

# Aviation Human Factors Industry News

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*From the sands of Kitty Hawk, the tradition lives on.*

Hello all,

To subscribe send an email to: [rhughes@humanfactorsedu.com](mailto:rhughes@humanfactorsedu.com)

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★And Much More

## Aviation Safety Manager Course

Dr. Robert (Bob) Baron  
TACG President/Chief Consultant

Interested In Becoming An Aviation Safety Manager? There is a **strong demand** for experienced and knowledgeable Safety Managers. And while we can't give you the experience, we can definitely give you the knowledge you need to either become a Safety Manager or, if you already are a Safety Manager, a robust refresher and update to your existing knowledge base. Our Safety Manager course is a comprehensive, total submersion, **certificate course** that is loaded with useful and practical information that you can use right out of the gate. At 2 weeks (10 days) in duration, our Safety Manager course delves deeply into safety management principles, Safety Management Systems (SMS), Human Factors, and best techniques and methods to train others (Train-The-Trainer).



<https://www.tacgworldwide.com/Aviation-Safety-Manager-Course>

## Resilience When You Need It

Submitted by Gordon Dupont

With permission from D.O.M. Director of Maintenance Magazine

**Resilience** or resilience engineering is one of the means being studied in order to reduce human error. I recently had the opportunity to attend a lecture by a head surgeon on resilience and wondered just how this would apply to aviation maintenance.

I sat with the head of the regional TSB/C and discussed how this would apply even to aviation.

The following is some of what I learned and perhaps you can tell me if it can be adapted to enable us to [lower maintenance human error](#).

After all, we are all human.

First of all, just what is resilience?

Using engineering terminology, it is simply the ability of a material to spring back to its original shape. For example, if you bounce a rubber ball, it deforms when it hits something but regains its shape as soon as the

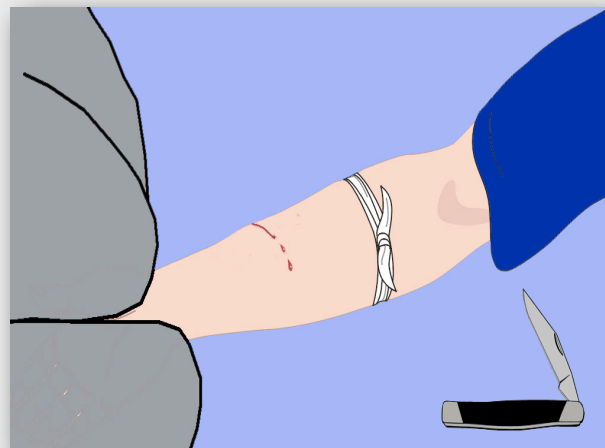
pressure is released in the bounce. Now, if we take the human, resilience is the capacity to recover quickly from a significant emotional event. Like materials, that varies greatly between humans. To some extent, for us humans, it could also depend on the event as well. For example, some soldiers fighting side by side come home from a war and carry on as before, while others suffer from PTSD and their lives are never the same. By the way, the word resilience and resiliency are completely interchangeable, although some academics might argue otherwise. Thus, in a vain attempt to keep everyone happy, I will use both. The resilience the doctor was talking about was the ability of a trauma team to function under sudden overwhelming conditions unlike any ever experienced before. For example, a 747 crashes at the airport with multiple injuries. They can't say, "Take them somewhere else because we're full." They call on resiliency and do what has to be done. They may have to "think outside the box" as they turn the restaurant into a triage center. They may have to turn a laundry into an operating room as they call for extra resources and they do what has to be done to get the job done. This calls for excellent teamwork, a lot of innovation, resourcefulness and resiliency. It is like one of my Dad's many old sayings: "When the going gets tough, the tough get going." Maintenance is actually full of stories like these with one that is close to home. Ken Borek Air is just one of many companies that have [legionary maintenance personnel](#) with a lot of resiliency.



