Aviation Human Factors Industry News

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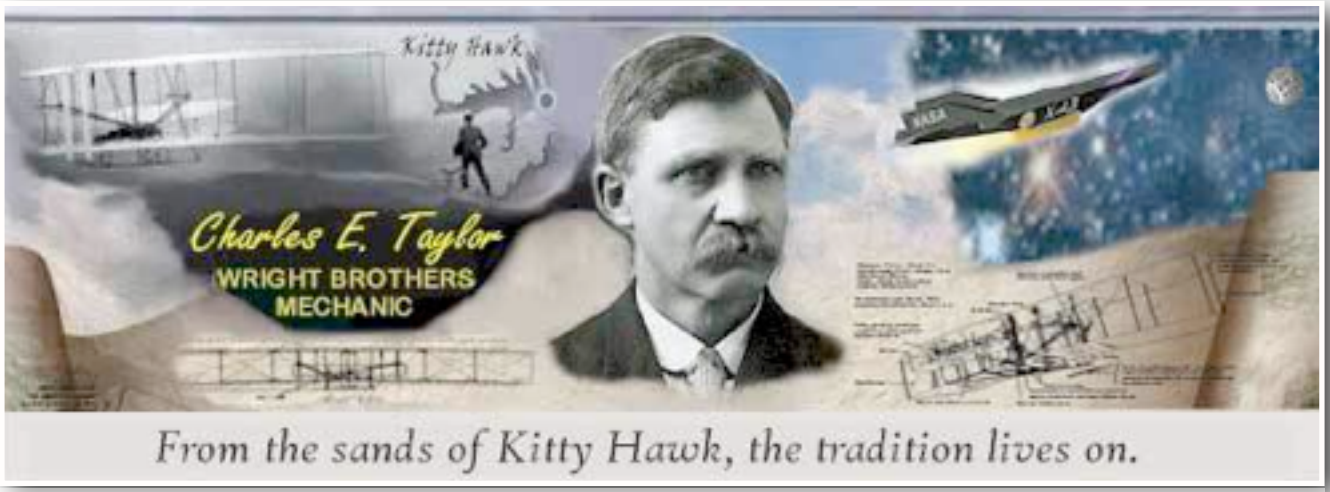

Hello all,

To subscribe send an email to: rhughes@humanfactorsedu.com

In this weeks edition of *Aviation Human Factors Industry News* you will read the following stories:

In Focusing On What Pilots Do Wrong, We May Be Missing Valuable Lessons From What They Quietly Do Right

The industry knows a lot about what pilots do wrong, but not nearly enough about what pilots do right.

Human error accounts for 80% of aircraft accidents. Because these errors are so deadly, the aviation industry studies them carefully. When an aircraft goes down, enormous resources are mobilized to determine what happened and prevent it from happening again. Even small mistakes are carefully examined – flight crews report errors to their companies, and the data is collected and studied. Routine flights are analyzed for mistakes, and pilots are taught how to spot errors, trap them, and make the consequences less severe. The industry does this so well that just about any commercial pilot you talk to can explain the ideas of threat and error management.But recent research from the NASA Engineering and Safety Center suggests that by concentrating on what people do wrong, we have been missing opportunities to learn about what people do right. Jon Holbrook, a cognitive scientist in the Crew Systems and Aviation Operations Branch at NASA's Langley Research Center, is leading a team that is studying routine performance, and the ways in which people actively contribute to creating safety in complex systems. "For every well-scrutinized accident, there are literally millions of flights in which things go right, and those flights receive very little attention," Holbrook said. "As Marit de Vos from Leiden University has described it, in aviation safety, it's like we've been trying to learn about marriage by only studying divorce."

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It turns out, there’s a lot to be learned from studying success. One of the key attributes of successful systems is resilience. Just like a resilient person can adapt to new circumstances and bounce back from adversity, a resilient system can adjust its functioning to keep operating despite changes and disturbances. And aviation is full of changes and disturbances. On any given day, flight crews may experiences mechanical delays, weather problems, sick passengers, or even the occasional aircraft malfunction. Handling these issues is so routine for airline crews that they often don’t even realize the implications of what they are doing. “Because pilots perform this way day in and day out,” Holbrook said, “they often don't realize how exceptional and critical to safety their behavior is.”

