

Aviation Human Factors Industry News

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

Hello all,

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

★Upcoming January 2020 HF/CRM/ Train-The-Trainer courses at The Aviation Consulting Group (TACG) location in Myrtle Beach, SC, USA.

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★The Importance of a Proper Turnover

Upcoming January 2020 HF/CRM/Train-The-Trainer courses at The Aviation Consulting Group (TACG) location in Myrtle Beach, SC, USA.

TACG is a respected global leader in aviation safety training and consulting with offices in Myrtle Beach, South Carolina. TACG works with domestic and international airlines, business and corporate aviation operators, Part 135 charter operators, maintenance, repair and overhaul facilities, flight schools, airports, manufacturers, and more. Dr. Robert Baron, Ph.D President/Chief Consultant has my endorsement as I've been a student in many of his classes.



Human Factors Courses

- Human Factors for Aviation Maintenance **Train-The-Trainer** (January 27-31, 2020).
- Human Factors for Aviation Maintenance **Initial** (January 27-28, 2020).
- Human Factors for Aviation Maintenance **Recurrent** (January 28, 2020).

Crew Resource Management Courses

- CRM **Train-The-Trainer** (January 29-February 2, 2020).
- CRM **Initial** (February 1, 2020).
- CRM **Recurrent** (February 2, 2020).

Train-The-Trainer (Generic) Courses

- **Train-The-Trainer Generic** (all industries welcome) (January 29-31, 2020).

<https://www.tacgworldwide.com/Scheduled-Courses>

Study uncovers some factors that might affect the amount and quality of airline pilots' in-flight sleep

New research in *PLOS One* sheds light on [how airline pilots use in-flight sleep to manage fatigue on long-haul flights](#). The study indicates that many pilots try to prepare their body for sleep before the trip even begins.



The new study examined qualitative feedback from pilots, which had been collected during previous studies on their sleep and performance. In particular, the previous studies surveyed pilots regarding their sleep at home, in-flight sleep, fatigue and performance on specific flight routes.

The surveys provided space for participants to comment at the end of the questionnaire, which is what the current study is based on.

“As I merged data from multiple studies into a larger database, I noticed that the pilots’ comments had information in them [that wasn’t being captured](#) in the scales and closed answer questions we were asking pilots to complete for our studies,” explained study author Jennifer Zaslona, a research officer at the **Sleep/Wake Research Centre** at Massey University.

“We talk about shared responsibility for managing fatigue but we were focusing on what we could measure and forgetting to listen to the people being impacted by our recommendations. To me, it seemed that we were missing part of the picture.”

After systematically coding comments from 123 airline pilots, the researchers found that several common themes emerged. [For example](#), many pilots noted that the design and location of the crew rest facility could adversely affect in-flight sleep.

“On long range (>8hrs) and ultra-long range (> 16hrs) flights, in-flight sleep is one of the main methods recommended to manage pilots’ fatigue and sleepiness. This means that on long flights pilots are provided with crew rest facilities which can range from an economy class seat to a separate lie-flat bunk area depending on the flight,” Zaslona told PsyPost.

“Pilots in our study made good use of their in-flight sleep opportunities (as recommended) and unsurprisingly they preferred the crew bunk area to the seat in the passenger cabin. However, they also highlighted ways in which the comfort of the crew bunk can be improved, for instance by reducing noise disturbances or providing softer mattresses.”

As one pilot said, sleeping in the crew bunk area was “like sleeping on a well-padded carpet over hard floor.”

Many pilots also said that they tried to prepare themselves before the flight, either by sleeping in on the day of their trip to get more rest before the flight or by increasing their time awake prior to their trip so they would have an easier time falling asleep in flight.

“Importantly, they indicated that their fatigue management on these flights actually starts before the flight with how they prepare for the flight. There were different strategies of flight preparation but pilots indicated that it is helpful for them to know ahead of time which rest breaks they will be allocated in flight so that they can better prepare for the flight,” Zaslona said.