The story of how they repaired a Basler P&W PT6A-67 powered DC3 with extensive take-off damage to the engines, wings, landing gear and cockpit in Antarctica with its perpetual winter, is well worth the listen and read. In 45 days, they dug it out of the snow, repaired it to flying condition and it flew out. If you haven't seen the video yet, put that on your bucket list and go to [YouTube - DC3 repair Antarctica](#). I would have loved to have been part of that team, but I don't like the cold.

So resilience for us humans can be calling on an inner strength to accomplish a goal that has never been encountered before. It is an attitude that there has to be a solution to the problem and I won't give up until it is found. I have seen this in some cancer patients and have a relative who was been diagnosed with an inoperable cancer and told that with chemo he had a maximum of six months to live. Three years later he is now receiving 3 different chemo treatments lasting over 5 hours every 3 weeks. When we phone him he is always cheerful and positive about life even though now he is sick for a week after each treatment, has a good week and starts to feel sick again. He has a resiliency that I'm not at all sure that I would have. Even though he has to know who will win in the end he certainly has the resiliency to say "not until I say so." He has my deepest admiration.

An unbelievable example of personal resiliency has to be Aron Rolston who, on April 26, 2003, cut off his right arm below the elbow with a dull 2 inch pocket knife blade. There is a movie about this feat called "[127 hours.](#)" Renee, my daughter, lent me the movie, but to be honest, I haven't had the resiliency to watch it. His arm was pinned under an 800 lb. rock in a hiking accident alone and he realized that cutting off his arm was his only hope of. I've read the story and my teeth shutter when he describes how he had to throw all his weight several times in order to get the two bones to break. But he says the most painful was when he had to cut the nerve going down the arm with the dull knife.



He then had to walk out until he was found, severely dehydrated and having lost about 25% of his blood. After the ordeal, he tells people that he didn't lose an arm [but gained a life](#).

Now that is resilience and a positive attitude that none of us know if we have until we are put into a position that calls for it. Thus, if you tend to [see the positive side of life](#) and have a determination to make the most of any situation, then you very likely are blessed with a degree of resiliency that I hope never gets severely tested. Resiliency is an inner strength that you call upon when needed.

All right, I want one, but what can we do?

As it is an inner strength, it is below the conscious level. The sub-conscious develops at an early age and influences all of our adult decision making. These [Early Life Decisions \(ELDs\)](#) are heavily influenced by experiences as a young child that we have no recollection of. Thus, resiliency will be developed in part at this stage of life. One of the indicators will be your level of [“positive thinking.”](#) That alone could fill an article in the future, but a person like Tony Robbins would be better qualified than I to write it. Positive thinking has served man well through the ages as documented in a book and movie called [“The Secret.”](#) Not to ruin the “secret”, but it is simply: “think positive and positive things happen to you.” While it can't get any simpler than that, a great many people have less happy lives because they fail to believe and follow it.

So [Step 1](#) is to work on being more positive. One way to help do that is to take the time to [be grateful](#). We are all truly blessed, perhaps some more than others, but we all have things to be grateful for. Maintenance tends to be on the negative side of aviation, as we spend our lives looking for something wrong. And when we do find something wrong it means that it is going to cost money. You may have saved hundreds of lives by finding the crack in the fan disc, but the initial reaction is likely, “Are you sure? (like you don't know what a crack looks like) Those things are %^&\* expensive and where am I going to find another one?” Therefore, work on being positive and look for the positive side of all you can.

[Step 2](#) is to accept reality. Yes, this may not be fair, but it is happening. So, let's just step back a second and see just what I have some degree of control of.

**Step 3** is what productive (positive) thing can I do about it?

**Step 4** is to control the emotions . At this stage “anger” or “panic” are very unlikely to help the situation. Sometimes a mantra repeated over and over (under your breath and in your mind of course) like: “We shall overcome” or “We can beat this” will help. You have to believe.

**Step 5** is to take some time for “mindfulness.” By that I mean time for yourself. Stress can wear you down and we all need some time to “recharge your resilience batteries” by getting away from the stress for a time. Refer to DOM April 2017, for more help here.

