Aviation Human Factors Industry News

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

As the Wrench Turns: Trapped Inside the Cargo Hold by John Goglia

First a jetBlue baggage handler makes an unscheduled two hundred mile flight from New York to Boston stuck in the cargo hold of an EMJ-190 jet. Then a USAirways handler is almost taken for an unexpected ride out of DCA in, yes, another Embraer-190. Poor guy would have landed in Hartford, if passengers had not heard his disconcerted screams and banging from below.

These news reports brought me back to my days on the ramp. Hey, it's not just baggage handlers who have to watch out for the closing cargo door. Mechanics can and have gotten caught in there. Fortunately, it wasn't me. But I was there when one got out and I can tell you the guy who locked him in was sure smart to make tracks out of there fast. But back to the beginning. It was a mild summer day. Busy but not crazy. We were just closing up the DC-9 after repairing a chronic engine indicator wiring problem. Part of the trouble-shooting required gaining access to some electrical connections in the rear cargo compartment, a known problem area. In this case, the problem was actually the connector behind the instrument panel but that doesn't mean the whole aircraft wasn't opened up before we finally tracked it down.

As you all know, chasing these intermittent electrical problems can take forever. And can require removing a lot of panels to gain access to a lot of different areas. Here, the aircraft sat overnight and now we were into the next day. For some reason, I told maintenance control that we had found and fixed the problem. Somehow that was interpreted as the aircraft was ready. So now it was go go go to get it done.

And go go going can lead to problems. Once word got out that the plane was fixed, the flight crew came out and started their preparations for flight. As soon as they finished, it was "what's the hold up?" Well, the hold up was that the aircraft was fixed but not buttoned up. So we rushed to button up. And in our rush, the mechanic screwing in an overhead panel in the cargo compartment was forgotten.

He got screwed alright. A ground guy slammed the door shut and with the APU running, no one could hear his screaming and banging. I don't remember exactly where the aircraft was headed. Pittsburgh. Or Indianapolis. But wherever it was going, this mechanic knew he didn't want to be there. While he was yelling and banging, he heard the engine starting. The adrenaline definitely kicked in then. Fortunately, some quick thinking, too. Since the panel wasn't fully installed yet, he reached in and grabbed some cables, which resulted in some strange gyrations in the cockpit. And the crew's attention. They reported the cables moving with no input. The word was passed down to maintenance where the light bulb went on. Moral of the Story: Never close a cargo door without checking the inside for human beings, be they baggage handlers, mechanics or even the occasional stow away.

Reported air-traffic errors rise 81% over 2007

More than 1,800 errors by air-traffic controllers - including 43 most likely to cause a midair collision between planes - were reported to the Federal Aviation Administration last year. The agency says that points up the need for greater safety steps.

Air-traffic errors that allowed planes to get too close together jumped 81% from 2007 to 2010, according to newly released data by the FAA, rising from 1,040 to 1,887. Those most likely to cause a collision or an accident were also up from 34 in 2007 to 43 last year, a 26% increase.

Inside the FAA NextGen Integration and Evaluation Capability air traffic control suite. Image: FAA

The higher number of reported errors involving airliners, private planes and military aircraft don't pose a sudden increase in the risk to fliers, the FAA says. Instead, the agency insists the numbers are the result of several years of effort to improve reporting.

For years the FAA has been dogged by reports that errors were sometimes covered up. Three years ago, for example, an FAA investigation prompted by whistle-blowers found that reports were routinely falsified at a Dallas facility. In response, the agency created a new no-fault system to report errors, developed computers that can routinely spot errors and changed the way it

judges air-traffic managers' job performance. The FAA says the growing number of errors reported are a sign it's taking safety more seriously.

Read Any Good Logbooks Lately?

As any pilot, aircraft owner, or maintenance professional knows, an aircraft requires a thorough and seemingly complex system of record-keeping to ensure it can be operated safely. In addition to having the shared responsibility of ensuring an aircraft complies with all relevant regulations to maintain its, there is also a need to keep an accurate log of equipment changes — everything from a new transponder to a new seat belt system.

Logbooks are the preferred method to enter and track these changes. With so many variations, it can be a daunting task to know which logbook to use when you are making or verifying an entry. And, even when you use the correct one, deciphering information from a logbook can be frustrating. With a little guidance on where and what to look for, you will have a clearer path to ensuring your aircraft has what it needs to fly legally and safely.

Read more in the March/April FAA Safety Briefing at www.faa.gov/news/safety_briefing/2011/media/MarApr2011.pdf

Situational Awareness in Maintenance

Distractions, unexpected events, and schedule pressure are all factors that reduce situational awareness. Unfortunately, these factors are commonplace in Maintenance. An Inspector and Mechanic both reported on the chain of events that contributed to a main gear tire hub cap departing a B737-700 aircraft.