The study — like all research — [includes some limitations](#).

“One of the main limitations of this study is that the questions from which we drew this data weren’t designed to be the primary outcomes of the study, so the amount of information provided by each pilot is more limited than if we had conducted interviews or focus groups,” Zaslona said.

“For example, the data doesn’t address pilots’ views on collaboration and communication with superiors and airlines [in relation to fatigue risk management](#). It is also difficult to assess how representative of the general pilot population our sample is because the studies from which we drew our data were more of a snapshot of the operation during a specific period of time.”

“There are still many questions to answer especially relating to flight preparation and rest break allocation. Owing to the variety in long haul flight operations it is unlikely that there would be a simple answer to these questions but perhaps >

we can start to identify different strategies that can be used in specific contexts,” Zaslona explained.

“Traditionally, regulatory bodies have set hard limits on flight durations but with newer technologies aircraft can fly longer and further so [there has been a shift](#) towards using Fatigue Risk Management Systems (FRMSs),” she added.

“An FRMS provides an airline with more flexibility, allowing them to operate outside the prescribed limits, provided that they are monitoring and managing fatigue risk in their operations. But an FRMS also [relies on all parties](#) (regulators, airlines and pilots) doing their part to manage the risk of fatigue because fatigue is a whole of life issue, meaning fatigue is impacted by your work but also by what you do outside of work.”

<https://www.sleepwake.ac.nz/>

The study, “[Shared responsibility for managing fatigue: Hearing the pilots](#)“, was authored by Jennifer L. Zaslona, Karyn M. O’Keeffe, T. Leigh Signal, and Philippa H. Gander.

Wrong flap settings fatal for CFI

The student pilot, who had 15 hours of flight experience, was performing an instructional flight [with her flight instructor](#) and a passenger. According to GPS data, the Cessna 172 landed and then took off from a grass airstrip in New Milford, Connecticut, climbed about 150’, then hit terrain about 1,000’ past the end of the runway.

There were no known eyewitnesses, and the student pilot and passenger did not recall the accident due to their injuries. The flight instructor died in the crash.



An examination of the wreckage **did not** reveal any evidence of a pre-accident mechanical malfunction or anomaly. An examination of the flight controls revealed that the wing flaps were in the fully extended (40°) position at impact. The airplane's operating checklist stated that normal and obstacle clearance takeoffs are performed with wing flaps up, and flap settings greater than 10° **are not recommended at any time for takeoff**.

Upon landing on the grass runway, the flaps should have been retracted as part of the after-landing checklist, then confirmed up as part of the before takeoff and takeoff checklists.

It is likely that the flap setting at the time of takeoff resulted in an aerodynamic stall and loss of control during the initial climb.

It could not be determined who was at the controls at the time of the takeoff and loss of airplane control. However, the flight instructor, **as pilot in command**, was responsible for the operation and safety of the flight and should have ensured that the flaps were retracted before takeoff. He also should have anticipated and corrected any significant errors made by the student.

Probable cause: The flight instructor's failure to ensure that the wing flaps were properly configured for takeoff, which resulted in an aerodynamic stall and loss of control during the initial climb.

NTSB Identification: [ERA17FA272](#)

This August 2017 accident report is provided by the [National Transportation Safety Board](#). Published as an educational tool, it is intended to help pilots learn from the misfortunes of others.

East Bay Congressman introduces airport safety bill with aviation hero's support

A near miss at SFO two years ago that nearly caused one of the worst aviation accidents in American history led to the introduction of a new bill in congress recently.

The [Safe Landings Act](#) is sponsored by East Bay Congressman Mark DeSaulnier in consultation with one of the best known names in flying: Retired airline Capt.

Chesley "Sully" Sullenberger. Everyday at SFO, pilots make landings look so easy. But on a July night two years ago, a nearly botched landing could have killed hundreds.

On that night, the pilots of an Air Canada jet were heading for a landing on what [they thought was a runway](#). It was in fact a taxi-way with four jets lined up, containing a thousand passengers.

