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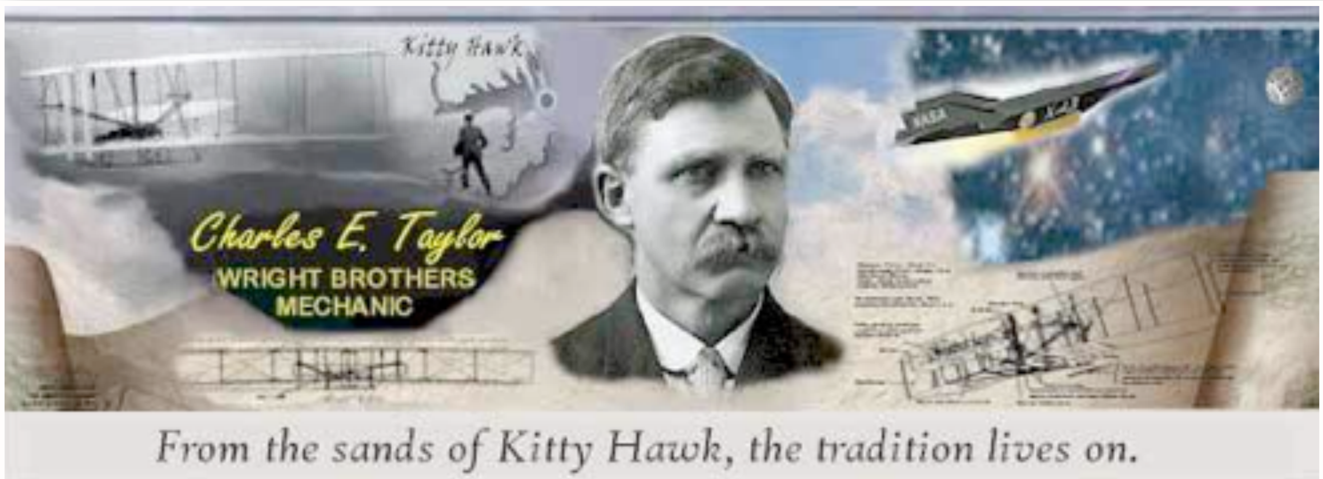

Hello all,

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

★Investigators Say Cracks That Caused SWA Engine Failure Developed Over Years

★Aircraft Accident Report AAR 2/2018 - C-FWGH, 21July 2017

★Lawsuit: Drill bit left during repair caused Cessna crash

★Flight Safety Foundation Publishes 'Controlled Rest' Best Practices Guide

★Incident: Frontier A320 at Las Vegas on Nov 30th 2018, engine doors separated

★Timeline of occurrences and regulatory actions on Airbus A320-family engine fan cowl door loss incidents

★JAL Sets 24-Hour Booze Ban For Pilots

★And Much More

Investigators Say Cracks That Caused SWA Engine Failure Developed Over Years

Testimony Given During NTSB Hearing On The Incident

The cracks that developed in engine fan blades that led to an uncontained failure on a Southwest Airlines 737 may have gone undetected during a 2012 engine overhaul and inspection, according to testimony given during an NTSB hearing held November 13th.

The *Philadelphia Inquirer* reports that Mark Habedank, a lead engineer at engine maker CFM International, testified at the hearing that by examining the wear patterns from the fan blades on the engine from Flight 1380, the initial cracks were present during the 2012 inspection, but because the blades were inspected visually using fluorescent dyes to highlight flaws, they were missed by the inspectors. At that time, inspectors were not required to use ultrasound or other advance technology to detect such issues.

Habedank said that engineers were able to trace the history of the crack by looking at "striations" in the metal, much like determining the age of a tree by counting the rings. If we look at the striation count and go backward, it appears that during that inspection, the size of the defect was about 1/16 of an inch," he said.

CFM had determined that the fan blade roots were subjected to excessive friction in flight before the April 17 engine failure. They had recommended that the blades be removed and lubricated every 3,000 flights. That interval has since been reduced to every 1,600 flights. Crack detection must also now be conducted using ultrasound or eddy-current devices.