Inspector's Report: I was the Inspector for the right wing and right main gear. A Mechanic changed the #3 main tire, but left the hub cap loose. There were many factors contributing to this including: moving the aircraft in the middle of the job, the Mechanic working the tire was called for a drug test during the job, and a general hurried atmosphere. The Mechanic signed off the job card and so did I. I did a walkaround after the tire change, but did not find that the hub cap was loose. The aircraft made it two flights before the #3 hub cap came off.

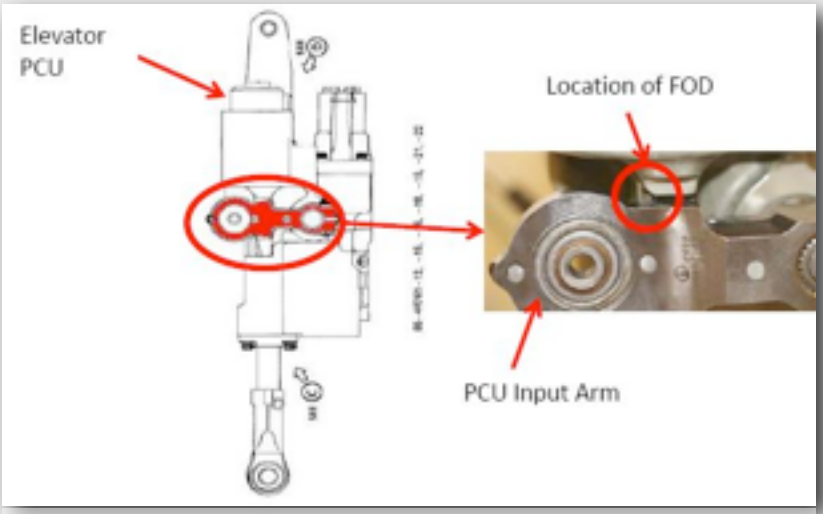
Mechanic's Report: I changed three main gear tires, #1, #3, and #4 on a B737-700 aircraft. We started with #4, was finishing up on #4, I started #3. After putting on the tire I put the hub cap on with the three bolts, but I didn't have any tools, so I got up to get some. I decided to move the tire over by the table that the other tire was leaning on. When I did, the table moved and both tires fell over. So I got someone to help me pick them up. After moving them to a better location it was time to swap the aircraft with a hangar line overnight aircraft. After swapping the aircraft, the Hangar Supervisor came and got me for a random drug screening. When I got back, the tire was done. I do not recall ever going back to tighten or safety the hub cap. The next day they found a hub cap on or near the runway. They determined it was off an aircraft. At that time they started looking for the aircraft that had lost it. They found the aircraft that was missing the #3 hub cap.

When inevitable work interruptions occur, a Mechanic usually has the option of noting on the job card or write-up that the job is unfinished ("hub cap in place, not tightened"), or tagging the part to increase situational awareness.

Jammed Elevators the Result of a 'Grandfathered' Design

Straining hard to keep the control yoke forward, the captain and first officer were able to overcome the jammed elevators on their Tailwind Airlines B737-400 after an uncommanded pitch-up to 40º. The airplane was just 20 feet off the ground, approaching to land at Turkey's Diyarbir airport.

The flight crew performed a go-around and managed to land the airplane with no injuries to the 159 passengers and flight attendants. The two pilots had to push constantly on the control yoke, as the elevators were jammed by a piece of metal about 0.2 x 0.14 inches in one of the elevators' two power control units (PCUs, one on each side).



The U.S. National Transportation Safety Board (NTSB) assisted Turkish authorities in investigating this incident involving Turkish-registered Tailwind Airlines. On 10 February 2011 the NTSB issued to the Federal Aviation Administration (FAA) its recommendations, which certainly suggest that the venerable B737-400 is lacking in safety features found on many other model airliners.

The B737-200 through -500 series does not feature a manual override should the elevator become jammed, despite the fact that either a rate jam or a position jam should be considered a catastrophic hazard.

The NTSB examined service difficulty reports (SDR) and found four accounts of B737-300 through -500 elevator jams. As the NTSB said:

"Although none of these events resulted in an accident, they highlight the fact that binding or jams of the elevator system do occur in flight, can result from numerous causes (including improper maintenance performed on the airplane), and can present the flight crew with controllability hazards."