Seconds before disaster, they pulled up. Sully Sullenberger says it was a warning.

"We have made aviation safe enough that we can no longer define safety solely as the absence of accidents," he said.

Sullenberger of Danville stood alongside DeSaulnier as he unveiled his new bill, the Safe Landings Act.



Sullenberger is known for his miracle on the Hudson, landing his stricken plane on the river with no casualties.

DeSaulnier says he consulted with Sullenberger, pilots unions and safety experts before introducing the bill.

"It's human factors, it's looking at how we make sure the pilots, as well trained as they are continue to use technology to make sure what happened here which came so close to being a huge disaster doesn't happen again," DeSaulnier said. His bill would require that airlines [use existing systems or install new ones](#) that alert the pilot and air traffic control when a plane is not properly lined up on a runway and that new safety technology be developed along with best practices on training pilots to better use existing and future tech.

In a statement, the FAA told us on Thursday that they are already working on it. They said: "We are modifying existing radar systems to issue an alert when an aircraft is lined up for a taxiway rather than a runway."

FAA says its already in use at ten airports, and soon to be at 12 more. DeSaulnier's bill would allocate \$20 million to get the ball rolling. He believes he has a good chance in the house, but the Republican controlled senate is another matter.

"Unfortunately, common sense is not very common in the U.S. Congress right now," he said.

He also expects push back from the airline industry, which may balk at investing more money in an already safe system.

Here's Sullenberger's reply: "When it comes to costs, nothing is more expensive than an accident."

<https://abc7news.com/travel/east-bay-congressman-introduces-airport-safety-bill-with-aviation-heros-support/5453690/#>

Technology soars in advancing critical communication, safety for pilots, passengers

Communication technology already used in dozens of airports across the U.S. launches new platform availability.

The Federal Aviation Administration has been putting an increased focus on **English language proficiency for pilots** as the agency looks to ensure safety for passengers through improved communication. The move means increased attention for a technology called **“Plane English,”** created by two **Purdue University** alumni that aims to help new pilots master radio communication skills and better interact with air traffic controllers.



Muharrem Mane, an alumnus from the **School of Aeronautics and Astronautics**, and Eren Hadimioglu, an alumnus from the **School of Aviation and Transportation Technology**, created and developed **PlaneEnglish**. The technology’s simulator is now used in dozens of airports across the United States and was recently launched for iOS.

“PlaneEnglish is an aviation radio simulator to help new pilots acquire radio communication proficiency by developing advanced skills more in realistic environments,” Mane said. “We have heard from users that they improve their radio communication skills in one hour through our platform than they do in flying for a dozen hours.”

The app-based tool also aims to help new pilots reach FAA and International Civil Aviation Organization standards for Aviation English language use, put in place to ensure safety in the sky.

“We have been analyzing audio training files from the FAA and ICAO and using that data to establish our grading metrics to help users achieve the necessary communication skills to increase their radio proficiency and aviation safety,” Mane said.

PlaneEnglish lessons guide users through simple and complicated interactions with air traffic control on every phase of flight. Each simulation includes visual clues (like altitude, distance from an airport and direction) to provide the pilot with the situational awareness necessary for communication.

Users are required to respond properly in specific situations, using the correct phraseology, speech rate and other factors. There can be as many as five or six exchanges back and forth with air traffic control. Then users are graded on those responses.

The work aligns with Purdue's **Giant Leaps** celebration, celebrating the university's global advancements in space exploration as part of Purdue's 150th anniversary. This is one of the four themes of the yearlong celebration's **Ideas Festival**, designed to showcase Purdue as an intellectual center solving real-world issues.

The creators of PlaneEnglish are working with the Purdue Research Foundation as they develop their technology.

For more information about funding and investment opportunities in startups based on a Purdue innovation, contact the Purdue Foundry at foundry@prf.org.