**Step 6** is to always be prepared for the unexpected, even if it is only mentally.

Organizations develop Emergency Response Plans to try to anticipate when resilience may be required. The medical field has developed four stepping stones to assist resilience. They are: **LEARN, RESPOND, MONITOR, and ANTICIPATE**. I might put them in a different order, but this is part of resilience engineering which is helping make the medical field a Safer place.

Mental strength is much like physical strength. You have to work on it in order for it to be there when you need it. None of us could run a marathon or ironman competition tomorrow without a lot of work preparing for it with exercise. The mental exercise calls for the positive thinking and being mentally prepared for whatever life or work throws at us.

**You have to believe in yourself** because resiliency resides in yourself and only you can call on that inner strength when you need it.



# **Lessons Learned From Aircraft Maintenance for Patient Safety During Major Repair and Replacement**

BY [DR. BILL JOHNSON](#)

This article started when Bill Johnson (aka. Dr. Bill) was discussing his upcoming hip replacement (i.e., “major repair and alteration”) with Marc Szepean, a former Lufthansa senior executive and now a lecturer at the University of Oxford Saïd Business School.



They talked about the surgery and realized that there might be similarities between performing “surgery” on Dr. Bill and an aging aircraft. Even more importantly, from Bill’s point of view, there surely could be similarities in terms of what one would expect from a hospital and a repair station. So, they discussed the characteristics of an aviation service provider and a hospital that would be most desirable to complete the service in an efficient, effective, and safe manner. Yes, even though the prospect of undergoing hip surgery isn’t all that pleasant, the discussion itself was fun. Here is a short summary ...

## **Is A Repair Necessary?**

First, there is the nonroutine finding and the necessity to undergo repair. Too many landing cycles or hard landings on an aging airframe can result in the main landing gear attach fitting not reaching its intended original equipment manufacturer (OEM) service life. Hopefully, any top-notch maintenance, repair, and overhaul (MRO) facility detects such damage, writes up a nonroutine finding and replaces the damaged or worn attach fitting.

[In the case of human beings](#), this sort of strain on the main landing gear system and its attach fittings – i.e., the legs and hips – can occur as well. Dr. Bill was fortunate that his doctor properly diagnosed failure of his right hip prior to reaching it, for lack of a better term and without any blasphemous intent, “OEM design life” and recommended to replace it as quickly as possible.

### **Right Service Provider**

In general, many maintenance facilities offer landing gear services. It is very important to ask around to find the very best maintenance provider.

It is important to find a MRO that is large enough to have top-notch hangars, shops, and modern equipment. On the other hand, the very busy large maintenance providers may be more focused on major airframe maintenance checks and structural repairs or full landing gear overhauls. That may mean that a mere main gear attach fitting replacement job may be squeezed in between the higher revenue big item jobs. Bill wanted a well-known provider that specialized in landing gear main attach fitting replacement and [that took pride](#) in performing this very procedure.

Of course, Bill wanted to be able to perform an informal on-site audit himself. That is not always possible. However, in our experience, nothing really beats walking around the flight line, the hangar floor, and engineering offices just to observe cleanliness, attitudes, and overall demeanor of people and to get a feel for the facility. The fact that the hospital and medical team [welcomed patient safety questions](#), before the procedure, was a good sign they were on the right track. He found the right place.

### **Right People and Right Team**

Maintenance work is based on highly qualified and experienced personnel, working together as a team, accomplishing the job with the highest care and resulting quality. Individual specialists must be properly trained and be current in their respective areas of work. For an individual, one-time customer, like Dr. Bill, it might not be feasible to [check the credentials](#) of all maintenance staff and to verify the level of recurrent training across the entire maintenance team. One must rely on the certification agency, like the FAA. We all know that there is variance across different Part 145 maintenance facilities but the certification agency(ies) must ensure an acceptable level of compliance to established standards.



In the same spirit Bill selected medical professionals with the right type of initial training (i.e. medical school), evidence of adequate levels of recurrent training, and appropriate certifications.

