action (go/no-go)
All green	Proceed normally
One orange	Proceed normally
Two oranges	Proceed with caution
Three oranges	Halt operation/reduce problems
One red	Halt operations

From a safety management perspective, big data can also provide better insights into an airline's emerging safety issues. According to the International Air Transport Association (IATA) (2018), in 2017 the accident rate for IATA operational safety audit (IOSA) airlines was almost four times better than that of non-IOSA members; IATA members are required to adhere to high levels of safety standards and maintain their IOSA registrations. While this compliance strategy has worked thus far, IATA has already announced a digital transformation plan that will leverage the predictive analytics of big data to improve operational safety; its "Six Point Safety Strategy" is a "comprehensive data-driven approach to identify organizational, operational, and emerging safety issues." (IATA, 2018)

Conclusion

Big data has already been used extensively in many industries, providing valuable insights into all facets of operations. In the aviation sector, it has proved useful in helping airlines improve operational efficiency and better manage maintenance requirements. With an increase in air travel demand, it is important not to become complacent about aviation safety. As the amount of data available increases, it is possible to use this data to predict the likelihood of an accident occurring. Importantly, this data can be used by airlines to assist in the decision-making process for crews. Capitalizing on a proven method of decision-making heuristics (i.e., Rule of Three), big data can be used to facilitate more objective crew decision-making, incorporating previously unknown or unrelated factors that contributed to accidents. ♦

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ISASI Presents Capt. Mohammed Aziz with **2018 JEROME LEDERER AWARD**

BY J. GARY DINUNNO, EDITOR, *ISASI FORUM*

The International Society of Air Safety Investigators, during ISASI 2018, awarded Capt. Mohammed Aziz with the coveted 2018 Jerome F. Lederer Award in recognition of his lifetime efforts to promote aviation safety through investigation. Frank Del Gandio, ISASI president, noted during the award banquet ceremony, which was held on the hotel patio overlooking a waterway leading to the Persian Gulf, that the award “is the highest ISASI honor an aviation accident investigator or safety professional can receive, and Capt. Aziz is most deserving of this award.” Del Gandio remarked that Aziz has steadfastly worked to improve aviation safety through his investigations, training other safety personnel, flying as an airline pilot, and mentoring others interested in becoming aviation industry professionals.

Aziz “was the initiator and focal point for the formation of ISASI’s Middle East North [MENASASI] Africa Society,” Del Gandio declared, and observed that he has been an “air safety investigator and ISASI member since 1994.” Since that time, Aziz has conducted many aviation accident and incident investigations as investigator-in-charge or accredited representative for Lebanon—some of which were shared during past ISASI seminars.

Aziz, Del Gandio reported, “contributed to many ISASI seminars and to *ISASI Forum* on various subjects related to accident prevention, safety management, regional and international cooperation, and safety investigation. He also participated in numerous ISASI working groups and sponsored, through MENASASI, two ISASI Reachout seminars—in Beirut, Lebanon, during 2002 and 2016 and helped organize regional ISASI seminars in Dubai; Rabat, Morocco; and Saudi Arabia.” As chair of the Arab Air Carriers Organization Safety Committee from 1995 to 2014, Aziz worked diligently to increase the numbers of ISASI members in the Middle East and North

Africa region and to promote air safety investigation studies and training. This effort helped to establish MENASASI.

“During his long career as an airline pilot (1972–2016),” Del Gandio said, “Capt. Aziz assumed many managerial positions within Middle East Airlines and participated in many industry committees and working groups that contributed to aviation safety.” He



Photos: J. Gary Dinunno

has been a part of the International Air Transport Association’s (IATA) IOSA Oversight Council since that group’s establishment and chaired the coun-

cil from 2009–2011. He also chaired IATA’s Human Factors Working Group (2004–2005) and was a member of the IATA Safety Committee (1993–1996)



**CAPTAIN
MOHAMMED
AZIZ, RIGHT,
RECEIVES THE
2018 JEROME
F. LEDERER
AWARD FROM
FRANK DEL
GANDIO, ISASI
PRESIDENT.**

and the IATA Operations Committee (1996–1998).

Del Gandio observed that Aziz, as an International Civil Aviation Organization (ICAO)- and IATA-certified instructor, contributed in the education and training of many industry experts over the years, lectured on safety and aviation management at various universities, and developed many related manuals and courses. Academically, Aziz earned BA and MA degrees from Beirut Arab University, a Ph.D. from the University of Alexandria, and an MBA in aerospace from the Toulouse Business School.

Del Gandio concluded that Aziz is a safety professional of the highest degree who has consistently served the flying public and the industry through promotion of global aviation safety and security and is truly worthy of the Jerome F. Lederer Award.

Aziz responded, “Thank you, Frank. I am really thrilled by the honor. I am even more thrilled for the association with Jerry Lederer. For the younger generation who don’t know Jerry, he was born in 1902 and is considered the ‘Father of Aviation Safety.’ He started with the U.S. Air Mail Service, and at that time one in four airmail pilots died from air accidents. He led us to establish aviation safety. If we look at the history of what he did in the 1930s for aviation safety, it’s similar to what we do today with SMS. He started a safety office and developed an education

program. He started safety bulletins and safety newsletters. These are some of the early achievements of Jerry Lederer.

“I was fortunate enough to meet Jerry many times. The last time I remember was just after the 9/11 attacks. He was nearly 100 years old. We were discussing slides on the aircraft—escape slides to evacuate the aircraft. He said that many years ago he was walking on the sidewalk in New York near a playground. When he saw children playing on the slides, he thought, ‘You know—that would be a good idea to put on an aircraft.’ This is a brief summary of what he did.

“I was fortunate to work for Middle East Airlines. Despite all the difficulties during the 45 years that I spent as a pilot there, we had safety as number one. Even during war time, safety was number one, and it’s still the priority today. I was also fortunate to travel outside the country of Lebanon to get additional education. Lebanese always supported getting continuous education, especially for the improvement of air safety. I was also fortunate to be a part of MENASASI. Under the leadership of Al Hosani and the rest of the board, we were able in five years to organize local seminars, contributions, a magazine, and the seminar you see here today is one such example. So this is about the past.

“Let’s go to the future. What do we want in the future? The theme for ISASI 2018 is “The Future of Aircraft Accident Investigation.” Most of the presentations we heard during the seminar were about the future of accident investigation. In order to move quickly into the future while keeping aviation safe, we have to put our fingers on the problems we have today. Some of these problems include the misinterpretation or misapplication of rules we have today. We heard a seminar presenter, Marcos Costa, the head of the Accident Investigation Branch at ICAO, disclose that only 32 percent of accidents result in a final report. And a report is only the first step—it’s like a doctor’s prescription. We still need to take the medicine. So the second problem is how many recommendations out of the 32 percent of reports issued were implemented? The third problem is if we go through the 32 percent of the reports, we would see disagreements that came out during the investigation. Disagreements are not necessarily bad, but we have

to continue discussing disagreements because it’s only through agreement and dialogue that we can improve. So if there is disagreement in a report, we should not set it aside and forget about it. The fourth problem is public disillusion with air safety in that our success can lead to the public misunderstanding that our job is done. In fact, it will never be completely done, unless we do not look for continuous improvement.

“So let’s look at problems for the future. This is done mainly through training. During the seminar, I talked about field investigation. Just like pilots losing some of the skills they have today because they are not ‘flying’ manually anymore, which may result in being unprepared for the effect of surprise. Much of the loss of control you see today can be attributed to pilots being surprised. By the time the pilots know what is going on, it’s too late and the aircraft is gone. So how can we improve this? When we investigate and make recommendations, we should not say the pilot did something wrong or did not have enough time. We need to put our investigations into context of the accident, otherwise what we do will be useless.

“If a pilot has five seconds to make a decision about how to recover an aircraft, we should not spend two days deciding what the pilot was supposed to do. We have to put our investigations into context. We have to ensure the pilots get training that addresses how to recover a failing aircraft—something simulators can provide. Perhaps simulators can be used to develop skills for future investigators if simulation programs can show what we see in aircraft today and what we see at the accident site. Aircraft simulators are justified due to the number of pilots we need to train. What about investigation simulators? Who is going to fund them? We have among our seminar participants numerous representatives from universities that not only teach air safety investigation and management, but also IT. Perhaps the safety section and the technology section could come together to develop a solution for a simulator to help solve this problem of lack of field experience due to the scarcity of air accidents.