<https://planeenglish.net/>

<https://takegiantleaps.com/>

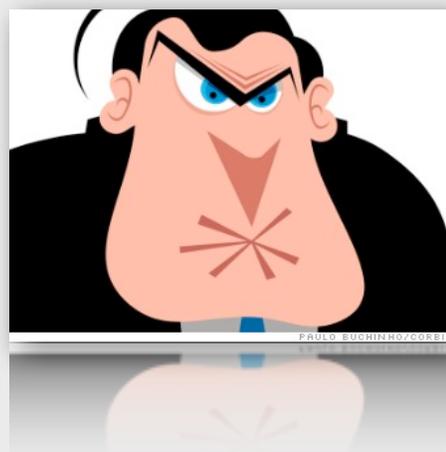
Writer: Chris Adam, 765-588-3341, cladam@prf.org

Source: Muharrem Mane, muharrem@planeenglish.net

Mechanics install aileron control cables backwards

The commercial pilot reported that the accident flight was the first flight following maintenance, **which included** the installation of right-seat rudder pedals with brake controls.

He added that, during a preflight inspection of the Piper PA-28R-180, he actuated the ailerons, **however he did not verify which direction the control yoke moved.**



He again checked the flight control movement before takeoff, **but did not verify** which direction the aileron moved when he moved the control yoke.

During the takeoff sequence, as the airplane became airborne, it immediately entered an uncommanded left roll. He attempted to correct for the roll, however he was unable to do so. He reduced the engine power.

The airplane then hit the ground near San Jose, California, and came to rest upright on an adjacent runway.

Post-accident examination of the airplane revealed that, when the control yoke was rotated for input of right aileron, the right aileron moved down, and the left aileron moved up, [which is opposite of what would be expected](#).

Examination of the aileron cables revealed that they remained attached to the “T” bar aileron control chains. However, the right aileron control cable was attached to the left aileron control chain, and the left aileron control cable was attached to the right aileron control chain, [meaning the cables were connected backward](#).

The cables were oriented such that they crossed underneath the flap handle and center console area.

The two mechanics who performed the maintenance on the airplane reported that they had disconnected the aileron control cables to facilitate the installation of the rudder pedals and brake controls. After completing the maintenance, they checked the flight control cable tension and aileron movement, [however they did not observe which direction the control yoke moved when the aileron was moved](#).

It is likely that the mechanics attached the aileron control cables backward during the reassembly of the aileron control system, which resulted in roll control that was opposite of that commanded by the pilot.

Probable cause: Maintenance personnel’s incorrect installation of the aileron control cables and subsequent failure to verify proper aileron functionality following the maintenance, which resulted in roll control that was opposite of that commanded by the pilot, and the pilot’s inadequate preflight inspection, during which he did not verify that the aileron movement matched the control yoke input.

NTSB Identification: [WPR17LA164](#)

This July 2017 accident report is provided by the [National Transportation Safety Board](#). Published as an educational tool, it is intended to help pilots learn from the misfortunes of others.

The Importance of a Proper Turnover

We have all heard it before: Make sure you get a proper turnover before taking the watch or assuming your shift. Why else would someone show up a half hour before a shift? A better question is: [Do most of us give a proper turnover?](#) I would like to think so, but I found out how important it really is.



It was the perfect winter day in the North Arabian Gulf as we neared the end of a six month deployment. At the end of the fly day, one of our jets came back with a downing discrepancy. After troubleshooting, we determined that the No. 2, top-deck relay box was the source of the problem. Maintenance control gave us the OK to remove and replace the part, and a new one was ordered.

It wasn't long before the part was received, [and the night shift began their workday](#) with the usual turnover, or so it seemed at the time. They removed and replaced the relay box. After doing an operational check of the system, they discovered that the downing discrepancy wasn't fixed. Night-check then began to troubleshoot the system to find the problem. [After a closer look at the schematics](#), we discovered that we had changed the wrong top-deck relay box. We had changed the No. 1 relay box instead of No. 2.