Successful maintenance work is not just a function of the excellence of an individual contributor but [a true team sport](#). Replacement of a landing gear main attach fitting can require Airframe and Powerplant (A&P) mechanics to remove and reinstall the landing gear, avionics mechanics to work on disconnecting and reconnecting wiring, structural experts to perform the replacement of the attach fitting itself, engineers to develop or coordinate repair schemes in case of secondary findings that are out of limit, tools and logistics specialist to ensure availability of spare parts, consumables, and tooling, facility experts to keep the hangar and shops in good condition, and – depending on an aircraft operator’s standards – pilots to perform a post-maintenance test or verification flight. Similarly, Bill did not judge the hospital of his choice by the quality/reputation of the orthopedic surgeon alone. Instead, Bill made sure to have a good feel for all other members of his surgical team – anesthesiologists, nurses, facility managers, etc. – in their own right and, above all, in terms of their team spirit.

### **Right Organizational Culture**

Even the best people and the best team [are likely to fail](#) in a maintenance organization that has the wrong culture. A dedication to safety and to an appropriately configured [safety culture](#) must be a shared and non-negotiable goal throughout the entire organization. This safety culture must be lived, daily reality, and priority, and not just be relegated to second fiddle. Sometimes that is difficult to ascertain during a short on-site visit. But it certainly is worthwhile trying to verify this and to look for visible indications of a service provider’s safety culture.

### **Lessons Learned From Aircraft Maintenance for Patient Safety During Major Repair and Replacement**

For example, walk past bulletin boards and pay attention whether safety-related matters are displayed prominently, are kept up-to-date, and measure the right key performance indicators (KPIs). Ask about voluntary reporting systems. Ask how the organization deals with honest errors. Ask if individual employees get sufficient rest and if teams are adequately staffed for the tasks at hand. And given Bill’s background, you will not be surprised that Bill recommends [inquiring about human factors training](#). Sometimes even the marketing material talks about safety.

That's worth looking for! Bill checked on all of this and only settled for a hospital once he was reasonably sure that the hospital had the same type of safety culture that he would expect from any repair station to which he would entrust an airliner repair.

### **Right Facilities, Equipment, Procedures, and Parts**

The best people and best team working in the best organizational culture will struggle to produce high-quality repairs if they are forced to work without being properly resourced. If possible, check the facilities, the equipment, and the tooling that are made available to MRO employees. Good lighting, work stands for easy access, and cleanliness are important. Consider tooling and equipment-related procedures as well. Check specifics. For example, look into tool control procedures. Do mechanics perform a toolbox check upon completion of maintenance work? You don't want tools left behind inside the airframe after closing up. And you certainly don't want your doctor to leave behind a scalpel or the like after closing the cowling. A old-fashioned television in the pre-operating prep room did raise concern, but the nurse commented that it was the oldest device in the hospital except for a couple of the nurses and doctors. She said that all surgical equipment was state-of-art and in calibration.

[Regarding procedures](#), in general, are working procedures clearly documented, sound, and consistently applied? Do employees have easy access to and perform maintenance work in accordance with authorized and up-to-date controlled documentation such as aircraft maintenance manuals (AMMs) or structural repair manuals (SRMs)? Replacing the main attach fitting of a landing gear is a complicated procedure. First, the gear must be removed from the airframe (Figure 1). Then the main attach fitting must be replaced. In case of finding secondary corrosion, that must be removed. The gear must be mechanically reinstalled and all electrical and hydraulic lines must be reconnected. Hip replacement is similarly complicated (Figure 2). You want your surgeon to work in accordance with proper procedures. You surely don't want your surgeon to – no pun intended – just “wing it”.

When undergoing parts replacement – i.e., a new hip – you want to make sure that the replacement part itself is of acceptable quality. Both in the case of “surgery” on human beings and on aircraft you want to beware of suspected unapproved parts (SUPs). Ask about the procedures your maintenance provider – i.e., hospital – has in place to control the risk of SUPs and most modern proven technology. Ask about procedures to ensure that consumables have not expired.

Dr. Bill looked into all of this before feeling at ease with his choice of hospital!