The challenge of studying resilient behavior is that it seems so ordinary. “When I say to someone ‘yeah, I study routine behavior’, that may not sound very exciting,” Holbrook said, “but the ability to adapt to small and large changes, whether those changes are expected or unexpected, is a really remarkable capability. And even though people demonstrate that capability every day, ironically, we know very little about how it happens or the mental processes that support it.”

Holbrook’s project, and a similar one underway at Embry-Riddle Aeronautical University, is meant to change that. By interviewing pilots and air traffic controllers and examining other routinely collected data, researchers hope to understand the way that humans anticipate, monitor, learn, and respond to challenges and disturbances. “If we can describe these behaviors, we can see how often they are occurring, and get a picture of how pilots contribute to safety,” said Dave Cross, one of Embry-Riddle’s lead investigators.

But aviation is already an incredibly safe system. Is there really even a problem here to solve? For one thing, aviation is changing. Holbrook started this project when he realized that many people believed that since 80% of aviation accidents are caused by human error, removing the human would result in an 80% decrease in accidents. “More and more I began to see proposals arguing that humans were in fact a barrier to safety and that removing humans from the safety decision making loop was a necessary step on the path to improving aviation safety,” Holbrook said. From studying human performance for years, he knew that this perspective neglected the positive contributions humans make.

Further, understanding the skills that lead to system resilience means that those skills can more easily be taught. “It's often said that FAA regulations are written in blood,” Holbrook noted, “but what if we could make substantial strides in aviation safety by continuously learning from the everyday resilient performance of flight crews and controllers and all of the humans who help make flying so safe?”

The aviation industry has made great progress in safety by understanding what people do wrong. Now it’s time to learn about what people do right.

https://hsi.arc.nasa.gov/awards_pubs/publication_view.php?publication_id=2785

https://openaccess.leidenuniv.nl/bitstream/handle/1887/67419/front.pdf?sequence=3

https://csaob.larc.nasa.gov/

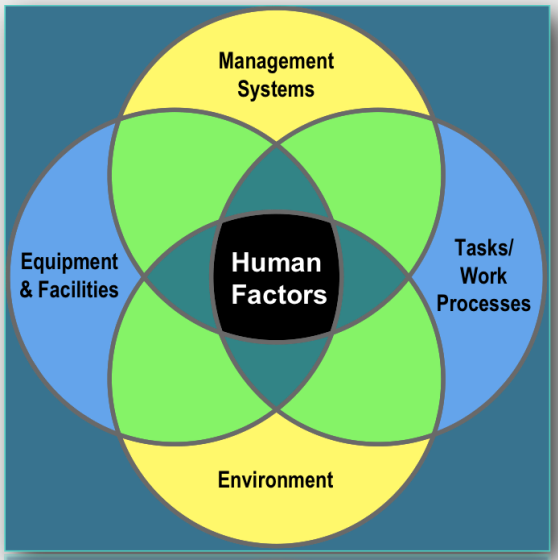
https://nescacademy.nasa.gov/video/c200d7657117467c8de080b35a7fd3be1d

EASA To Add Human Factors to Rotor Certification

A notice of proposed amendment (NPA) from the European Union Aviation Safety Agency (EASA) introduces specific provisions into small and large rotorcraft certification specifications to ensure that human factors are systematically taken into account during the design and approval processes of rotorcraft flight decks. Such provisions were introduced into the certification specifications for large airplanes a dozen years ago, EASA said.

Additionally, new generations of rotorcraft are characterized by having a high level of integration of avionics, displays, controls, and automation.

"It is also likely that future rotorcraft projects, embodying, for instance, fly-by-wire technology flight controls that include enhanced piloting control laws, will pose new and additional challenges from a human factors perspective," said EASA.Regarding those accidents or incidents for which human factor shortfalls in the design of rotorcraft were considered to be the root cause, EASA said it is "expected that the proposed new certification specifications will help to significantly reduce the probability of such accidents occurring."



For other accidents or incidents in which human factor shortfalls in the design of rotorcraft have been identified as a contributing factor, it is "expected that there will be a significant positive impact on safety. In fact, an improved crew workstation design that is optimized for human factors will contribute to reducing the crew's workload and increasing the crew's situational awareness." EASA estimated that these benefits could reduce the number of incidents and accidents by between 10 and 20 percent.

https://www.easa.europa.eu/sites/default/files/dfu/NPA%202019-11.pdf

FAA's Dickson Calls for Holistic Approach to Certification

Key themes have emerged surrounding the FAA's certification process as a result of the reviews surrounding the Boeing 737 Max, FAA Administrator Stephen Dickson told the Aero Club of Washington recently, adding he is committed to addressing each one. In his first address to the Aero Club, the recently appointed administrator said in his prepared remarks that "willingness to accept critique is a sign of humility and transparency.