“I maintain that human factors are the center of everything in aviation safety. Even if we end up with drone air transport, it will be humans man-

PAST LEDERER AWARD WINNERS

1977—Samuel M. Phillips
1978—Allen R. McMahan
1979—Gerard M. Bruggink
1980—John Gilbert Boulding
1981—Dr. S. Harry Robertson
1982—C.H. Prater Houge
1983—C.O. Miller
1984—George B. Parker
1985—Dr. John Kenyon Mason
1986—Geoffrey C. Wilkinson
1987—Dr. Carol A. Roberts
1988—H. Vincent LaChapelle
1989—Aage A. Roed
1990—Olof Fritsch
1991—Eddie J. Trimble
1992—Paul R. Powers
1993—Capt. Victor Hewes
1994—UK Aircraft Accidents Investigation Branch
1995—Dr. John K. Lauber
1996—Burt Chesterfield
1997—Gus Economy
1998—A. Frank Taylor
1999—Capt. James A. McIntyre
2000—Nora C. Marshal
2001—John W. Purvis and the
Transportation Safety Board of Canada
2002—Ronald L. Schleede
2003—Caj Frostell
2004—Ron Chippindale
2005—John D. Rawson
2006—Richard H. Wood
2007—Thomas McCarthy
2008—C. Donald Bateman
2009—Capt. Richard B. Stone and the
Australian Transport Safety Bureau
2010—Michael Poole
2011—Paul-Louis Arslanian
2012—Curt L. Lewis
2013—Frank Del Gandio and Myron Papadakis
2014—David King
2015—Ladislav (Ladi) Mika
2016—Eugene (Toby) Carroll
2017—Chan, Wing Keong

ufacturing the drones and humans flying the drones. Maybe pilots will not be sitting in the aircraft but flying from some remote location. These new pilots may not be tracking one aircraft—they may control 10. So a human error in that context could be more catastrophic; we have to watch this closely.

“We also need to look at the multi-disciplinary approach to aviation safety. In recent years, we have seen fewer major air accidents so what are air safety investigators going to do? Other than working with operators and manufacturers to resolve or avoid events and incidents, air accident investigators can look at accidents that occur outside the aviation sector. I know we can learn from other transportation accident investigations and other industries.

“This brings us to the 4 Cs that I would like to see implemented: cooperation, communication, conclusion, and change.

“We need to develop better cooperation, not just within an investigative body but among investigative bodies, airlines, manufacturers, regulators, governments, and international organizations.

“We need better communication. Communication is like engine oil. If you run a combustion engine without oil, it will fail—even if it’s the best engine in the world.

“We need to come to some conclusions—we cannot leave investigations open for years and years. We need to know what happened in a timely manner. Even if we cannot come to a conclusion, we need to put the facts forward and declare that this is what we see.

“We need to adapt to change and adopt a management of change process. This is the only way to achieve continuous improvement.

“Having said that, that’s the benefit of my 45 years of aviation safety. I don’t know how many years I have left, but I will continue to work for aviation safety as long as I live.” Aziz concluded, “I would like to thank everyone for being here at the seminar—the sponsors and all the people and organizations that made this seminar possible in this part of the world.” ♦

Adapted with permission from the author's technical paper titled EASA Involvement in Safety Investigations presented during ISASI 2018, Oct. 30–Nov. 1, 2018, in Dubai, United Arab Emirates. The theme for ISASI 2018 was "The Future of Aircraft Accident Investigation." The full presentation can be found on the ISASI website at www.isasi.org in the Library tab under Technical Presentations.—Editor

EASA INVOLVEMENT IN SAFETY INVESTIGATIONS

By Mario Colavita, Safety Investigation and Reporting Section Manager, European Aviation Safety Agency

Introduction

In its multiple roles of regulator as well as certification and standardization authority, the European Aviation Safety Agency (EASA) has always recognized the strategic safety value of accident investigations. For this reason, following the entry into force of Regulation No. 996/2010 of the European Parliament and of the council on the investigation and prevention of accidents and incidents in civil aviation, EASA has been continuously increasing its level of engagement in accident investigations to actively contribute to them and, at the same time, to have the opportunity to learn lessons from the field to convert into timely safety actions.

This paper describes the internal protocols EASA uses to comply with access to information and confidentiality requirements during a safety investigation, as well as the resources specifically dedicated to support the investigation.

Moreover, the paper presents the range of activities that EASA has recently undertaken to strengthen the links with safety investigation authorities (SIAs) worldwide and to further increase the internal capabilities to provide effective support to their independent investigations.

Background

At the European Union (EU) level, the principles governing the investigation of accidents and serious incidents are defined in Regulation (EU) No. 996/2010

of the European Parliament and of the council of Oct. 20, 2010, on the investigation and prevention of accidents and incidents in civil aviation.

Regulation (EU) No. 996/2010 implements international standards and recommended practices as described in Annex 13 of the Chicago Convention on International Civil Aviation. It sets down an obligation for each member state of the EU to establish an independent and permanent national civil aviation safety investigation authority that shall investigate accidents and serious incidents to improve aviation safety and to prevent future occurrences without apportioning blame or liability. Investigation reports and the related safety recommendations shall be communicated to the concerned aviation authorities for consideration and for appropriate action, as needed.

In particular, Regulation (EU) No. 996/2010 takes into account that EASA carries out on behalf of member states the functions and tasks of the state of design, manufacture, and registry when related to design approval, as specified in the Chicago Convention and its annexes. Therefore, it establishes EASA's right to participate in a safety investigation to contribute, within the scope of its competence, to its efficiency and to ensure the safety of aircraft design without affecting the independent status of the investigation.

Article 8 of the abovementioned regulation is specifically dedicated to the participation of EASA (and national civil aviation authorities of member states) in



Mario Colavita

safety investigations. In accordance with that, SIAs shall invite EASA to appoint a representative to participate

(a) as an adviser to the investigator-in-charge in any safety investigation under Article 5 (1) and (2) conducted in the territory of a member state or in the location referred to in Article 5 (2) under the control and at the discretion of the investigator-in-charge;

(b) as an adviser appointed under this regulation to assist accredited representative(s) of member states in any safety investigation conducted in a third country to which a safety investigation authority is invited to designate an accredited representative in accordance with international standards and recommended practices for aircraft accident and incident investigation, under the supervision of the accredited representative.

The same article details the activities in which EASA is entitled to participate. Among them are to

- receive copies of all pertinent documents and obtain relevant factual information,
- participate in the readouts of recorded media, except cockpit voice or image recorders, and
- participate in offsite investigative activities such as component examinations, tests and simulations, technical briefings, and investigation progress meetings.

Furthermore, Article 9 establishes an obligation to the SIAs of member states to notify EASA, without delay, “of all accidents and serious incidents of which it has been notified.”

EASA engagement

The multiple roles of EASA in regulation, certification, and standardization show the strategic nature of the engagement in safety investigation in order to react in a timely fashion to identify a safety issue to be addressed, but also to be able to support the investigation by providing information and advice as necessary.

In 2009, to cope with the expected high volume of investigations carried

out in 28 member states, EASA identified the need to create an internal team devoted to safety investigations and the management of related safety recommendations. This team currently is part of the Safety Investigation and Reporting Section in conjunction with the Internal Occurrence Reporting Section team that represents the single entry point for all safety-related occurrences that are reported to EASA.

The section is part of the Safety Intelligence and Performance Department, which is part of the Strategy and Safety Management Directorate that is responsible for developing EASA strategy, key programs, and plans, as well as international cooperation, technical training, and research and safety promotion activities.

EASA’s safety investigation team,

currently made up of seven members, acts as a bridge between the agency and SIAs of member states and facilitates an intense exchange of information and data between the entities. The team consists of a group of experts that is made up of a wide range of nationalities and backgrounds. The cross-domain nature of safety investigations makes the safety investigation team a core unit of EASA, a team that is highly interconnected with all other departments and is in direct contact with senior management.

Due to the confidential and sensitive nature of the data received, Article 15 of Regulation (EU) No. 996/2010 also establishes EASA’s obligation to protect information in accordance with the provisions established for SIAs. To comply with this requirement, EASA has put in place very strong internal proto-

Table 1. Amount of Investigation Information Processed at EASA

	YEAR 2017	YEAR 2018 (until end of July)
Notifications	825	578
Interim Reports	33	22
Draft Reports	170	92
Final Reports	579	302

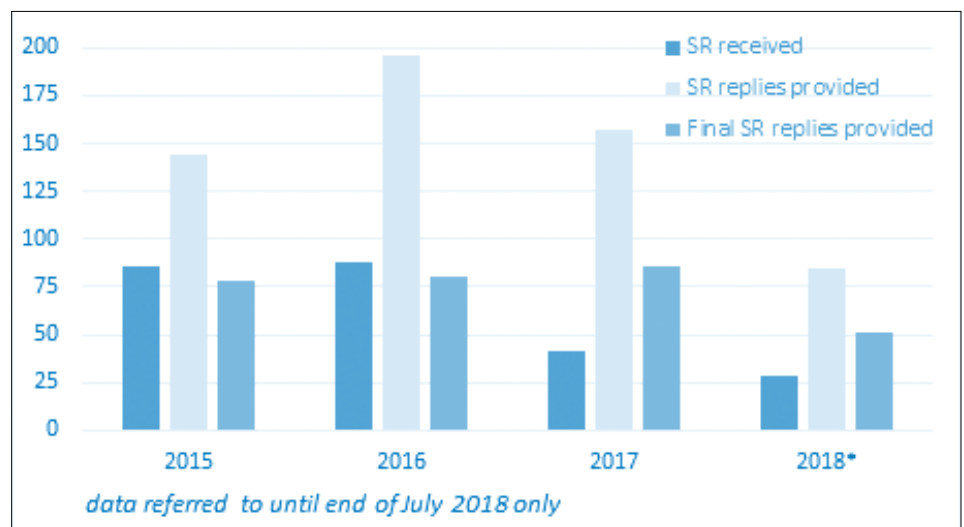


Figure 1. Number of safety recommendations treated at EASA.