### **Aircraft Maintenance vs. Medicine**

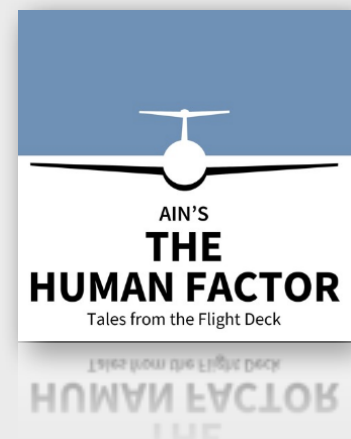
As an aviation safety professional, Bill appreciates the direct comparison between aircraft repair and surgery. Our maintenance processes, particularly our safety management systems, ensures continuing safety worldwide. Our industry strives to identify hazards thus seeking every opportunity to manage safety.

Especially a day before his surgery. Bill does not want to delve into medical patient safety statistics. They are not positively impressive. The good news is that medical professionals and hospitals are [seeking advice from aviation safety risk experts](#). Some aviation safety consultancies have even reduced their aviation workload in favor of patient safety consulting, where the help is most certainly needed. Medical schools are increasing their offerings related to patient safety. Insurance companies have stepped up to pay for patient safety initiatives.

After having tried to do his homework of checking on people and teams, the organizational culture, and facilities, equipment, procedures, and parts at the hospital of his choice, Bill is ready for his major repair and alteration. He is looking forward to returning to walking and running his favorite trails. Better yet, to doing more “walk-arounds” at your MRO.

## **AIN's The Human Factor Podcast Episode 04: Engine Fire Forces Water Landing, Part 1**

After Dennis Murphy dropped five charter passengers in Havana, Cuba, on February 20, 2003, one of the engines on his Cessna 402B developed a engine fire over the Straits of Florida, forcing him to make an emergency water landing. In the first part of AIN's [The Human Factor](#), Murphy recounts how the emergency developed and then delves into the issue of the extreme fear that he faced and how best to prepare for when the unexpected occurs [Listen here](#)



## NTSB Warns GA Pilots, Mechanics on Dangers of Carbon Monoxide

Carbon monoxide is often overlooked and underestimated.

General aviation pilots and aviation maintenance personnel need to take extra steps to eliminate the risks of carbon monoxide (CO) poisoning, according to the U.S. National Transportation Safety Board (NTSB), which issued two safety alerts recently to increase awareness of the problem.

Safety Alerts [SA-070](#) and [SA-069](#) “warn mechanics and pilots that the risk of carbon monoxide poisoning is generally overlooked and underestimated — a dangerous prospect given that many internal combustion engine airplanes are heated by air warmed by exhaust systems using a heater shroud,” the NTSB said. “A defect or leak in the exhaust pipes or muffler can introduce the colorless, odorless and tasteless gas into the cockpit — [with sometimes fatal results.](#)” The safety alerts warned that a high level of CO in the blood stream results in “oxygen starvation and the onset of symptoms such as headaches, drowsiness, nausea or shortness of breath.”

Pilots often fail to recognize the symptoms as signs of an elevated CO level, the alert to pilots said. The alert to maintenance personnel cautioned that CO can enter an aircraft cabin through undetected cracks in exhaust and heater mufflers and tubes, unplugged holes in firewalls, degraded door and window seals, and leaks in air ducting.

In the safety alerts, the NTSB advised maintenance personnel to thoroughly inspect exhaust systems, air ducting, firewalls and window and door seals during 100-hour inspections and annual inspections, and to check heater air inlet cockpit vents for soot, which can indicate the presence of CO.



Pilots were advised to install CO detectors and replace them in accordance with manufacturer guidelines and to check the exhaust system during preflight inspections for cracking at the ends of the muffler.

“During flight, if you believe you have been exposed to CO, don’t hesitate to act,” the alert to pilots said. “Early symptoms are vague and may involve a [headache or nausea](#). Other symptoms include impaired judgment, disorientation or dizziness.”

If signs of CO are found, the alert recommended opening the aircraft’s windows, turning off the heat, landing as soon as practical and seeking emergency medical attention.