It is also a strength…We welcome scrutiny and feedback on how we can improve our processes.

”In meeting with the regulatory counterparts around the world, he added, “They appreciate and value U.S. leadership. They understand that by working together, we will all be better and raise the bar on global aviation safety.”

As far as the themes that have emerged, Dickson cited a more holistic approach rather than a transactional, item-by-item approach to aircraft certification; the integration of human factors consideration more effectively through the design process, particularly as aircraft become more automated and systems more complex; and coordination and flexibility of information flow during the oversight process.

He stressed that a return-to-service decision for the Max will be based solely on the FAA's assessment of Boeing’s proposed software updates and the availability of appropriate pilot training. “We are not delegating anything,” he said. “When we finally make the decision to return this aircraft to service, it will be the most scrutinized aircraft in history. It will also be one of the safest machines to ever take to the sky.”

Airport worker who fueled Tampa surgeon’s plane before deadly crash had just been hired

A well-known Tampa Bay area plastic surgeon was killed after the wrong fuel was put in his plane on Oct. 5, according to the National Transportation Safety Board.

8 On Your Side Investigative Reporter Mahsa Saeidi has now learned the airport employee who fueled the plane had been on the job just six weeks.

Dr. Daniel Greenwald was flying a Piper Aerostar 602P in central Indiana when he crashed in a field last month. The 59-year-old died from blunt-force trauma in the crash, according to an Indiana coroner.NTSB officials say jet fuel was put into the plane Greenwald was flying instead of the regular aviation gasoline that should have been used. 8 On Your Side spoke with aviation expert, Captain John Cox, who tells us jet fuel would have caused the engine to quit.

8 On Your Side Investigates has received new information about this case from Beth Copeland, the attorney for the City of Kokomo in Indiana.

According to Copeland, the fueling technician was hired by the city on Aug. 26, 2019. The college student was paid $11 an hour. His previous experience included jobs at the YMCA and Burger King but nothing in the aviation field.

Investigators say the plane crash happened shortly after Greenwald left the Kokomo Municipal Airport.

According to the NTSB report, the airport employee who fueled the plane says he asked Greenwald twice if he wanted jet fuel.

That employee claims Greenwald said “yes” both times. However, Greenwald was an experienced general aviation pilot with hundreds of hours of flight time experience. Friends say Greenwald would have known the effect the jet fuel would have had on the plane’s engine.

The NTSB has not issued its final report but this case raises questions about the training of workers at smaller airports across the country.

Right now, it's unclear if the new technician was being supervised when he reportedly pumped jet fuel into Dr. Greenwald's plane.

"It is a place that a lot of people in aviation start, myself included," said Captain Cox. "This type of error has happened before and unfortunately, I don't think this is the last time we'll see it."

According to an Advisory Circular obtained by 8 On Your Side Investigates, the FAA can require specific training at big airports like Tampa International but they can only make recommendations at smaller airports.

"The responsibility lies with the operator to provide adequate training," said Captain Cox.

Copeland sent 8 On Your Side Investigates the job description for the technician's position. In addition to fueling, he was responsible for maintaining fuel trucks and servicing airplanes.

8 On Your Side has asked the City of Kokomo to provide details about the technician's training. We are waiting to hear back.

In the meantime, NTSB investigators say the technician reported difficulty in refueling the doctor's plane because the nozzle didn't fit.

"Should be a red flag?" asked investigative reporter Mahsa Saeidi.

"It should certainly have caused him to ask questions," said Captain Cox.

The NTSB is still investigating. 8 On Your Side Investigates will continue to follow this story.

Criminalization of Aviation Accidents Rarely Warranted

The fiery crash last week Aeroflot flight SU 1492 at Moscow's Sheremetyevo airport killing at least 41 people and the Russian government's opening a criminal investigation, once again raised the ugly specter of criminalization of aviation accidents and its harmful effect on aviation safety.