It's common for EA-6B electricians to change the No. 1 relay box but not the No. 2 box. When the electricians saw the gripe and ordered a replacement, they [incorrectly assumed](#) it was the No. 1 component. Our shop had become [complacent](#), and that lax attitude was the key factor in the error. The task was just another routine maintenance discrepancy; however, it didn't turn out to be routine this time. The cost was half a day of missed flights.

How did night-check replace the wrong component? The answer goes beyond complacency; [we did not put a detailed turnover in the logbook](#). We use various logbooks throughout the Navy and Marine Corps to record important information. Turnover logs are no different. The AEs [did a verbal turnover](#), but we didn't have a written record. The words and message were lost.

What are the learning points here? Approaching the end of deployment, maintainers need to [sharpen their focus](#) on seemingly routine tasks so that mistakes are avoided. Use the turnover log and record all the information that is crucial to maintenance and safety, including those items that will help avoid wasted maintenance man-hours and missed sorties. Too many times when a simple log entry is missed, extra work is done that didn't need to occur. [Help your shipmates](#) and provide a complete turnover.

[Amazon requests FAA approval of delivery-drone plans](#)

Amazon has grand plans to deliver packages to its customers via autonomous drones but first it needs to get clearance.

The company has requested that federal regulators [excuse it from following some current rules of flight](#), according to the Federal Aviation Administration.

The agency on Thursday published in the Federal Register a petition from Amazon (AMZN) that would allow the company to operate "a delivery system that will get packages to customers in 30 minutes or less using UAS" - an acronym for unmanned aerial systems, better known as drones.



Amazon is requesting permission to use its custom MK27 drone for deliveries before the FAA grants the aircraft a certificate of airworthiness, and an exemption from drone-specific rules, including a requirement that they only be operated when an operator can see it.

The company also requested to be excused from complying with aviation regulations more commonly associated with planes, such as requirements that pilots fly above certain heights, carry extra fuel, and fly with documentation including maintenance logs aboard the aircraft.

The petition says delivery drones will fly autonomously, or without human input, but that there will be one operator for each drone in the sky at any time. Amazon would [like to eventually have a lower operator to drone ratio](#) "subject to FAA approval based on flights and simulations that demonstrate required levels of safety."

The 29-page petition also outlines how the drone delivery program would operate. At least initially, the company plans to only conduct flights during the day in "areas with low population density" when there are no "icing conditions" and the wind is less than 24 knots.

Flights will be planned to avoid "all known overflight areas such as sensitive government installations, hospitals, open air assemblies," which includes fields where sporting events are taking place. Deliveries will be less than 15 nautical miles round trip and packages must weigh 5 pounds or less - parameters the company has previously outlined.

Amazon said in June drone deliveries would begin "in months," although it did not specify if that timeline applied to the US.

The FAA will take public comments on the petition until August 28.

Testing Testing 1..2..3.. Recreational Drone Flyer Test Coming Soon! Can your business help?



Are you part of the drone or tech industry? The Federal Aviation Administration (FAA) wants your help to administer a recreational flyer knowledge and safety test to the widest audience possible! We have posted a request for information (RFI) where you can submit your suggestions. While the FAA develops the training and test content, we're seeking your help to ensure it is administered in an effective way. We are looking for input from both private and public sectors on how to make the test easily accessible to drone users.

We love that the drone community is growing so quickly, and because drones can be flown straight out-of-the box, we need to make sure that drone pilots only take flight once they know the FAA's aviation rules and safety practices. Congress requires that recreational flyers pass a test and we now have an opportunity to educate recreational flyers on drone safety and to bring new flyers into our extraordinary aviation safety culture.

This knowledge test is important to educate recreational flyers about the rules of the sky as we continue to safely integrate drones into our nation's airspace. We look forward to getting your feedback by September 12, 2019.