<https://www.nts.gov/safety/safety-alerts/Documents/SA-070.pdf>

<https://www.nts.gov/safety/safety-alerts/Documents/SA-069.pdf>

## **NTSB News - Report on LaGuardia Airport Incident Pilot Actions, Decision Making, "Lack of Command Authority" Led to New York LaGuardia Runway Excursion**

[Several failures](#) in close succession by a jetliner's flight crew were the probable cause of Oct. 27, 2016, runway excursion at LaGuardia Airport, according to the National Transportation Safety Board's final report issued recently.

The Eastern Air Lines Boeing 737-700, a chartered flight carrying then vice-presidential candidate Mike Pence and campaign staff, overran Runway 22 during landing on the rainy evening.

### **Accidents/Incidents Analysis**

#### **Compelling Observations on Causes**

- Ineffective Communication
- Inadequate Leadership
- Poor Group Decision Making

The airplane departed the runway and partially transited an arrester bed of crushable concrete before coming to a stop about 170 feet past the end of the runway. None of the 11 crewmembers or 37 passengers were hurt in the incident. The plane sustained minor damage.

NTSB investigators document information and gather evidence the morning after the Oct. 27, 2016, runway excursion of a chartered Eastern Air Lines Boeing 737-700 at New York LaGuardia Airport (NTSB photo by Peter Knudson)

Data from the flight recorder and post-incident interviews with the flight crew indicated the 737 was on a stabilized approach to Runway 22 until the landing flare, when it "floated" for thousands of feet, finally touching down more than 4,200 feet past the threshold of the 7,001-foot runway, leaving less than 2,800 feet of runway surface for the 737 to decelerate and stop.

The NTSB said when the first officer, who was at the controls, failed to get the jet's wheels on the ground within the first third of the runway, or 2,300 feet, [he should have](#) executed a go-around maneuver instead of continuing the landing attempt.

During the landing roll, [contrary to procedures](#), the captain didn't announce he was assuming control of the airplane, which resulted in each pilot attempting directional inputs that [were at odds](#) with the other. This [breakdown of basic crew resource management](#) along with the captain's failure to call for a go-around demonstrated, "a lack of command authority." This, along with pilot actions, including starting the flare at an altitude almost twice as high as Boeing recommends, delays in reducing throttles and manually deploying the speed brakes, all contributed to the excursion, the NTSB said.

Eastern Air Lines management told the NTSB that it has since developed specific flight crew training to address the safety issues identified during the investigation.

The 24-page final report is available at <https://go.usa.gov/xRJ4v>.



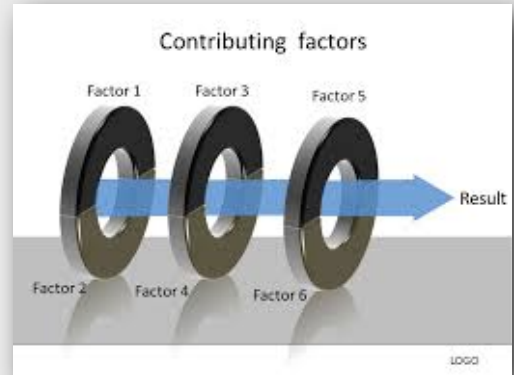
## **Army: We've followed recommendations to prevent crashes**

A spokesman says the Army post where a helicopter crashed, killing two pilots, has implemented all of the recommendations of an investigative report in order to prevent similar accidents.

Capt. Kristoffer L. Sibbaluca is a spokesman for the 101st Combat Aviation Brigade at Fort Campbell. He says the safety of soldiers is paramount and the post is doing everything it can to prevent a similar occurrence.

The U.S. Army Aircraft Incident Report [found that an improperly installed part caused the helicopter to crash](#) in Tennessee, killing the two 101st Airborne Division pilots aboard. The Apache helicopter took off from Fort Campbell in December 2015 on a training mission. The report says it came apart in midair before crashing to the ground and bursting into flames.

Fort Campbell is on the Kentucky-Tennessee border.