Habedank testified that eight more blades have been removed from service since the more stringent requirements have been put in place.

The CFM-56 series engines of the type that failed are in use by more than 300 airlines worldwide.

FMI: Source report

Aircraft Accident Report AAR 2/2018 - C-FWGH, 21July 2017

Boeing 737, C-FWGH, took off with insufficient thrust for the environmental conditions and struck an obstacle after lift-off.

Introduction

The Air Accidents Investigation Branch (AAIB) became aware of this serious incident during the morning of 24 July 2017. In exercise of his powers, the Chief Inspector of Air Accidents ordered an investigation to be carried out in accordance with the provisions of Regulation EU 996/2010 and the UK Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996 and, subsequently, 2018.

The sole objective of the investigation of an accident or incident under these Regulations is the prevention of accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or liability.

In accordance with established international arrangements, both the National Transportation Safety Board (NTSB) of the USA, representing the State of Design and Manufacture of the aircraft, and the Transportation Safety Board (TSB) of Canada, representing the State of Registration and the Operator, appointed Accredited Representatives to the investigation. The aircraft operator, the aircraft manufacturer, the European Aviation Safety Agency (EASA), and the UK Civil Aviation Authority (CAA) also assisted the AAIB.

Summary

At 1539 hrs on 21 July 2017, a Boeing 737-800 took off from Belfast International Airport (BFS) with insufficient power to meet regulated performance requirements. The aircraft struck a supplementary runway approach light, which was 36 cm tall and 29 m beyond the end of the takeoff runway.

An outside air temperature (OAT) of -52°C had been entered into the Flight Management Computer (FMC) instead of the actual OAT of 16°C. This, together with the correctly calculated assumed temperature thrust reduction of 48°C , meant the aircraft engines were delivering only 60% of their maximum rated thrust. The low acceleration of the aircraft was not recognized by the crew until the aircraft was rapidly approaching the end of the runway. The aircraft rotated at the extreme end of the runway and climbed away at a very low rate. The crew did not apply full thrust until the aircraft was approximately 4 km from the end of the runway, at around 800 ft aal.

There was no damage to the aircraft, which continued its flight to Corfu, Greece without further incident. However, it was only the benign nature of the runway clearway and terrain elevation beyond, and the lack of obstacles in the climb-out path which allowed the aircraft to climb away without further collision after it struck the runway light. Had an engine failed at a critical moment during the takeoff, the consequences could have been catastrophic.

The investigation found the following causal factors for this serious incident:

1. An incorrect OAT was entered into the FMC, which caused the FMC to calculate an N1 setting for takeoff which was significantly below that required for the aircraft weight and environmental conditions.

2. The incorrect OAT was not identified subsequently by the operating crew.

3. The abnormal acceleration during the takeoff run was not identified until the aircraft was rapidly approaching the end of the runway, and no action was taken to either reject the takeoff or increase engine thrust.

The investigation found the following contributory factors for this serious incident:

1. The aircraft's FMC did not have the capability to alert the flight crew to the fact that they had entered the incorrect OAT into the FMC, although this capability existed in a later FMC software standard available at the time.
2. The Electronic Flight Bags (EFB) did not display N1 on their performance application (some applications do), which meant that the crew could not verify the FMC-calculated N1 against an independently-calculated value.
3. The crew were unlikely to detect the abnormally low acceleration because of normal limitations in human performance.

The investigation identified other examples of accidents or serious incidents where there was a gross failure of an aircraft to achieve its expected takeoff performance, and found that technical solutions to address this serious safety issue are now feasible.