I was aware of this problem for years but it was all brought home when I read *Flying In The Face of Criminalization, The Safety Implications of Prosecuting Aviation Professionals* by British writers Drs. Sofia Michaelides-Mateau and Captain Andreas Mateau, both lawyers. As the authors explained, in many countries, after an aviation accident, there generally are two different investigations: the technical investigation, designed to find the cause(s) of the accident, and the "judicial" investigation, the purpose of which is to assess blame. In all too many countries worldwide, however, frequently the "judicial" investigation is criminal, potentially involving prison, rather than civil, the purpose of which is to compensate the victims of the crash.

The problem with the criminal type of investigation arises when the conclusions of the technical investigation are used to criminally prosecute flight crews, mechanics, and air traffic control personnel. In these cases, the judicial authorities take control of the physical evidence with the criminal investigation processes ruining the physical evidence for accident investigation purposes. Of course, the converse is also true: when civil authorities conduct scientific examinations and destructive procedures the parts and other items can be rendered inadmissible as criminal evidence.

I agree with these authors that criminal prosecutions of individuals for omissions and negligent actions, as opposed to actions based on intent or willfulness–the usual criminal standards–are chilling and potentially dangerous. Why would an individual faced with possible criminal prosecution voluntarily open up and tell "the whole truth?"

What to do? Civil authorities should be given priority over the evidence. Criminal prosecution has no place where the conduct is unintentional or simple carelessness.

But remaining is the issue of what to do when there are violations of criminal laws (distinct from aviation laws and civil laws), such as when volatile oxygen generators were placed on the ValuJet DC-9, violating state and federal hazardous materials laws. Do the violators get a pass simply because they committed their crimes in the aviation context? The answer has to be no and criminal process is warranted.

Then there is the matter of government involvement in the design, construction, marketing and sale of aircraft—should governments who profit from the aircraft manufacturing industry be involved in civil, let alone criminal, investigations? One example is the Air France Airbus A320 crash demonstration crash in 1988 where the French Minister of Transportation announced, shortly after the crash and as the technical investigation had just begun, that there was no problem with the aircraft. Later, the French BEA cleared the aircraft and found operational error, raising credibility issues since the French government was heavily involved in the design, construction, certification, and marketing of this aircraft–and in the accident investigation.

Where an accident investigation is carried out by qualified, independent investigators, its factual findings (not conclusions) should provide the basis for post-accident remedial measures as well as civil legal actions. Criminal prosecutions are another matter, however, and need to be addressed where criminal, causal acts or omissions are found, but not as part of the fact-finding investigation aimed at enhancing safety.

How An Abnormal Preflight Led To A Cessna 172 Taking Off With The Tow Bar Still Attached

It's fall. And every morning, it's getting colder and darker.

We'd all like to think that we spend as much time thoroughly pre-flighting on a frosty morning, as we do in the middle of a beautiful July day. But when the cold wind is whipping through your checklist (and your jacket), you tend to move a little bit faster around the plane.

Add in a change to your normal preflight routine, and you increase the chance of something getting skipped or forgotten.That's exactly what happened to this Cessna 172 student and instructor.

Running Behind Schedule: The Preflight

I had a student meeting me for a lesson [early in the morning]. My student was running late, so I performed the preflight and got the aircraft ready to fly. It was cold out, so once I pulled the aircraft out I hopped into the aircraft to stay warm and let my student know where I was (newer student) and that the aircraft was ready to fly.

He showed up shortly after, and we got ready to go and started up and went on with the lesson. I had left the tow bar on the front of the aircraft nose wheel. I did not notice it or remember it at the time. The tow bar didn't make any noise I could hear as it scraped across the ground, but looking back it did seem a little more difficult to steer than usual, but not enough to raise a flag. Not outside of the realm of possibility for a Cessna in my experience.

On takeoff I heard a bump that sounded like a door opening. I looked around, didn't see anything unusual and continued with the lesson.

We landed, and as soon as I looked in the back of the aircraft for the bar I immediately knew what happened. I called the Tower, they sent Operations to find the tow bar (it was on the runway), and then I went and told my Chief Pilot. I ordered a new tow bar for the aircraft and maintenance took a look to make sure nothing was damaged. No damage occurred.