## **The end of air turbulence? Boeing laser technology could solve age-old bumpy flights problem**

For air travel passengers turbulence is one of the biggest problems. It can strike fear into nervous fliers, cause nausea in others or in extreme cases be responsible for injury and damage to cabins. Put simply, it's something airlines are desperate to avoid but because some is hard to spot it's easier said than done.



However, passengers could be about to see the end of bumpy flights as Boeing is testing a [new laser system](#) to help detect pockets of disruptive air up to ten miles (17km) in advance, giving pilots plenty of time to avoid it.

Clear-air turbulence, which is almost impossible to see as it comes with no visual clues like clouds, can catch pilots off-guard and passengers gripping their seats but a new lidar (light detection and ranging technology) system will send out pulses of laser light from the plane's nose to detect abnormal changes in wind speed ahead.

The emitted laser light is scattered over small particles in the air and the reflected light back towards sensors on the plane can determine

The new system will [sound an audio alert and could give pilots up to 60 seconds](#) to react to problematic turbulence as well as give crew the chance to baton down any food or drink they are serving.

Currently, pilots who are able to observe upcoming turbulence either ascend or descend altitude as evasive action, however in some circumstances if unavoidable they will fly through the turbulence as planes are more than capable of withstanding the rough patches of air despite it being less than comfortable for passengers.

Boeing said that the experimental laser technology will be put on trial on-board FedEx 777 freight aircraft over a six-week period where more than 30 other technologies will also be researched. It is hoped the concept, if successful, will be rolled-out to all commercial carriers.

The development of more advanced turbulence detection systems comes after turbulence-related injuries doubled in 2016 from 21 to 44, according to the Federal Aviation Administration.

In 2017 ten people were injured on-board an American Airlines flight from Athens to Philadelphia suddenly dropped sending people hitting the cabin ceiling. While in May 27 people were injured as an Aeroflot flight from Moscow to Thailand hit clear-air turbulence, hurling passengers through the air and breaking several babies' spines.

It also comes at a time where scientists predict extreme turbulence on flights is set to soar as climate change impacts the North Atlantic Jet Stream. Transatlantic flights are said to become a much bumpier ride as carbon dioxide levels in the atmosphere increase, according to a paper published in the journal *Advances in Atmospheric Sciences*.

## **How cloud technology in aviation keeps us safe in the skies**

Every day, over 100,000 passenger planes take to the skies all around the world bringing along with it a host of challenges and the wonderment of how modern-day aviation safety technology keeps disasters few and far in between.

The number of flights varies based on the time of day and year, according to FlightRadar24, which keeps track of aircraft around the world. In July and August this year, more than **16,000 flights** were up in the air in the span of two hours on an average Friday afternoon. Until today, the tragic disappearance of Malaysia Airlines Flight 370 in March 2014 remains a mystery. It is seen as a clarion call for the global airlines to adopt more efficient tracking methods, particularly those that run on cloud technology.

For the uninitiated, cloud computing, simply put, is software and services run over the Internet, instead of an isolated computer network.

According to American think tank *Brookings Institution*, the vanishing of the ill-fated flight was “astonishing” as it left no clear digital fingerprints amid a world of instantaneous communications and geo-position systems. And the only way we would learn the truth about the incident is if investigators recover the aircraft’s black box still retrieved from depths of the Indian Ocean.



This is equivalent to saying that the digital information of what transpired during the flight is only available on a sole hard disc drive.

With that in mind, cloud computing technologies for the aviation industry began proliferating. In recent years, airline companies have increased their reliance on cloud tech to receive flight location, speed, and other information to servers on land through tamper-proof mechanisms, as the think tank advocated.

The cutting-edge technology also allows aviation authorities to monitor flight conditions and recreate the circumstances of air crashes if the need arises.

Earlier this year, an official from the International Civil Aviation Organization's (ICAO), the specialized United Nations' agency that oversees international air transport, said cloud computing now plays a critical role in the management of global civil aviation.