<http://links.govdelivery.com/track?type=click&enid=ZWFzPTEmbXNpZD0mYXVpZD0mbWFpbGluZ2lkPTlwMTkwODE1LjlxNTEzMTEmbWVzc2FnZWlkPU1EQi1QUkQtQIVMLTIwMTkwODE1LjlxNTEzMTEmZGF0YWFhc2VpZD0xMDAxJnNlcmlhbD0xNzQzODY2MSZlbWFpbGikPXJodWdoZXNAaHVtYW5mYWN0b3JzZWR1LmNvbSZ1c2VyaWQ9cmh1Z2hlc0BodW1hbmZhY3RvcnNIZHUuY29tJnRhcmldGikPSZmbD0mbXZpZD0mZXh0cmE9JiYm&&103&&https://faaco.faa.gov/index.cfm/announcement/view/34272>

<http://links.govdelivery.com/track?type=click&enid=ZWFzPTEmbXNpZD0mYXVpZD0mbWFpbGluZ2lkPTlwMTkwODE1LjlxNTEzMTEmbWVzc2FnZWlkaU1EQi1QUkQtQIVMLTlwMTkwODE1LjlxNTEzMTEmZGF0YWJhc2VpZD0xMDAxJnNlcmIhbD0xNzQzODY2MSZlbWFpbGikPXJodWdoZXNAaHVtYW5mYWN0b3JzZWR1LmNvbSZ1c2VyaWQ9cmh1Z2hic0BodW1hbmZhY3RvcnNlZHUuY29tJnRhcmdldGikPSZmbD0mbXZpZD0mZXh0cmE9JiYm&&104&&https://www.faa.gov/uas/>

Tammie Jo Shults, Captain of Southwest Flight #1380, Announces Book at EAA Airventure Show - Nerves of Steel Releasing in October 2019

Nerves of Steel is the true story of Shults' remarkable life, from growing up the daughter of a humble rancher, to being one of the [Navy's first female F/A-18 Hornet pilots](#), to safely landing the severely crippled Southwest Airlines Flight 1380. *Nerves of Steel: How I Followed My Dreams, Earned My Wings, And Faced My Greatest Challenge* (ISBN# 9780785228318) is a personal chronicle from Captain Tammie Jo Shults being released on October 8, 2019, by W Publishing Group, an imprint of Thomas Nelson.

Nerves of Steel is the captivating true story of Tammie Jo's remarkable life – from growing up the daughter of a humble rancher, to breaking through gender barriers as one of the Navy's first female F/A-18 Hornet pilots, to safely landing the severely crippled Southwest Airlines Flight 1380 and helping save the lives of 148 people.

["Adventure is worthwhile,"](#) is one of Tammie Jo's favorite quotes by Amelia Earhart, an American aviation pioneer and whose birthday is July 24. Tammie Jo has spent her entire life loving the skies. She became one of the few female fighter pilots in the U.S. Navy and in 1994, after serving her country honorably for eight years, Tammie Jo joined Southwest Airlines.



On April 17, 2018, Captain Tammie Jo [was called to service once again](#). Twenty minutes into a routine domestic flight, she was faced with the unthinkable – a catastrophic engine failure in the Boeing 737 caused an explosion that punctured hydraulic lines and severed fuel lines, tearing away a section of the plane, puncturing a window, and taking a woman's life. Drawing deeply from her well of experience, Captain Shults was able to wrestle the severely damaged 737 safely to the ground. Not originally scheduled for that flight, Tammie Jo believes [that there is no doubt](#) God had prepared her and placed her right where she needed to be that day.

This book will take the reader back to Tammie Jo's early days watching Air Force pilots hone their skills in the skies overhead in New Mexico and dreaming that one day she, too, would be flying. She had to overcome obstacles and barriers to pursue those goals. [Her story will inspire and captivate the reader](#) and show us all that perseverance prevails.

"We knew Tammie Jo had an amazing story, but it's been wonderful to go deeper into her journey as a woman so committed to her family and her faith—and to learn more about the experiences that have made her who she is today," said Daisy Blackwell Hutton, Vice President of Thomas Nelson and Publisher of W Publishing Group. "Readers will be enthralled and inspired by her story."