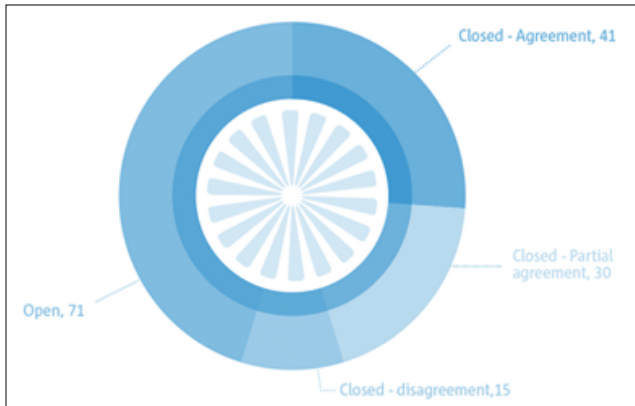


Figure 2. Safety recommendation replies sent in 2017: EASA assessment.

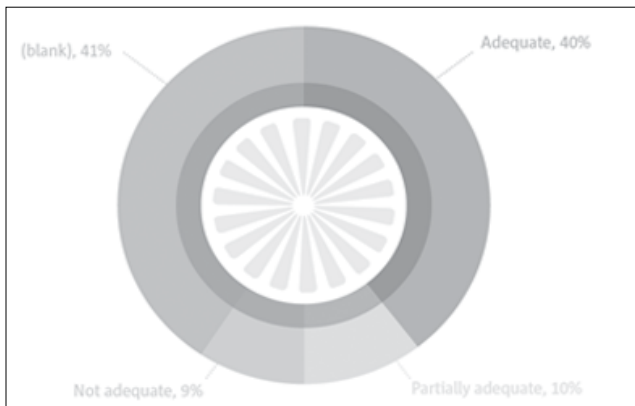


Figure 3. Response assessment received on final replies provided in 2017.

cols so that all information always goes through the safety investigation team. Access to this information is always strictly limited to the experts who need to use it and who are informed about the prohibition to further disseminate it.

When the notification of a newly opened investigation is received at the functional mailbox, investigation@easa.europa.eu, EASA's safety investigation team acknowledges its receipt. With the same response e-mail, EASA designates a technical adviser as a point of contact who can assist the investigator-in-charge (or the accredited representative depending on the circumstances) during the investigation.

EASA's technical adviser is always a member of the safety investigation team. The standard process requires that the technical adviser be the officer of the team who is "on duty" on a weekly basis and in charge of the correspondence received in the functional mailbox. However, in those cases in which a specific level of expertise is more easily predictable, or where it is

possible to understand a link with similar cases already handled in the past, this procedure can be sidestepped and a more focused member with the most appropriate background and expertise is designated.

The amount of data managed by EASA is shown in Table 1, which summarizes the most recent figures in terms of notifications of newly opened investigations and interim, draft, and final reports received.

The significant effort behind treating this massive amount of data is complemented by the additional processing of safety recommendations (SRs) addressed to EASA, which remains the main single EU addressee of safety recommendations. The number of safety recommendations is summarized in Figure 1.

In accordance with Regulation No. 996/2010, Article 18, "Follow-up to safety recommendations and safety recommendations database," this aspect is further accomplished by an additional internal process to assess safety recommendations and the related replies provided.

The data reported in the Annual Safety Recommendation Review 2017 clearly references this aspect and reflects the high degree of acceptance of safety recommendations that EASA receives:

- more than 82 percent of the safety recommendations received were "agreed" or "partially agreed" in 2017 (see Figure 2).
- 85 percent of the assessments received to the closing replies provided in 2017 by EASA were "adequate" (68 percent) or "partially adequate" (18 percent) (see Figure 3).

The excellent level of maturity reached in the internal processes established in this area was certified during the last international Civil Aviation Organization (ICAO) audit (November 2017), when the applicable protocol questions regarding accident investigation were assessed at 100 percent of effective implementation.

EASA had previously supported, specifically in areas of accident investigation, the Asia Pacific Combined Action Team (CAT) program undertaken by the ICAO Regional Office of Bangkok aimed at conducting an assessment and gap analysis of Universal Safety Oversight Audit Program protocol questions in areas of low effective implementation and to assist member states in attaining the most readily achievable improvement. Between 2016 and 2017, EASA safety investigation team members acted as experts during the CAT program ICAO missions to assist the SIAs of Bangladesh, Cambodia, Indonesia, and the Philippines.

In addition, members of the safety investigation team have also been engaged in the European Common Aviation Area agreement to assess the current status of the expected transposal and implementation of EU regulations pertaining to accident investigation into Serbian national legislation. EASA is expected to provide a similar commitment to the other western Balkan states involved in the agreement.

Not only desk work

Since its establishment, EASA has been steadily increasing its direct participation in safety investigation, always fully respecting the independence of SIAs. Table 2, page 21, shows the number of requests for assistance/support EASA

has recently received requiring the identification and involvement of its most competent experts.

In a select number of investigations, there is a need for more in-depth participation. This is the case when joint debriefing meetings are organized during the investigation on aspects that could have substantial relevance for EASA, such as airworthiness or the operation of an aircraft.

As an example, the following is a list of the investigations of events that occurred in 2017 that required the direct participation of EASA safety investigation team members:

- ACC L410, RA-67047—in-flight activation of beta reverse mode that occurred in Russia on Nov. 15, 2017.
- ACC AS332L, JA9672—in-flight separation of tail rotor gearbox and tail rotor hub that occurred in Japan on Nov. 11, 2017.
- ACC A380, F-HPJE—engine No. 4 fan and inlet separation that occurred when overflying Greenland on Sept. 30, 2017.
- SI A340-300, F-GLZU—slow rotation at takeoff that occurred in Bogota, Colombia, on Mar. 11, 2017.
- CL-604, D-AMSC—wake turbulence encounter that occurred when overflying the Arabian Sea on Jan. 7, 2017.

Involvement in investigations promoting safety actions

The current trend, for many SIAs in the world, is to promote safety actions during the investigation to be acknowledged in the final report instead of issuing a safety recommendation in the end.

From EASA's perspective, this is seen in principle as a very welcome step forward. However, it should be recognized that the implications of this approach are very different when considering different addressees (e.g., an operator or a regulator).

At EASA, these differences are also considered depending on the areas of competences that are involved in the safety issue identified by the investigation. As a matter of fact, in many cases the information shared by SIAs during an investigation has identified an unsafe condition that would warrant an airworthiness directives (AD) action under EU Regulation No. 748/2012, Part 21.A.3B. This has then been timely transposed into mandatory actions implemented by EASA to ensure, as temporary or conclusive measures, the continuing airworthiness of the fleet.

This was also the case of some of the investigations listed previously (L410, 332L, and A380).

Furthermore, there are a number of circumstances in which EASA is also intervening by issuing a safety information bulletin (SIB), a different tool that is particularly useful to tackle operational concerns. An example is the issuance of the SIB drawing attention to the risk of rotating too slowly during departure from runways where performance-limiting factors are present.

SIBs have also been introduced during the investigation as additional operational barriers to reinforce safety nets when the safety concern is not considered to be an unsafe condition that would warrant an AD action under EU Regulation No. 748/2012, Part 21.A.3B.

This was the case regarding the SIB on severe propeller/engine vibration events investigated by Sweden and France on ATR aircraft during descent when flying close to maximum operating speed with power in flight idle. EASA published SIB 2015-03 (superseded on Jan. 19, 2016, by SIB 2015-03R1) to improve crew awareness about this type of vibration event and to allow a better and prompt identification of the issue and the application of conservative measures.

In general terms, there is a shift currently ongoing at EASA to address more safety issues through safety promotion

activities like collaborative groups or an SIB rather than a rulemaking process. When rulemaking is considered necessary, it implies a different magnitude of time to reach a conclusion that is barely compatible with the completion of a safety action in the timeframe of an investigation.

Similar consideration applies to research activities that may also be prompted by the safety investigation. This is a tool in which EASA is currently planning to invest more, but from the planning of research to its conclusion and possible implementation of results, the timeframe becomes often impractical to be presented as safety actions already implemented at the release of the final report.

EASA level of integration with SIAs

Since 2005, EASA has been organizing and hosting an annual coordination meeting with SIAs of member states. The event has now reached a high level of maturity, and since 2016 it has been extended to the current format of one and a half days. The meeting is intended to cover the status of the key enablers for the future development of safety investigation in Europe. It offers a great opportunity to encourage participants to share information on a significant number of relevant topics that have been studied or investigated during the previous year. The meeting is also intended to promote enhancements in data exchange and analysis between SIAs and EASA aimed at identifying and assessing systemic risks.

Since 2018, EASA has further strengthened the links with SIAs in Europe and worldwide, promoting a series of bilateral meetings where, face-to-face and through tailored agendas, there is the opportunity to discuss topics of common interest.

This project has been started with the UK AAIB and the Dutch DSB. More meetings are planned with the French

BEA, the Greek HAAIB, the Portuguese GPIAA, and the Spanish CIAIAC. This project will continue, and preliminary contacts have already been made with the Finnish SIA and the Italian ANSV.