The NTSB found that many airplanes feature a manual override so pilots will maintain control when a system malfunction occurs. To cite just some of the airliner models with override mechanisms in the elevator system: Boeing B717, B747, B757, B767 and B777 airplanes; Embraer 120, 145, 170 and 190 models; Bombardier CRJ-200, CL-600, DHC-8 and Q400 airplanes; and ATR-42 and -72 airplanes. Moreover, the "next generation" B737-600 through -900 series incorporates several override mechanisms.

But the “classic” B737-300 through -500 were not retrofitted with override mechanisms, and when one PCU is jammed by pieces of metal or other foreign object debris (FOD), the other PCU is unable to exert sufficient force to overcome the condition.

Before being added to Tailwind’s fleet, the aircraft went through scheduled maintenance major maintenance. While undergoing the “C” check, the left side elevator failed the free play check. A number of parts were replaced; the free play check was passed. But, obviously, all debris was not cleaned up, and six months later, on approach to land at Diyarbir, the left elevator jammed.

The airplane did not incorporate a manual override feature. The B737-300 through -500 series was a derivative of the B737-100/200 model. This airplane was certificated by the FAA in 1967. At the time, the regulations did not require consideration of a single point failure (such as a single PCU jam) as long as the failure mode was considered extremely remote (e.g., probability of occurrence one in a billion flight hours). The B737-300/500 was certificated as a derivative of the B737-100/200. As such, it was grandfathered to the original certification standard. As shown by the recent SDRs, the airplane’s elevator control system falls well short of the one in a billion standard.

Federal Aviation Regulations (FARs) modified since 1967 require an elevator jam to be handled by the crew “without requiring exceptional piloting skill or strength.” This requirement is the genesis of the manual override feature on airplanes certificated since.

The whole process of grandfathering derivative designs to an earlier, less demanding, certification requirement bears review and change. Here’s an airplane with potentially a “catastrophic hazard” in daily revenue service with unsuspecting pilots.

There is another wrinkle. The PCUs for actuating the wing ailerons are of the same design – with a key difference. The aileron PCUs are located in the main landing gear wheel well. When the landing gear is extended, the aileron PCUs are vulnerable to damage from environmental debris or tire failure. Accordingly, protective soft covers were installed over both aileron PCUs.

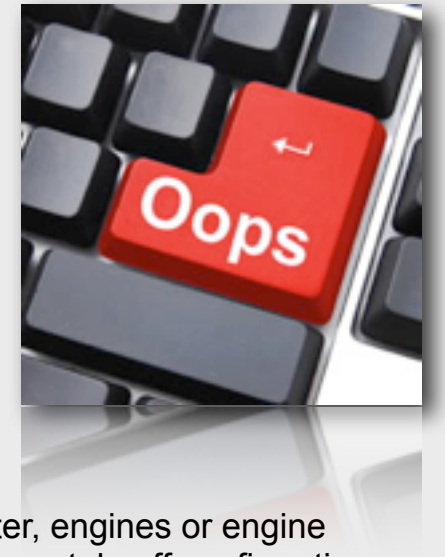
These protective covers would also protect the elevator PCUs from FOD.

The NTSB recommended the installation of these protective covers to the aileron PCUs of B737-300 through -500 models, and a manual override such as that found on other models certificated since.

One could argue that the NTSB recommendations, although good, don't go far enough. The whole process of the FAA approving designs, and not eliminating grandfathering to earlier models of the same airplane, needs to be changed. And if protective covers are used on one application, why aren't they employed on all aircraft, for all types of actuators? For example, on U.S. Air Force C-141 and C-5 cargo jets, the jackscrew for the horizontal stabilizer is protected by a bellows-type device that blocks FOD.

Engine Switches Mispositioned

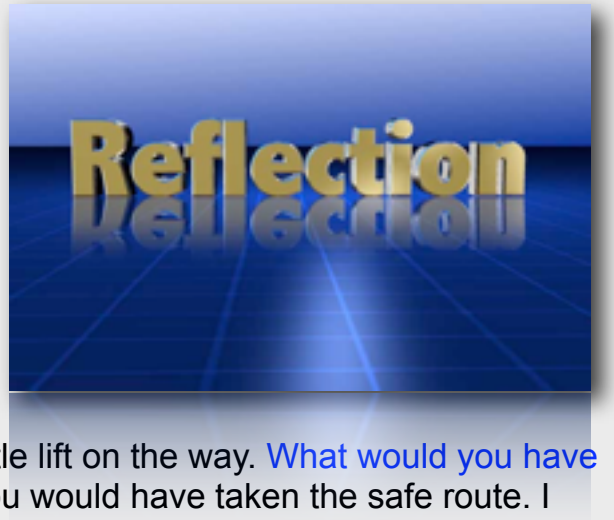
The emergency medical services helicopter was departing from Pottsville, Pennsylvania, U.S., to respond to a motor vehicle accident the night of May 30, 2008, when the pilot realized that something was wrong. "The helicopter would neither climb nor accelerate normally," said an NTSB report issued in October 2010. The helicopter descended over down sloping terrain, struck the top of a truck about 100 ft from the helipad, settled to the ground and rolled onto its left side. The pilot, flight nurse and flight paramedic sustained minor injuries.