The ICAO chief of integrated aviation analysis Marco Merens said the Accident Notification System was a good example of how ICAO uses the cloud to collect, store, organize, analyze and ultimately share information, *The Edge* reported.

Computer networks, servers, storage and applications, are among those offered by cloud service providers. It's cheap and effective and depending on how certain clouds were designed, makes extremely complex tasks simple, [allowing anyone with an account and password access from anywhere and at any time](#).

In light of this, ICAO's Integrated Aviation Analysis Section (IAA) transitioned to the cloud tech which is able to notify the agency of a major incidences or risks in real-time.

Merens said the process of collecting massive amounts of data and streamlining the crucial bits of information on what's happening is usually done through Elastic MapReduce or EMR on Amazon, the programming framework which structures data into smaller tasks.

### Cloud-based safety solution

Head of Aviation at United Kingdom solutions provider Ideagen Steven Cespedes said the company's enterprise cloud-based software, Ideagen Coruson, essentially aligned all the key elements of an airlines' safety management into one system.

“In terms of compliance, auditing risk management, hazard reporting, and safety reporting – [it puts all those elements into one solution](#),” he told *Tech Wire Asia* recently.

Coruson was recently adopted by Jakarta-based Lion Air Group, which has a fleet of more than 100 aircraft and flies to at least 300 destinations, replacing an older system, helping to [strengthen the airline’s safety culture](#) through functionality such as smart forms, geotagging and a mobile app for detailed reporting.

The Coruson software provides airlines like Lion Air Group with safety performance oversight across its six affiliated Air Operator’s Certificate’s (AOCs), delivering detailed performance data to quickly highlight potential safety weaknesses and risks, such as those linked to [pilot fatigue or aircraft incidents](#).

Cespedes said apart from being a highly-integrated safety measure, Coruson is also big on cost savings for growing airline companies. “That’s essentially one of the biggest cost savings solutions because all of the previous systems all relies on hardware so that hardware goes away and all they need is an internet connection,” he said. “As they grow they don’t need to invest in other hardware, an internet connection is all they need to access the system,” he added.

Unlike other solutions on the marketplace that are hosted on the cloud, Coruson is a native cloud application, designed and built for the cloud, utilizing the full power and scalability of the AWS technologies.”

### **Safety compliance and better aircraft maintenance**

According to American aviation solutions provider Aircraft Technical Publishers (ATP), aircraft mechanics who used cloud tech have immediate access to the right information in the right way.

[“They don’t need to worry about currency or whether someone has installed the latest revision disc or updated paper pages,”](#) it explained in a white-paper.

The company said with cloud computing, mechanics would [always have access to the most current documentation](#), even when they are traveling or out in the field.

<https://www.brookings.edu/blog/techtank/2014/04/04/time-to-bring-cloud-computing-to-aviation-safety/>

[https://www.atp.com/files/ATP\\_Whitepaper\\_Cloud\\_Computing.pdf](https://www.atp.com/files/ATP_Whitepaper_Cloud_Computing.pdf)

## **The Toxins in Tattoos**

Tiny toxic particles from tattoo ink can travel through the body and accumulate in the [lymph nodes](#), which could have long term health consequences, according to a new study. In addition to pigments, tattoo ink, contains molecules from preservatives and contaminants such as nickel, chromium, manganese and cobalt. To track where these molecules go, scientists targeted one of the most common ingredients of tattoo ink: [titanium dioxide](#), a white pigment that is often mixed with other colors. The researchers used X-ray fluorescence to analyze the lymph nodes of four deceased people who'd had tattoos.



Lymph nodes serve a critical role in the [immune system](#), filtering toxins and cancer cells and storing immune cells that fight infection. The test confirmed the accumulation of titanium dioxide nanoparticles in lymph nodes, which suggests contaminants collect in them, too, *Smithsonian.com* reports. It's unknown how deposits of microscopic contaminants could affect the lymph nodes and the immune system. "When someone wants to get a tattoo, they are often very careful in choosing a parlor where they use sterile needles," say the study's co-author Hiram Castillo. "No one checks the chemical composition of the colors, but our study shows that [maybe they should](#)."