Outside of EU borders, an exchange program has been established with the U.S. National Transportation Safety Board (NTSB) that will lead to having a member of EASA's safety investigation team staying at the NTSB for four weeks to cooperate on investigation matters.

EASA has also been granted access, as an observer, to the meetings of the European Network of the Civil Aviation Safety Investigation Authorities (ENCASIA), whose activities are aimed at further improving the quality of investigations conducted by SIAs and strengthening their independence. This is a great opportunity for EASA to strengthen the cooperation with SIAs of member states, since it gives the agency a chance to actively contribute to some of the working groups that are generated by this network. In particular, the work done by Working Group 6 was established to address the subject of safety recommendations to work toward consistency and common procedures among members states in order to

- provide assistance to ENCASIA to achieve an effective management of safety recommendations information system database and to ensure compliance with the current EU regulation framework,
- provide guidance on best practices for developing and processing safety recommendations, and
- provide the views and opinions of ENCASIA on developments in occurrence reporting that directly relate to accident and serious incident investigation under EU Regulation No. 996/2010.

EASA was recently invited by some of the states hosting the activity to take part in exercises organized in the framework of the ENCASIA Mutual Support System (EMSS) Project. This activity is intended to help EU states that are less capable and/or experienced in conducting a major or complex civil aircraft safety investigation, identifying their capability gaps in order to develop contingency plans and establish prior arrangements with other states. The objective is to enhance the competence and confidence of the SIA in leading a major safety investigation and maintaining public confidence in aviation.

In June 2018, EASA participated in EMSS exercises organized in Iceland and Slovenia. EASA considered the outcome of the exercise to be very positive. The

	YEAR 2017	YEAR 2018 (until end of July)
Number of requests	82	53

Table 2. Requests for Assistance/Support Received from State Investigation Authorities During an Investigation

opportunity to see on site how an SIA with limited resource would react to a major occurrence is undoubtedly very advantageous in terms of an SIA preparing for any future event. It is also important to fully appreciate the relevance of ENCASIA's effort to promote structured support provided by more experienced investigation authorities.

Safety investigation in the framework of EASA's SRM process

EASA's safety risk management (SRM) process is based on the establishment of safety risk portfolios (SRPs) and provides for different operational domains data driven input to the decision-making process that supports the European Plan for Aviation Safety.

The systemic list of "safety issues" collected in the SRPs specifically identified per each aviation domain are the areas of concern covering one or more identified safety deficiencies that may lead to an accident.

EASA's involvement in safety investigations is a powerful enabler to timely update the information available in the occurrence data, one of the main pillars of the SRM, with the objectives to allow

- an adequate internal and external coordination on the identification and assessment of safety issues, as well as the programming of the safety actions, and
- the prioritization of safety actions that are most efficient in reducing risk levels.

Conclusion

EASA's involvement in safety investigations has been growing over the years in full respect of international standards and the complete independence of SIAs.

Regulation (EU) No. 996/2010 is key in clearly identifying EASA's role and responsibilities in the framework of investigations. Since its introduction, significant improvements have been achieved, mostly driven by the mutual trust that has been built between EASA and SIAs of member states.

The strategic importance of a fair and timely sharing of information between EASA and SIAs fully justifies the investment in the resources that the agency is currently devoting in this matter. The plans and the actions currently in place are aimed at further strengthening the cooperation with SIAs and enhancing EASA's ability to provide the assistance requested for successful investigations. ♦

INVESTIGATING OUR *FUTURE*

By Nat Nagy, Executive Director of Transport Safety, Australian Transport Safety Bureau

The transport sector is changing at a rapid rate. More passengers are flying today than ever before. And when they board an aircraft, it is increasingly likely to be one designed with advanced automation, state-of-the-art technology, and digital connectivity. This kind of “disruptive technology” challenges not only the aviation industry, but safety investigators in all modes of transport. There are complex and critical questions in relation to how safety investigation agencies are anticipating and preparing for these challenges. How do we anticipate the types of hazards and risks that are likely to be contributing factors to a serious incident or accident in the near future? We need to better utilize data to become more predictive. We also need to understand what an investigation organization will look like in the future. What are the skill sets we should be recruiting as investigators? Should we continue to recruit pilots as investigators or should we be looking wider at systems engineers or data coders?

In this paper, the Australian Transport Safety Bureau (ATSB) outlines the work it is doing to be future ready. The ATSB recognizes that accident investigation methodology as applied by today’s investigators will not necessarily meet states’ expectations in five, 10, and 20 years. When examining the aviation operating environment, the ATSB considers the kind of expertise we will need, the type and amount of data we will need to store and analyze to become more predictive, and how we will communicate critical safety issues to the industry, regulators, and the public. The ATSB will evolve, as all accident investigation agencies must, to continue to be a relevant and integral part of the safety system, identifying the safety issues of tomorrow.

Since the inception of manned flight, aviation has been a dynamic mode of transport—continually evolving to become safer, to carry a greater number of passengers and heavier tonnage of cargo, and to become environmentally cleaner and more efficient. For example, the flight data recorder, invented by David Warren

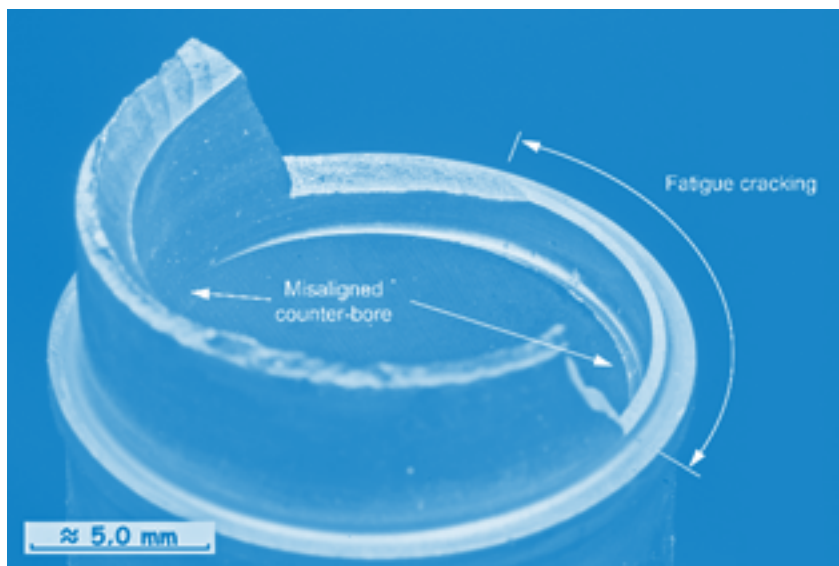


Figure 1: AO-2010-089 oil feed pipe.

AO, transformed aviation accident investigations when it was first introduced in the 1950s. And over the decades since, its design has evolved to be more durable and to collect more data over longer periods. Flight data recorders today have four times the capacity of the original magnetic tape flight recorders; they can survive high-intensity flame for more than 30 minutes and can operate even after water immersion for 30 days at pressures equivalent to a depth of 20,000 feet. These and other changes are significant, and they help us do our work to improve transport safety and ultimately save lives.

Many of the safety changes and improvements are a testament to the work of dedicated accident investigators such as those in ISASI. The ATSB’s investigation into a 2010 incident—an in-flight uncontained engine failure on an Airbus A380-824—found that a number of oil feed stub pipes were manufactured with thin wall sections that did not conform to the design specifications (see Figure 1). The investigation led to a number of relatively small but significant changes: identification and replacement or management of nonconforming oil feed stub pipes, an engine control software update, and changes to the engine manufacturer’s quality management system.

More recently, in the course of the AIB’s assistance to the Malaysian Ministry

of Transport in support of the missing Malaysia Airlines Flight MH370, we recommended that states make certain that sufficient mechanisms are in place to ensure a rapid detection of, and appropriate response to, the loss of aircraft position or contact throughout all areas of operation. The ATSB also recommended that aircraft operators, aircraft manufacturers, and aircraft equipment manufacturers investigate ways to provide high-rate and/or automatically triggered global position tracking in existing and future fleets. States and industry are taking action to respond to these recommendations.

Change is the only constant in the aviation industry and not new to this group or to any aviation investigation agency. It is central to what we do. But we can ill afford to be complacent about the future. As leaders in aviation safety, we must predict the challenges ahead to ensure we remain relevant and continue to improve safety.

The changes of the past, while significant, have largely been gradual and iterative. What we are seeing now, across many sectors, is a shift toward more sudden, disruptive change. “Disruptive innovation” is the buzzword of our generation, and for good reason. Innovations such as the “sharing economy” (think Uber and Airbnb) are disruptive in that they are transforming the way people utilize re-



Nat Nagy

sources. This is not limited to holiday and personal travel. There are a number of share economy businesses in the aviation sector (or seeking to enter it), including Uber Elevate, Airpooler, and Uberjets. These companies are innovating quickly and are fundamentally changing the way the aviation sector operates. Traditional aviation companies and regulators are finding it challenging to keep up with these changes while potential customers are changing their activities to adjust. These and other disruptive innovations will influence the world and the future of aviation safety.