Factors that I believe led to this:

1. *not getting a great nights rest beforehand*
2. *I have a new job as a first officer, so flight instruction is now a side job, lack of consistency in instruction*
3. *it was cold, so I rushed my preflight and hopped inside the aircraft to wait for student*
4. *inconsistent chain of events (normally my student is with me for preflight)*
5. *it was dark, sun was just starting to rise*

Analyzing the event:

1. *steering was slightly abnormal, but still maneuverable with nose steering*
2. *takeoff I heard an unusual bump*

Had I correlated these at the time it would have been evident what had occurred.

Rushing, Unsurprisingly, Leads To Mistakes

A cold morning, a behind-schedule pilot, and an abnormal preflight were the recipe for forgetting the tow bar. Fortunately, the plane wasn't damaged, and it was nothing more than a lesson learned.

I've been in a similar situation myself - preflighting on a cold morning, and hopping in the plane, waiting for another pilot or passenger.

I spent 6 years pre-flighting airplanes in North Dakota. And in the winter months, it's a real challenge to take your time, when the below-zero wind chill is driving through your hat, gloves, and jacket.

When you're in a hurry, or if you're not preparing for your flight the way you normally do - that's when you need to pay extra attention to what you're doing.

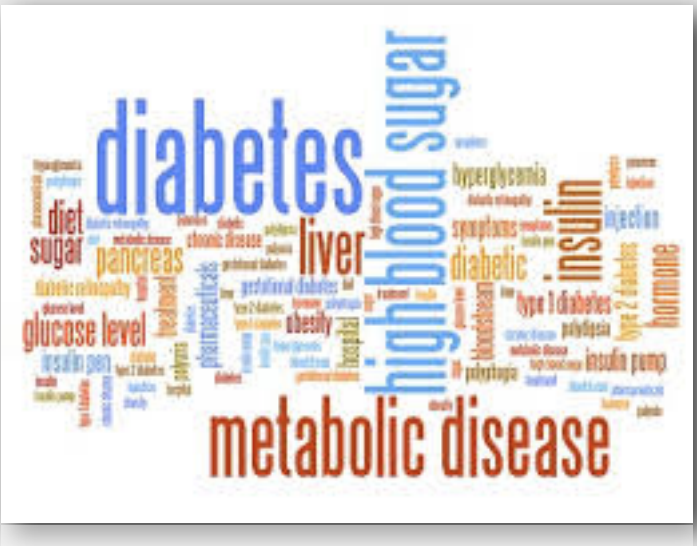
I've started a plane with the chocks still in. And it was a direct result of rushing my preflight. While it didn't cause a problem (aside from some deflated pride) it's an eye-opening experience of how quickly you can make a mistake that can have a negative outcome.

If you need to, run through your exterior preflight checklist one more time in the cockpit, to make sure you didn't forget anything. Dress warm, so you don't feel like you're taking a polar plunge while you're preflighting.

And most importantly, when you feel like you're rushing, take a second to think things through before you turn the prop. It's just the thing that might keep you from spinning your prop through the middle of a tow bar.

FAA releases new protocol for pilots with diabetes

The FAA published in the Federal Register a notice on a new protocol for pilots with diabetes seeking a private pilot, commercial, or Air Transport certificate.



Published Nov. 7, 2019, the “innovative new protocol makes it possible for airline transport or commercial pilots with insulin-treated diabetes mellitus (ITDM) to potentially receive a special-issuance medical certification,”

FAA officials said.“Medical science has come a long way in the treatment and monitoring of diabetes,” FAA officials said in announcing the new protocol.

"This new medical protocol takes into account medical advancements in technology and treatment and opens the door for individuals with ITDM to become airline pilots."

Since 1996, private pilots with ITDM have been issued medical certificates on a case-by-case basis after assessing their risks.

The new protocol is based on established advancements in medical science that make management and control of the disease easier to monitor, mitigating safety risks.

To be considered under this protocol, applicants must provide a comprehensive medical and overall health history, including reports from their treating physicians, such as their endocrinologist. They also must provide evidence of controlling their diabetes using the latest technology and methods of treatment being used to monitor the disease.

The FAA developed the new protocol based on the reliability of the advancements in technology and treatment being made in the medical standard of care for diabetes and on input from the medical community, officials noted.