Additionally, a book adapted for young readers will instill bravery and dedication in boys and girls alike. [Nerves of Steel \(Young Readers Edition\): The Incredible True Story of How One Woman Followed Her Dreams, Stayed True to Herself, and Saved 148 Lives](#) (ISBN# 9781400215317), will release November 12, 2019, and show the next generation of pilots what it means to work hard, find purpose, and prepare for the adventure ahead.

Thomas Nelson, a division of HarperCollins, is a world-leading provider of inspirational content and has been providing readers with quality life-changing product for more than 200 years. The publishing group provides multiple formats of award-winning Bibles, books, gift books, cookbooks, curriculum and digital content, with distribution of its products in more than 100 countries. Thomas Nelson is headquartered in Nashville, TN.

Robotics in the Workplace Initially Increase Safety but Pose New Hazards

*The introduction of robots in the workplace has brought safety in certain situations, but **potential hazards** have also started to emerge. The documentation of these hazards will hopefully aid workers in avoiding future injuries.*



As robots begin to become more commonly used in workplace settings, potential hazards also are beginning to emerge. While the use of robots increases safety in certain areas of the workplace by allowing workers to steer clear of potentially hazardous situations, **without the proper guidelines** in place to ensure robotics safety, these injuries could resurface from the robots.

For instance, in 2015, a worker at a water bottling company was killed after attempting to remove a piece of plastic from the forks of a driverless forklift, known as a laser guided vehicle. The manufacturer's manual required workers to initiate an emergency stop before removing an obstacle detected by the LGV, but the **worker did not do this**, which resulted in the LGV resuming its task as soon as the piece of the plastic was removed.

To prevent injuries and potential fatalities such as this one, the Washington State FACE Program **issued the following recommendations for employers.**

- Incorporate manufacturer safety requirements into written company safety procedures for automated guided industrial vehicles.

- Train workers about the specific hazards and safety requirements associated with automated guided industrial vehicles, such as LGVs.
- Emphasize that workers are expected to follow required safety procedures every time, and ensure compliance through periodic refresher training and spot checks.

In two different cases, workers were injured while using demolition robots. In the first case, an operator was crushed between the robot and a wall after bumping the remote control against the machine. In the second case, a robot machine crushed a worker's foot while attempting to apply more pressure on the tip of the breaker, which was being used to chip concrete. The machine shifted forward and the outrigger came down on his foot.

Following these injuries, the Washington State FACE Program issued the following [recommendations for preventing injuries](#) while working with demolition robots.

- Prepare a job hazard analysis with operators for each new job to identify and control hazards. Use the manufacturer's safety instructions to establish the risk zone for the specific machine, attachment, and task.
- Always stay outside the risk zone when the machine is in operation, and do not enter until the machine is put into emergency stop mode or de-energized.
- Consider using a proximity warning system, such as those based on radio frequency identification (RFID), to maintain a safe worker-to-machine distance.
- Train operators to manage power cables and to continually monitor the process for hazards and redefine the risk zone.

- Ensure operators always read and follow manufacturer’s provided safety instructions.
- Consider using a spotter to assist the operator.
- The National Institute for Occupational Safety and Health said since the use of robots in the workplace is so new, it’s difficult to know what regulations need to be made in order to ensure safety. Therefore, the documentation of these accidents is vital to the continuation of robotics safety efforts.

“Currently, there is a lack of standard classification codes for robot-related injuries, which makes it hard to identify the frequency of incidents,” NIOSH said.

“Additionally, worker injury data systems do not include detailed information on how a robot-related fatality or injury incident occurred.”

To begin to solve this, NIOSH established the Center for Occupational Robotic Research to increase worker safety while using robots.

“The center is building a research portfolio that includes efforts to document risk to workers through surveillance and fatality investigations,” NIOSH said.

<https://blogs.cdc.gov/niosh-science-blog/2019/07/31/robot-safety-face/?deliveryName=DM6213>