We need to prepare for increasingly unfamiliar environments with disruptive innovation—a rapidly changing transport environment. The ATSB is planning for the future by preparing a vision for 2025.

In this paper, I will provide examples of the key changes and trends we see emerging that demonstrate why we expect the future to rapidly change. I will also pose some challenging questions we should all be asking ourselves and outline what the ATSB is doing to try to answer those questions.

The future of aviation

Automation

Automation is not new to the aviation sector. Autopilots have been used for decades, and even technologies such as ADS-C and terrestrial ADS-B have now been in use for some time across the globe. However, automation continues to advance and is no longer confined to the biggest and latest state-of-the-art aircraft, airports, and other aviation systems. We are seeing the effects of increased automation throughout the aviation sector now. In 2018, the ATSB released two investigation reports identifying pilot interaction with automated technology as a contributing factor to the accident.

In the first incident, two Beech Aircraft Corp B200s were involved in a near collision (see Figure 2). Difficulties in operating the GPS/autopilot resulted in the pilot of one of the aircraft experiencing an unexpected reduction in the level of

supporting flight automation and a significant increase in workload while attempting to conduct RNAV (GNSS) approaches into the airport. This increased workload affected both the pilot's ability to follow established tracks such as the published approach and missed approach and his ability to communicate his position accurately to other aircraft and the air traffic controller.

In the second incident, a Cessna 172 collided with terrain resulting in fatal injuries to the pilot (see Figure 3, page 24). Our investigation found that the aircraft impacted terrain in a level and slight right wing-low attitude. This indicated that the pilot likely stopped the aircraft's descent and started to initiate a maneuver to avoid the terrain. It is likely that the pilot manually manipulated the controls while the autopilot was engaged in a vertical mode. As a consequence, the autopilot re-trimmed the aircraft against pilot inputs, inducing a nose-down mistrim situation that led to a rapid descent. The aircraft's low operating height above the ground,

due to the extent and base of the cloud, along with rising terrain in front of the aircraft, provided the pilot with insufficient time to diagnose, react, and recover before the ground impact.

There was no advice, limitation, or warning in the aircraft pilot operating handbook or avionics manual to indicate that if a force is applied to the control column while the autopilot is engaged the aircraft's autopilot system will trim against the control column force and possibly lead to a significant out-of-trim situation. Training requirements for autopilot systems was rudimentary at the recreational pilot license (RPL) level due to stipulated operational limitations for its use. At the time of the accident, there was no regulatory requirement for pilots to demonstrate autopilot competency at the RPL level.

Both accidents demonstrate that pilots need to have a thorough understanding of all systems on board their aircraft and have the skill to provide redundancy when those systems fail or their perfor-

Figure 2: A0-2015-108 radar data showing the near collision.

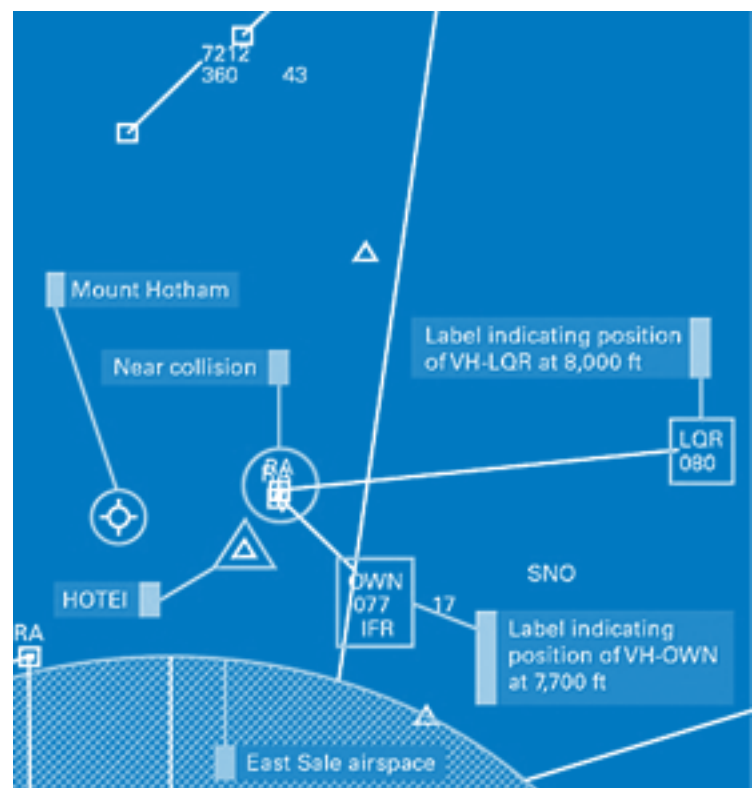




Figure 3: AO-2015-105 accident site.



Figure 4: Ballarat Railway Station.



Figure 5: An example of an RPAS, the Pulse Aerospace Vapor 55.

mance is degraded.

Aircraft manufacturer plans and industry demand suggest that automation is likely to continue to advance throughout the aviation sector. This increases the likelihood of systemic factors arising related to the design and operation of automated systems. The challenge for investigators will be ensuring we can and do identify those factors. We will need the appropriate tools and expertise. As the level of automation increases, our investigation of human factors may shift from the capability of the pilot to the person who coded the system that operates the aircraft.

Big data and complex systems

Many systems in the aviation sector, be

they for manufacturing, maintenance scheduling, navigation, or all manner of other things, are increasingly relying on complex digital codes and algorithms. Other transport modes are experiencing this same trend, and as a multimodal investigation agency, the ATSB is able to share safety lessons and experiences from these other sectors.

In a recent rail investigation (see Figure 4), the ATSB determined that the computer system controlling movements of rail tracks was not operating as expected due to design errors in the system's coding. Track maintenance workers were put at risk because the safety control they expected to be in place was not actioned. We identified a safety message—it is critical that system designers ensure that the

functionality and performance requirements needed to meet all operational scenarios are incorporated within the design. It is also important that effective check and test processes are developed to fully validate system functionality. This is an important message for all transport modes, including aviation, as systems become more technically complex.

Associated with the emergence of complex systems is the creation of “big data.” Ninety percent of digital data was created over the two years 2014 and 2015, and the rate of data creation is increasing. Transport systems, including aviation, are generating high volumes of data relating to routes, fuel efficiency, customer interactions, and maintenance. By collecting accurate, rapid, and comprehensive information, the aviation sector can improve productivity and efficiency.

Remotely piloted technology

Another emerging technology is remotely piloted aircraft systems (RPAS). The ATSB is closely monitoring the growth in this sector as it presents an emerging and insufficiently understood transport safety risk.






Data about the number of RPAS (see Figure 5) operating in Australia is limited. Australia's civil aviation regulator certifies RPAS operators, but not all RPAS need to be certified. To estimate the total number of RPAS, we combine the regulator's data with Google trends shopping data. We use this estimate to help predict occurrences.

Data about occurrences such as collisions and near encounters is somewhat better. The ATSB receives occurrence reports from a wide range of aviation stakeholders. At the time of writing this paper, the ATSB had received many reports about RPAS occurrences but no reports of collisions between RPAS and manned aircraft in Australia. Over half of all RPAS occurrences from January 2012 to June 2017 involved near encounters with manned aircraft. The next most common type of occurrence involved collisions with terrain, almost half of which resulted from a loss of control of the RPAS.

A key challenge for investigation agencies regarding RPAS is collecting and analyzing data that will help us predict future occurrences. As data about RPAS is difficult to collect, this could be an opportunity for agencies to cooperate and share data internationally to form a more complete picture.

What next?

Now that we have given some thought to what our future looks like, we need to ask ourselves some difficult questions such as

 INVESTIGATIONS	<p>What will we investigate? How will we investigate? Why will we choose to investigate some occurrences and not others?</p>
 DATA	<p>What data do we need to do our job well? How will we collect and manage data? How will we use data to inform our other work?</p>
 COMMUNICATIONS	<p>Who will be our audience? How will they want to engage? What information will we want and need to share?</p>
 OUR RESOURCES	<p>How will we be funded? Who will we work with? What technology and resources will we need to do our work?</p>
 OUR PEOPLE	<p>What expertise do we need? How will we engage people to conduct work? What will our workforce look like?</p>

What is the ATSB doing?

The ATSB has embarked on a major project to challenge ourselves to ensure that we are prepared for the future. We have chosen to focus on the medium term and what our vision is for 2025. This vision will be a declaration of our intended purpose and aspirations. It will guide our strategies over the coming years, help us communicate with our stakeholders about our purpose and value, and allow us to check if we are on track for achieving what we intend.

An important part of this process has been entering into conversations with a wide variety of stakeholders. We are talking to our staff—experts in their fields—about what they see as the emerging opportunities and challenges. We are talking to our government colleagues—policy makers, regulators, and others—about how to best work together to improve safety. We are talking to peo-

ple in the transport industry about how the ATSB can best add value and support the work they already do. We are talking to the minister about what he and the Australian government expect from our agency. By asking questions and listening, we have learned a great deal—and their input has been integral to developing our vision.

Our vision is “to drive safety action in a rapidly changing transport environment.” This acknowledges the fast pace of change and our important role in identifying safety issues and influencing improvements. As with all vision statements, it is an aspirational target, supported by goals and strategies. These goals and strategies center on ensuring that the ATSB remains relevant and uses resources in the best way to achieve safety improvements.