The new protocol became effective when the notice was published. Public comments will be accepted for 60 days from the date of publication, with FAA officials noting they "may revise the new protocol based on comments."

https://www.federalregister.gov/documents/2019/11/07/2019-24150/special-issuance-medical-certification-diabetes-protocol-for-applicants-seeking-to-exercise-airline

https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=21934

Boeing's Humans Step In After Robots Fumble Assembly of 777 Jets

Employees perform quality checks on components for a Boeing Co. 777X commercial aircraft at the Boeing Defense, Space & Security facility in St. Louis, Missouri, U.S.

Score one for the humans. After four years of trial and error, Boeing Co. is dumping the robots that build two main fuselage sections for its 777 jetliners and the upgraded model known as 777X. Instead, the Chicago-based plane maker will rely on skilled mechanics to manually insert fasteners into holes drilled along the circumference of the airplane by an automated system known as "flex tracks," which it developed and honed on the 787 Dreamliner.

The shift to the new human-plus-machine system began during the second quarter and should be complete by year's end, Boeing spokesman Paul Bergman said in a statement. Boeing doesn't plan any change in total staffing for its 777 jetliners, which are manufactured in Everett, Washington, about an hour north of Seattle.

"The flex track solution has proven more reliable, requiring less work by hand and less rework, than what the robots were capable of," he said.

As tempting as automation can be -- with its promise of a mechanized workforce that never gets sick, tired or hungry -- manufacturers are finding many cases where the technology hasn't yet caught up to the dexterity and precision of human hands and eyes. Tesla Inc. famously tried to build a fully automated car factory in Fremont, California, before adding a tent outside of the facility to allow more work to be done by hand.

Boeing's fully automated initiative -- known as FAUB, for fuselage automated upright build -- relied on robots working in tandem to drill holes precisely and fasten together metal panels held upright to create the outer frame of the hulking twin-engine jets. It was showcased as part of the advanced manufacturing that Boeing is pioneering on the 777X, and that it plans to expand to future jetliner programs next decade.

Out of Sync

But the plane maker struggled to keep the robots moving in sync on the outside and inside of the fuselage panels, creating production snarls when it first introduced the FAUB technology to the legacy 777 line. A Seattle Times report from 2016 described a swell of worker overtime and incomplete jobs that were finished after jets rolled out of the factory.

"It was hard. It took years off my life," Jason Clark, a Boeing vice president overseeing 777X production, said during an interview earlier this year.

The robot flub isn't a complete loss. Boeing learned some valuable lessons from its "first very deep dive into that type of technology," Clark said. "It's taught us how to design for automation."

The new flex-track method creates less wear-and-tear on workers since machines handle one of the the most physically demanding tasks of the fuselage assembly: drilling holes through metal.

Also, "We redesigned portions of the build to replace rivets with less difficult forms of fasteners, further improving the ergonomics," Bergman said. The combination should bring improvements in safety, quality and factory flow, he said.

The 777X will be Boeing's largest-ever jetliner, but the plane isn't expected to take its first flight until next year after General Electric Co. unearthed a durability issue with its GE9X engines. The company relies heavily on robots to manufacture the plane, from wings spun from resin-infused tape to self-guided vehicles used to transport large components within the factory.

Under fire for Boeing 737 Max crashes, FAA chief vows to examine how humans interact with automated aircraft systems.

KEY POINTS

After two fatal crashes, the FAA has been under fire for certifying Boeing's 737 Max.

The agency's head says it is examining how humans interact with ever-more automated planes.

Pilots on both 737 Max planes that crashed were battling an automated flight-control system.The Federal Aviation Administration, under fire for its approval of the now-grounded Boeing 737 Max, will work to better assess how human pilots interact with increasingly automated and complex aircraft, the agency's chief said Tuesday.

The pilots on two flights of the 737 Max — Lion Air Flight 610 in Indonesia in October 2018 and Ethiopian Airlines Flight 302 in March — were battling an automated flight-control system that repeatedly pushed the nose of the planes down before they crashed.

Regulators ordered airlines to stop flying the planes after the second crash. Together, the crashes killed all 346 people on board.

The National Transportation Safety Board in a September report criticized Boeing for overestimating how pilots would react to a flurry of cockpit alerts during a malfunction, as occurred on the two flights.

Steve Dickson, who was sworn in as administrator for a five-year term in August, told an industry conference in Washington, D.C., that human factors should be considered “throughout the design process.”

He also called for better data sharing as the FAA oversees aircraft and a “more holistic approach versus a transactional item-by-line-item approach to aircraft certification.”