"No pre-impact mechanical anomalies of the helicopter, engines or engine switches were found,: the report said. "As part of the pre-takeoff confirmation check, the pilot was required to ensure that both main engine switches were in the "FLIGHT" position; however, onboard recorded data revealed that the no. 2 main engine switch was in the "IDLE" position during takeoff."

Reflections After an Accident

I heard about a pilot who died in a glider accident last spring. He was an amazing pilot and a really good guy. He used to fly jets in the CAF [Canadian Armed Forces] and then flew 747s for JAL [Japan Airlines]. He was an instructor out at the glider club, and people looked up to him because of his competence, confidence, and the excellent decision making that he displayed.



So what happened? A series of decisions, combined with poor conditions, led to him being just a little too low to return to the field. But it was really close. He could have landed in a small field a few miles away from the airport, but that would have resulted in damage to his brand-new glider, and it would have taken hours to retrieve his glider out of that field. Instead, he headed for a downwind straight-in landing at the airport, hoping for just a little lift on the way. What would you have done?I know what you just answered. You would have taken the safe route. I would answer the same way. But research has shown that when we are actually in these predicaments, we often don't take the safe and sure route. Instead, we often gamble.

Let me give you a less dramatic scenario, and I want to encourage you to be honest with yourself about how you would respond. You are driving down an unfamiliar road. You passed a small town about 20 minutes ago, but since then, you have not seen any sign of civilization. You have no idea about what is coming up next or how far it is to the next town. Suddenly, the little fuel light comes on. You have about 30 minutes of highway driving until your car runs out of gas. What will you do? To be safe and sure, you would need to turn back, but how powerful is the motivation to press on. There should be another station up ahead!

As humans, we hate to lose. So it is very difficult for us to make a decision that we know will result in a loss.

- We hate to turn back for gas when it means losing an hour of our time.
- We hate to cancel a flight when it means losing face or losing a customer.
- We hate to commit to a precautionary landing when we know it will mean damage, not to mention a huge hassle to get the aircraft out of a farmer's field. So to avoid the known loss, we are often tempted to take a risk.
- There should be a gas station just ahead.
- The weather for the trip isn't that bad, and we could always turn back if things turn out badly.

- I can probably make it back to the airport.

What we fail to do is look at the probability and severity of a bad outcome to the risk that we are taking.

One of the most studied decisions in recent history was the decision to launch the space shuttle Challenger on a cold January morning. That decision was exactly like the ones above. Canceling the launch would have meant a huge loss to the shuttle program and a loss of face for the NASA [National Aeronautics and Space Administration] directors. When they asked the engineers about the risks of launching, no one could give them a clear, unequivocal answer. So they chose to avoid the known loss by taking a risk.

Of course, in hindsight, we now know that the Challenger launch decision was a bad one. And I now know that this dead glider pilot made a bad decision on his flight last spring. But tomorrow, you or I might be faced with another similar decision. So how do we avoid making that bad decision?

First, we need to recognize this tendency and catch ourselves when we are in these situations. That isn't easy. We make these kinds of decisions instinctively, and it takes work to recognize them. But we make these kinds of decisions in small ways all of the time, so start recognizing the little things you do, as practice. Next time you are exceeding the speed limit while driving, ask yourself why. The answer will probably be that you are trying to avoid being late for something by taking the risk of a speeding ticket. Next time you are doing home maintenance and are using a tool improperly or using a ladder that is too short, ask yourself why. The answer will probably be that you are trying to avoid the hassle of purchasing the right tool by taking the risk of personal injury.

Once you start recognizing your pattern for making these decisions, you need to give some deliberate thought to the risks. What are we afraid of losing?

- An hour's driving time
- A revenue flight
- An insurance deductible and a great deal of time

What risk are we considering taking to avoid this loss?

- Reasonable probability of running out of gas in the middle of nowhere

- Reasonable probability of flight into IMC [instrument meteorological conditions], leading to a possible fatal accident

- High probability of a forced landing in an unsuitable area with unknown survivability

Once we consciously consider the alternatives, we often see things in a different light. Normally, our focus is on avoiding the known loss and not on the risks we are taking. When we start looking realistically at the risks, we can improve our decision making. Start practicing today to avoid making a really bad decision the next time you fly.