One of our aspirational goals is to be Australia’s national transport safety investigator. As we are a multimodal investigation agency, covering aviation, marine, and rail, it could be argued that we have already achieved this goal. However, we need to strategically consider where we can best add value to the transport sector. We currently focus on passenger transport across these three modes, but our expertise could potentially also assist in protecting economic interests by focusing on freight movements and damage to public infrastructure. We could potentially also lend our expertise to other transport modes such as heavy vehicles. For example, a recent accident north of Sydney involved a truck and six cars and resulted in two fatalities and multiple injuries.

This stretch of road has been the site of several serious accidents, and an investigation into the accident could potentially identify some systemic contributing factors. The investigation techniques and expertise are largely transferable and could lead to improvements in road safety and a reduction in fatalities. While these options require extensive consideration by the agency and the government, we are committed to think more strategically about what our role as Australia’s national transport safety investigator does and should mean, especially in the context of future change.

Another goal for 2025 is to expose the critical safety issues that others do not. There are many relevant stakeholders in each of our modes, including industry operators, private operators, regulators, policy owners, research bodies, police,

and coroners. All of these stakeholders have some interest in improving safety and work to identify issues and take action. Many of them have investigation capabilities and can identify safety issues in minor and routine occurrences.

If they do this work, there may be no need for the ATSB to be involved. Replicating the work of these stakeholders would be inefficient and unlikely to lead to further safety improvements. Instead, we should use our position as the independent, no blame investigator to investigate and research those issues that others cannot or will not. We are in a unique position to raise the standard of investigations, conduct detailed technical work, and advocate for serious systemic change.

For example, the ATSB investigated a collision with terrain involving a Robinson R44 helicopter. We also conducted statistical analysis of helicopter accidents that occurred in Australia and the United States between 1993 and 2013 and identified a significantly higher proportion of postimpact fires involving R44s than for other similar helicopter types. The analysis also identified that despite the introduction of requirements for newly certificated helicopters to have an improved crash-resistant fuel system (CRFS) some 20 years previously, several helicopter types were still being manufactured without a CRFS and that many of the existing civil helicopter fleet were similarly not fitted with a CRFS. The ATSB issued a safety recommendation about the risks involved in not having a CRFS. As a result, Australia’s civil aviation regulator, and other international regulators, took action to ensure that owners and operators made these improvements. The ATSB’s investigation and research led to safety improvements that otherwise would not have happened. This is the kind of work we should prioritize into the future.

Conclusion

Our collective future lies in a rapidly changing transport environment, and the ATSB will continue to drive safety action. We have a great deal of research and strategic planning ahead to determine what our future direction should be. But the process so far has been fruitful, and we are better placed to continue being an integral part of the safety system. ♦

ISASI International Council Conducts Semiannual Meeting

By J. Gary DiNunno, Editor, *ISASI Forum*

The Society's international councilors, executive officers, and committee and working group chairs met in Dubai, the United Arab Emirates, on Oct. 28, 2018, just prior to ISASI 2018 to review the state of the organization and conduct business. Following approval of the minutes for the previous International Council meeting, President Frank Del Gandio reported on the results of the 2018 election of ISASI officers: President—Frank Del Gandio, Vice President—Ron Schleede, Secretary—Chad Balentine, and Treasurer—Bob MacIntosh. Also elected were U.S. SASI President—Toby Carroll and International Councilor—Caj Frostell.

Del Gandio noted that the Latin American Society recently held a meeting to get that society restarted but that he was unable to attend. Daniel Barafani provided the group with the presentation that Del Gandio had planned to provide.

An updated privacy statement is now included on the ISASI website. With this change, ISASI is meeting all the privacy requirements of California and the U.S., Canada, and Europe. Canada SASI President Barbara Dunn explained that other ISASI websites also must comply with the new privacy statement and cannot include personal information about members.

Del Gandio reported that he recently appointed Bill Bramble of the U.S. National Transportation Safety Board as the Human Factors Working Group chair and mentioned that the new president of the New Zealand Society is Graham Streatfield. He noted that Vice President Schleede has been acting as the Membership Committee chair and is looking for a volunteer to assist him as an understudy. Schleede discussed some challenges with the ISASI membership form that require attention.

MacIntosh briefed council members on the financial report and health of the Society. He noted that ISASI is financially sound and that expenditures for 2018 were within budget projections. He discussed the need for completing IRS forms to maintain ISASI's nonprofit status in the U.S. and observed that ISASI also holds funds for AsiaSASI and the inactive Northern California Regional Chapter. He went over the proposed 2019 budget. Upon further review, the International Council approved the proposed budget for 2019.

In a written Membership Committee report, Schleede said that since October 2017 applications have been approved for 199 new individual members and 10 new corporate members. He added that as of Sept. 13, 2018, ISASI had 1,301 individual

members and 118 corporate members. The Membership Committee's main concern, Schleede reported, is recruitment and retention of individual and corporate members as dues payments are the primary source of ISASI revenue. He stressed that this matter requires the attention of all Society members. Annual dues notices are now sent to members in October of the year before their due date of January 31. Schleede expressed thanks to Reachout Workshop participants Embry-Riddle Aeronautical University, the University of Southern California, and Southern California Safety Institute for their recruitment efforts.

Gary DiNunno, the editor of *ISASI Forum*, discussed the final 2018 issue of the magazine that was in production at the time of the International Council meeting and addressed progress on creating a digital form of the publication for members wishing to receive an electronic copy rather than a one printed. DiNunno, on behalf of Executive Administrator Dick Stone, reported on the status of ISASI's website and ongoing projects, including publicity for ISASI's annual seminars.

ICM Business Matters

International Council officials continued previous discussions on proposed changes to the seminar manual. On paper selection, council officials suggested language that "Government agencies, aviation manufacturers, and corporate members may possess special authority within their areas of interest and competency. Serious consideration should be given to authors of papers who can well represent the professional perspective of his/her collective organization." Language also proposed included: "Material that castigates individuals, regulatory agencies, governmental policies, or individual airlines will generally not be published unless presented as an ISASI position or comment." On the matter of who can and should have access to the information presented in technical papers/presentations posted to the ISASI website, the International Council suggested allowing anyone to access papers on the website without a password being required. These suggested seminar manual additions will be voted on during the May 2019 International Council meeting and will become effective for ISASI 2020.

ISASI Seminar Committee Reports

Dunn, ISASI Seminar Committee chair, led a discussion regarding plans and organiza-

tion for upcoming annual seminars.

- Tom Curran, chair of the Host Committee for ISASI 2018, outlined the schedule for the session that would begin with tutorials the following day.
- Daan Zwart, ISASI 2019 Host Committee chair, reported on the upcoming seminar preparation in the Hague. The seminar is scheduled for Sept. 3-5, 2019, and is being put together with the cooperation of VNV (Dutch ALPA), the Dutch Safety Board, and Delft University of Technology. The seminar venue will be the World Forum. Plans currently include that on Sunday, September 1, the International Council will meet in the morning followed by a masterclass on the reconstruction site of MH17 in the afternoon as part of the ISASI 2019 program. MH17 will be an additional item to the main program open to a fixed number of attendees, and requirements are still to be determined. On Monday, September 2, the tutorials and Welcome Reception will take place. On Tuesday through Thursday, the seminar will convene at the World Forum. On Tuesday evening, an offsite dinner will be held at the Louwman Museum. On Wednesday evening, a "pub quiz" will be scheduled, and on Thursday evening the Awards Banquet will take place at Kurhaus Scheveningen Beach. The Companion Program will include a tour of old and new Holland on Day 1, and windmills, water, and cheese on Day 2. On Friday, September 6, there will be an optional all-day visit to Amsterdam. Zwart added that Delft University of Technology will pay the seminar registration fee for four Kapustin scholarship recipients. Zwart said there are two hotel options: Marriott the Hague, which has a total of 300 available rooms, and the Novotel, which has a total of 200 available rooms (as overflow).
- Dunn, Host Committee chair of ISASI 2020, said that the seminar will be held in August at the Sheraton Montreal. Plans are proceeding, and the council has previously approved the submitted budget proposal.

Reports of National Societies, Regional Chapters, and Councilors

International Council

Councilor Frostell told meeting participants that he appreciated having ISASI 2018 in Dubai as that decision is good for ISASI's international image.

AsiaSASI

Yasuhiro Yamada discussed AsiaSASI's submitted report. In 2017 the AsiaSASI Executive Committee was elected: President—Japan Transport Safety Board, Vice President—Civil Aviation Department of Hong Kong, and Secretary—Transport Safety Investigation Bureau. The Executive Committee's term runs until Sept. 4, 2019. Hong Kong has recently formed an independent investigation authority, the Air Accident Investigation Authority. The Hong Kong Civil Aviation Department is no longer responsible for Annex 13 investigations. The Civil Aviation Department recently expressed a desire to step down as vice president, and an election will be scheduled to fill that position. (Editor's note: The Hong Kong AIA was subsequently elected.) The Executive Committee was slated to meet Nov. 7, 2018. Additionally, the Transport Safety Investigation Bureau planned to host a two-day AsiaSASI workshop on Nov. 8–9, 2018.