Lawmakers have criticized the agency’s relationship with Boeing as too cozy, since the FAA outsourced some certification procedures to the company, under a decades-old delegation program.

The FAA is reviewing Boeing’s software changes to the 737 Max that aim to make the system implicated in both crashes less aggressive. Boeing is also planning to feed the system with a second sensor, instead of a single sensor. In the crashes, that single sensor received an inaccurate reading and triggered the flight-control system, known as MCAS.

Boeing’s CEO, Dennis Muilenburg, repeatedly apologized in front of lawmakers on Capitol Hill last month, acknowledging the company made “mistakes” in its design process for the planes.

Dickson said Tuesday that the plane will only fly based on the FAA’s assessment.

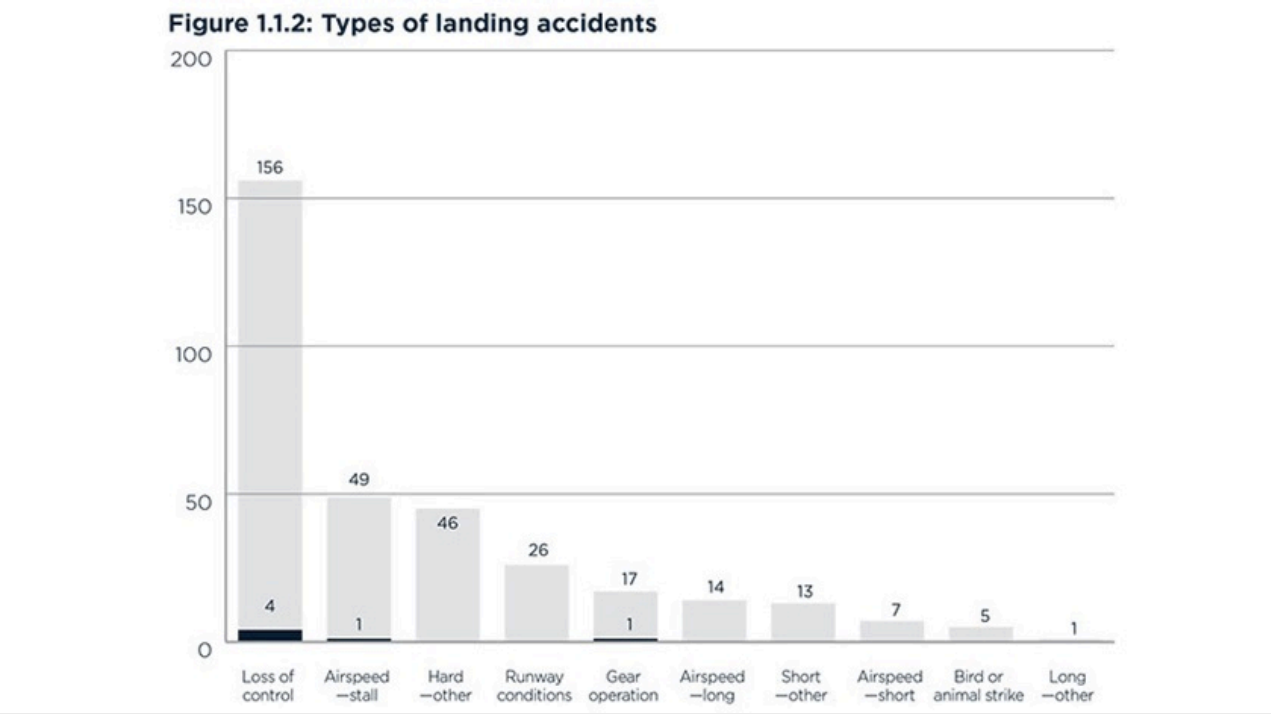
“We are not delegating anything in this process,” said Dickson. A former Delta Air Lines executive and captain, Dickson reiterated that he would fly the revamped 737 Max himself before certifying it.

The FAA was the last major aviation authority in the world to ground the planes in March, a shift from previous years when other nations would follow the FAA’s lead.

https://www.cnbc.com/2019/09/26/ntsb-boeing-overestimated-pilots-ability-to-handle-737-max-misfires.html

CRUNCH NUMBERS, NOT AIRPLANES

A popular turn of flight-safety phraseology exhorts you not to become "a statistic." A newly released report reveals what type of accidents occurred most in 2016.