Australia SASI (ASASI)

A submitted written report indicated that the 2018 ANZSASI conference was very successful, providing two days of presentations that allowed the exchange of ideas and new concepts. A total of 92 delegates and 18 partners from Australia, New Zealand, the U.S., Singapore, and the UK attended. Preliminary discussions are under way to select a location for ANZSASI 2020 in Australia.

New Zealand SASI (NZSASI)

In a submitted written report, Alister Buckingham, the New Zealand councilor, said that since the spring International Council meeting, members and officers of NZSASI attended the annual combined ASASI/NZSASI regional seminar held in Melbourne, Australia, over the weekend of June 1–3. During that meeting, plans for the 2019 regional seminar were announced. The 2019 meeting will be held in Wellington, New Zealand, from June 7–9. The Civil Aviation Authority of New Zealand will host a related meeting of the Asia-Pacific Cabin Safety Working Group on Friday. Both groups will hold their formal business meetings immediately following the seminar on Saturday.

European SASI (ESASI)

Robert Carter noted that members met in Latvia for the European regional meeting on May 23–24. There were 120 attendees, and a military tutorial preceding the event. He noted that Rolls-Royce would provide a

briefing in 2019 in lieu of an ESASI seminar in preparation for ISASI 2019.

Korean SASI

Soon-Cheol Byeon reviewed a written report that was provided. He discussed the Reachout Workshop in Seoul, South Korea, that occurred on Jan. 30–Feb. 1, 2018, at the Korea Aerospace University. Schleede and Elaine Parker were the lecturers and discussed aircraft accident/incident investigations, along with emergency response planning and risk management. Byeon also provided a presentation on recorders, along with discussions on the UAV investigation manual and UAV security.

Pakistan SASI

Naseem Ahmed discussed a written report that was provided. During the Pakistan SASI annual meeting in April 2018, the society decided to sponsor one student and one full member to attend ISASI 2018. The society planned a SASI Pakistan seminar at Lahore in December 2018. The Executive Committee met in July 2018 to finalize details. A one-day seminar on personal safety was held in August 2018. Pakistan SASI also held a picnic at the Army Proof Range on Sonmiani Beach on August 14 to promote the society among students.

U.S. SASI

Carroll, U.S. SASI president, noted that the national Society has 600 members and 11 chapters. Two chapters need leadership. He also discussed the reports submitted by both the Dallas-Ft. Worth and Pacific Northwest Chapters. U.S. SASI partnered with the Southeast Regional Chapter for a seminar in Savannah, Georgia, USA. Carroll and Del Gandio designated Anthony Brickhouse as the U.S. SASI vice president.

Mid-Atlantic Regional Chapter (MARC)

Schleede briefed the International Council on the MARC leadership changes. The 2019 MARC dinner would be on May 2 in Herndon, Virginia, USA, and the next International Council meeting will be held May 3.

Dallas-Ft. Worth Regional Chapter (DFWRC)

DFWRC President Erin Carroll said the chapter had a meeting on Sept. 6, 2018. Virgin Galactic Director of Safety Tim Logan was the dinner speaker. Logan provided an overview of commercial space investigations.

Pacific Northwest Regional Chapter (PNRC)

Acting PNRC President John Purvis said the group held a meeting with 21 attendees

on June 27, 2018, at the Museum of Flight in Seattle, Washington, USA. Richard Anderson, an accident investigator for Boeing, was the featured speaker. Anderson discussed the status of several Boeing investigations. He is the Boeing focal point for investigating the disappearance of MH370. The chapter planned a fall 2018 visit to the Boeing Safety Promotion Center at the manufacturer's widebody production facility in Everett, Washington, USA.

Reports of Committees and Working Groups

Rudy Kapustin Scholarship Committee

Committee Chair Balentine reported that the Scholarship Committee received 11 submissions for 2018 and selected four scholarship recipients: Katharina Ertman—Delft University of Technology, Avery Katz—Embry–Riddle Aeronautical University, Ian Low—University of New South Wales, and Nicolette Meyer—Embry–Riddle Aeronautical University Worldwide. He noted that these four students would be in attendance at the seminar and provide a short presentation on their topic. They would also be the microphone runners for delegates who wish to comment or have questions from the seminar floor.

Reachout Committee

Schleede noted that the ISASI Reachout program has become nearly dormant, adding that he had participated in a few recent Reachout programs. Gandio suggested the need to establish a team to assist with Reachout activities.

Cabin Safety Working Group

Working Group Chair Dunn reported that the group continues to engage with the International Civil Aviation Organization on cabin safety. At the working group meeting, there was a briefing from Emirates on cabin safety issues during a recent accident.

Corporate Affairs Working Group

Working Group Chair Erin Carroll reported that 25 corporate members were past due for renewal as of August 2018. Of those past due, seven have indicated they wanted to retain membership.

ISASI Coordinator of Student Outreach & Mentoring Report

Anthony Brickhouse noted that college and universities are just getting started for the semester and are reengaging. He asked for mentors and potential students to reach out to him, noting that he would be pairing up students and mentors in the near future. ♦

NEWS ROUNDUP

Plans for 2019 ANZSASI Seminar Set; Officers Shift Positions and Locations

New Zealand Councilor Alister Buckingham reported that the main event on the radar is the joint seminar of the Australian and New Zealand Societies to be held in Wellington, New Zealand, on the weekend of June 7–9. The invitation, call for papers, and seminar registration form are currently posted on the ISASI website. During the seminar weekend, ASASI will hold its annual general meeting and NZSASI its biennial general meeting.

Late 2018 saw some changes in NZSASI. The secretary/treasurer stood down because of other commitments, and that position was taken over by the previous incumbent, Russell Kennedy. Buckingham filled the VP position previously occupied by Russell. President Graham Streatfield recently took a new position in Washington, D.C., as the New Zealand air attaché and will be participating in society affairs remotely for the time being. Similarly, the seminar lead, Laurie Earl, has taken an academic post in the UK and will also be operating remotely. She'll continue to be a joint recipient of seminar papers per the website notice.

In the lead-up to the June seminar, NZSASI will be holding its biennial election of officers, with the successful candidates being confirmed at the biennial general meeting. ♦

NTSB Vice Chairman to Speak at MARC Dinner

Mid-Atlantic Regional Chapter President Frank Hilldrup recently announced and posted on the ISASI website plans for the annual dinner meeting to be held in Herndon, Virginia, USA, at the Crowne Plaza Dulles Airport Hotel on May 2 from 6:00–9:30 pm.

The main speaker for the event will be NTSB Vice Chairman Bruce Landsberg.

Hilldrup asked that people wishing to attend the dinner make reservations early as space is limited and a final dinner count with the hotel needs to be confirmed by Thursday, April 18. Participants who wish to stay at the hotel should immediately check with ISASI Office Manager Ann Schull to reserve a blocked room at a special ISASI rate. The block will expire on April 1. Additional details and driving directions can be found on the ISASI website under the Events tab. ♦

ESASI Plans Workshop for May

European Society President Olivier Ferrante reported there will be a workshop at the Rolls-Royce Learning and Development Center in Derby, UK, on May 22–23. The workshop theme is “Safety Investigation throughout the Aircraft Life Cycle—Design for Safety.” The proposed program includes the following:

Session 1: How can the investigation of design aspects be enhanced to improve safety throughout the lifecycle of an aircraft?

Moderator: Crispin Orr, AAIB

Topics to be covered

- The design process for a modern aircraft and the things that must be considered before making changes to a

certified design.

- The contribution of accident and incident investigation to risk management at the level of the manufacturer and regulator.
- The relationship between the continuing airworthiness processes dealing with in-service incidents and an Annex 13 investigation. Are they complementary?
- The added value of an Annex 13 investigation led by an independent safety investigation authority and the challenges of investigating design aspects.
- Is a new approach required to improve the timely identification of design-related safety issues and to enable practical solutions to be developed?
- How can investigators gain the knowledge, skills, and experience necessary to investigate design aspects effectively?

Session 2: How effective are safety recommendations and safety actions related to aircraft design?

Moderator: Graham Braithwaite, Cranfield University

Topics to be covered

- The safety recommendation process across the European Union.
- What constitutes an effective safety recommendation on design aspects?
- The difference in approach for technical, procedural, and human performance recommendations.
- The role of safety actions versus safety recommendations.
- Factors that influence the decision to take a design-related safety action or issue a safety recommendation.
- Factors that influence the timeliness of change.

Session 3: How can we further improve the relationship among investigators from safety investigation authorities, manufacturers, regulators, and operators?

Moderator: Nunu Aghdassi, NetJets

Topics to be covered

- The routine collaborative working environment versus an independent accident investigation.
- Safety data is routinely collected by the manufacturer, operator, and regulator. How to gain access to this data without jeopardizing day-to-day safety protocols while ensuring an effective investigation.
- The different roles of the European Aviation Safety Agency in a safety investigation in relation to its various functions (certification, rulemaking, safety promotion, standardization).
- Small organizations can feel left out of the investigation process and may require greater support.
- Increasing aircraft complexity to the extent that, at times, only the manufacturer has the tools and expertise needed to allow the determination of causal factors.
- International perspective (U.S. National Transportation Safety Board). ♦

For more information on this seminar, go to www.esasi.eu.

ISASI Member Becomes GM of Safety and Quality Assurance at PIA

ISASI President Frank Del Gandio and ISASI International Councilor Caj Frostell recently congratulated ISASI member and B-777 Capt. Moshin A. Khan on his appointment as general manager of safety and quality assurance at Pakistan International Airlines (PIA). Frostell said, "With your extensive experience in aviation safety and your long-standing cooperation and interest with ISASI and ISASI activities, you are an excellent choice for the high-level safety job."

"Very good news," Del Gandio added. "I join Caj in sending you accolades. I wish you every success in your new position. Warm regards to you and your wife."

The ISASI officials added, "The Society is looking forward to continued close cooperation between our corporate member PIA and ISASI and hopes to see you and your team at the ISASI annual seminar in 2019 in the Hague, the Netherlands, from September 1-6. Kind regards." ♦



Capt. Moshin A. Khan (Pakistan International Airlines) and his wife Soofia at ISASI's 2018 seminar.

ISASI to Attend ICAO Meeting in Montreal

ISASI Vice President Ron Schleede and Treasurer Bob MacIntosh will represent ISASI at the 5th annual meeting of the International Civil Aviation Organization (ICAO) Accident Investigation Panel (AIGP5) in Montreal, Que, Canada, from April 30 to May 2. About 40 specialists from some 20 countries and international observer organizations will continue their work to update and improve ICAO standards and recommended practices and guidance materials regarding accident/incident investigations and prevention.

ISASI's role as an approved international observer organization at ICAO has assisted the AIGP to make significant upgrades to ICAO materials over the past six years. One of ISASI's important contributions was the development of ICAO guidance material on investigation of unmanned aircraft systems that began as an ISASI manual. Other improvements have stemmed from input by ISASI members at the meetings. ♦

ISASI 2018 Technical Program

(Continued from page 7)

1515

"Use of sUAS in Developing Photogrammetric Model for Wind Simulation"—Mike Bauer, NTSB

Wednesday, Oct. 31, 2018

Morning Session Moderator—Abdulah O. Felimban, KSR AIB
0900

"EC225 LP Accident near Turøy, Norway"—Kåre Halvorsen and Tor Nørstegård, Norway AAIB
0930-1000

"EASA Involvement in Investigations"—Mario Colavita, EASA
1030

"The Growing Level of Aircraft Systems Complexity and Software Investigation"—Paulo Soares Oliveira Filho, Embraer
1100

"Investigating How Regulators and Industry Endeavour to Address the Risks of Erroneous Data Entries"—Florent Duru and David Nouvel, BEA
1130-1200

ISASI Business Meeting

1330

Afternoon Session Moderator—Ibrahim Al Koshy, Saudia Airlines

"The National Transportation Safety Board's Family Assistance Program: Current Status and Challenges"—Elias J. Kontanis, NTSB
1400

"Implementing GCAA (Part III CAR-FAP) Aviation Disaster Family Assistance Plan"—Gill Sparrow, Emirates
1430-1440

Kapustin Scholar Presentation: "Skydiving Operations and Air Safety Investigation: How an Extreme Sport Highlights Broader Issues for Air Safety Investigators"—Avery Katz, Embry-Riddle Aeronautical University
1510

"Investigating Our Future"—Nat Nagy, Australian Transport Safety Bureau
1540

"5mm Crack Leads to Engine Fire"—David Lim, TSIB Singapore

Thursday, Nov. 1, 2018

0830

Morning Session Moderator—Mark Burtonwood, Emirates

Keynote Address—Graham Braithwaite, Cranfield University

0900

"Shoreham Airshow—A Simple Accident?"—Alan Thorne, UK AAIB
0930-1000

"Just Culture—Weak Link or Vital SMS Component"—Andreas Mateou, Cobalt, and Sofia Mateou, ALS Aviation
1030

"Aircraft Tire Hydroplaning and How to Analyze It in Runway Excursion Events"—Gerard Van Es, Netherlands Aerospace Centre-NLR
1100

"Investigation of Decision-Making during a Rejected Landing Occurrence"—Wen Chin Li and Morris Yang, ASC Taiwan
1130-1200

Kapustin Scholar Presentation: Big Data—Thinking Big for Aircraft Accident Prevention"—Ian Low, University of New South Wales
1330

Afternoon Session Moderator—Khalid Al Raisi, GCAA

"Improving Safety with Few Accidents Occurring"—Bertrand de Courville, Air France, Ret.
1400

"Reducing Fleet Disruption through Human Factors Data Assignments"—David Chapel and Eston Betts, GE
1430-1440

Kapustin Scholar Presentation—"Electric Air Taxis and the Adaptation of the Air Safety Investigator"—Nicolette Meyer, Embry-Riddle Aeronautical University
1510

Innovative Technologies Deployed in Recent Investigations"—Sundeep Gupta and Albert Urdiroz, Airbus, and Anders Kristensen, AIB Denmark
1540

ISASI 2019—The Hague, the Netherlands
Closing Remarks—Frank Del Gandio ♦



ISASI HOLDS 2018 SEMINAR IN DUBAI, UAE

(Continued from page 10)

involved.

“All this creates challenges for an air safety investigator. You are going to have to unravel how we allowed all this to happen. This also means those new players have to understand our world in terms of how an investigation process puts value back into the aviation system. We have done that very well for a long time. But this requires a clear understanding that there is an independent process, which takes time, and it is not something that you can shortcut,” concluded Braithwaite.

Following the morning technical presentations, seminar participants enjoyed a lunch break. In the afternoon, Moderator Olivier Ferrante, BEA, began introducing the remaining technical presentations and the final Kapustin scholarship winner’s essay. Delegates then watched a short video about the facilities and plans for ISASI 2019 to be held in the Hague, the Netherlands, from Sept. 2–6, 2019—including tutorials on Monday and a postseminar optional tour on Friday. The theme for ISASI 2019 is “Has the Past Become Irrelevant?”

ISASI 2018 Host Committee Chairman Tom Curran then passed the Society’s traditional cowbell to ISASI 2019 Host Committee Chairman Daan Zwart, VNV–Dutch ALPA. Zwart presented a pair of wooden shoes to Del Gandio, who then closed the gathering with thanks to everyone who attended and participated. ♦

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ERAU Student Selected for Robertson/ISASI Fellowship

Tori Kobayashi, a student at Embry–Riddle Aeronautical University (ERAU) in Prescott, Arizona, USA, was awarded in November 2018 the Robertson/ISASI Fellowship in Aviation Safety and Crashworthiness. She completed her B.S. degree in aeronautics in December 2018 and plans to continue at ERAU Prescott for graduate studies.

Originally from Lomita, California, USA, Kobayashi's interest in pursuing aviation was inspired while attending an air show at Edwards Air Force Base in California. She was particularly enthused by the history of Chuck Yeager's Bell X-1 flight breaking the sound barrier at Edwards. Upon graduating high school, Kobayashi joined the Air Force with the specific goal of becoming an aircraft maintainer. "I did achieve this in active duty and as a veteran with my airframe & powerplant [A&P] certificate," said Kobayashi. "I knew enlisting to be a maintainer would give me the chance to see aircraft

up close that I had only seen in air shows, and it would give me the experience and maturity I needed to pursue an aviation-related career."

Kobayashi came to ERAU's Prescott campus as a veteran of the U.S. Air Force, holder of an FAA A&P certificate, and possessing an associate of science degree in aeronautics from Embry–Riddle Worldwide. Kobayashi chose to come to Prescott to further her education with a concentration in aviation safety. While at Prescott, Kobayashi participated in Women in Aviation International and the ISASI Arizona Chapter at ERAU. In advance of pursuing the fellowship application, Kobayashi completed a capstone research project titled *The History of Human Factors in Maintenance*.

Kobayashi's decision to seek the Robertson/ISASI Fellowship was predicated on the knowledge and experience that would come with it. "[It would] provide me with the opportunity to work closely with Embry–Riddle's

Aviation Safety and Security Archives," said Kobayashi. "I drew encouragement from seeing handwritten documents by Jerome Lederer, the 'Father of Aviation Safety.' Jerome Lederer created the Aircraft Mechanic's Creed in 1941, which is used globally in repair stations and hangars. His work has been my biggest inspiration in conducting research on aviation maintenance safety culture."

Kobayashi's planned areas of research while holding the Robertson/ISASI Fellowship include human factors and safety culture in aviation maintenance operations, with a concentration on

outsourced aviation maintenance.

Harry Robertson, an ISASI Fellow and Lederer Award winner who developed and produced the Robertson crashworthy fuel system found in many helicopters and race cars, endowed and helped establish the Robertson Family/ISASI Aviation Safety and Security Fellowship to allow graduate students to conduct research on crashworthy safety topics at ERAU in Prescott. For more information on the fellowship, go to the ISASI Web Roundup News, May–June 2015, pages 3–7, in the Library on ISASI's website. ♦



ISASI President Frank Del Gandio, left, and Treasurer Bob MacIntosh congratulate Tori Kobayashi for being awarded the 2018 Robertson/ISASI Fellowship during a Jan. 8, 2019, luncheon.