This graph in the Twenty-eighth Joseph T. Nall Report shows the types of landing accidents experienced by pilots of noncommercial fixed-wing general aviation aircraft in 2016.

An aircraft mishap is less likely to have your number if you have studied the subject and know where the risks lie. For any student pilot or other pilot hoping to direct their flight training toward risk management, the ***Twenty-eighth Joseph T.***

Nall Report released October 11 by the AOPA Air Safety Institute provides a fact-packed roadmap.

Becoming familiar with accident data at the level of detail the Nall Report offers can help you guard against the most risk-prone scenarios while helping general aviation subdue some of the most stubborn stumbling blocks before the next annual report.

The big picture makes it apparent that accidents related to actions or inactions by pilots remain the largest major category, with landing accidents the largest grouping within pilot-related accidents (noncommercial fixed-wing aircraft). They were also the largest phase-of-flight accident category, and for the year studied (2016), 80.5 percent of landing accidents involved single-engine, fixed-gear aircraft.

The bar graph above crunches landing-accident numbers by accident type. Loss of control runs away with being the most common type, accounting for 46 percent of the total. Airspeed/stall accidents and hard landings were major contributors.

You will be a private pilot someday, so it's worth noting the large percentage of landing accidents involving those pilots—during daylight visual meteorological conditions. One takeaway for a student pilot is that earning your certificate won't exempt you from the need to practice; another is to remember that as you move on to bigger or more complex aircraft, don't cut corners on proficiency training. (A quick checkout right before that long holiday-weekend cross-country is tempting but not recommended as a method of "aircraft familiarization.")

Student pilots contributed their share of landing mishaps to the total. If you search **NTSB accident reports**, you will see many examples of common types, helping you train to avoid the time-tested traps.

While you're doing your part to tamp down aviation's future accident statistics, another safety project to take on is helping to keep one of the Nall Report's most encouraging statistics moving in the right direction.

According to the report, weather accidents registered a 10-year low—good news because of their typical lethality and because the majority involved single-engine, fixed-gear airplanes flown by private pilots in (or inadvertently into) day instrument meteorological conditions.

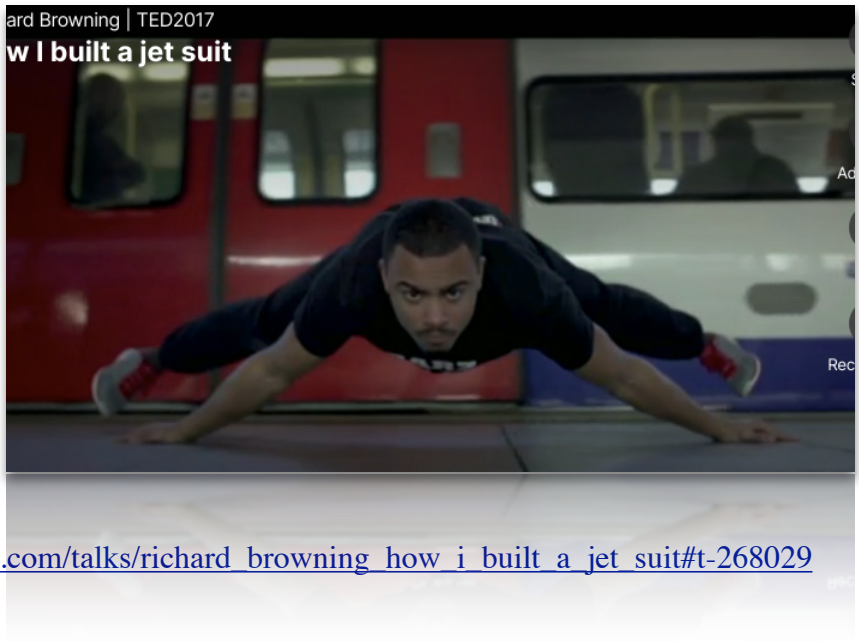
https://www.aopa.org/training-and-safety/air-safety-institute/accident-analysis/joseph-t-nall-report

https://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx

TED Talks: Ideas Worth Spreading

How I built a jet suit!

We've all dreamed of flying -- but for Richard Browning, flight is an obsession. He's built an Iron Man-like suit that leans on an elegant collaboration of mind, body and technology, bringing science fiction dreams a little closer to reality. Learn more about the trial and error process behind his invention and take flight with Browning in an unforgettable demo.



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