Download report:
High resolution version: Aircraft Accident Report: 2/2018, C-FWGH High resolution

Low resolution version: Aircraft Accident Report: 2/2018, C-FWGH Low resolution

Special Bulletin:
AAIB Special Bulletin S2/2017, published on 20 September 2017, provided initial information on the circumstances of this serious incident, clarification about the reporting of accidents and serious incidents, and made two safety recommendations related to FMC software updates. In this report, the AAIB makes four safety recommendations: one supersedes a recommendation made in Special Bulletin S2/2017; one concerns procedures to verify engine takeoff power settings; and two concern the development of Takeoff Acceleration Monitoring Systems.

Lawsuit: Drill bit left during repair caused Cessna crash

A drill bit left during repair of a single-engine Cessna aircraft is responsible for a 2015 crash in Arkansas that caused minor injuries to the pilot and destroyed the new $712,290 aircraft, a federal lawsuit alleged.

The complaint filed Friday in U.S. District Court in Kansas against Textron Aviation in U.S. by Mid-Continent Aircraft Corp. of Missouri and its insurance company involves the purchase of a 2014 Cessna T206H Stationair TC aircraft.

The lawsuit alleges the misplaced drill bit was the cause of the crash and that Cessna's parent company Textron refuses to pay for the loss of the aircraft.

Textron declined to comment on the pending litigation.

During a pre-acceptance test flight, a problem was found in the left magneto, a self-contained electrical generator which fires the engine spark plugs.

Wichita, Kansas-based Cessna Aircraft Company replaced the faulty magneto and noted in the plane's maintenance logbook that aircraft was airworthy, according to the lawsuit.

Mid-Continent took delivery of aircraft N164CS on April 3, 2015. The following month, the plane crashed during takeoff from Piggott Municipal Airport in Arkansas.

The National Transportation Safety Board's report of the May 15, 2015, accident said the airplane was about 20 to 30 feet in the air when the engine "surged" before losing power. The airplane settled back down to the ground, but was traveling too fast to stop on the remaining runway. It came to rest in an irrigation ditch near the runway. The pilot's air bag deployed during the accident.

When investigators took apart the failed magneto, they found a section of a drill bit about 3/8 of an inch long inside it, according to the NTSB report.

Mid-Continent said in its lawsuit that its insurer, National Union Fire Insurance Company, paid $699,000 for the insured loss. Mid-Continent has another $13,290 in uninsured losses.

Flight Safety Foundation Publishes 'Controlled Rest' Best Practices Guide

The 25-page document encourages pilots to take short naps on the flight deck, a practice the FAA prohibits.

Should pilots be napping in the cockpit? Safety experts say maybe yes, but the FAA isn't so sure it's a good idea.

The Flight Safety Foundation has published a guide developed with an industry "fatigue countermeasures" working group that details the "best practices for implementation of a policy allowing for controlled rest (CR) on the flight deck." In other words, napping in the cockpit while the pilot in the other seat keeps and eye on things.

The working group includes fatigue safety managers from the airlines; pilot labor unions; researchers and scientists from Clockwork Research, NASA Ames Research Center, and Washington State University; and fatigue and human performance research organizations.

Controlled rest is defined by ICAO as a "short sleep opportunity" that serves as a mitigation strategy in case of unexpected fatigue during flight. The Flight Safety Foundation cautions it is not to be used as a planned strategy to extend duty periods, but rather as a "safety net" to combat in-flight fatigue. Nevertheless, CR periods have yet to be approved by all national regulatory authorities.

"For over 20 years, operators have been utilizing CR to harness the benefits of napping and limit the disadvantages of fatigue caused by extended hours of wakefulness, sleep loss and time of day," the document says. "Sleep studies support the use of naps to improve alertness and performance, and operators that are experienced in CR are supportive of the use of CR."

Other sections of the 25-page publication offer guidance for operators in deciding whether to introduce CR; how to implement, document and review an effective CR procedure; how to monitor and continuously improve CR as part of a fatigue risk management program; and ICAO's recommended procedures for CR. An appendix contains the International Civil Aviation Organization's recommended procedures for CR on the flight deck.

According to the report, a recent survey of managers and flight crew at operators with a CR policy revealed the following: 90 percent said the practice has provided significant benefits for flight safety, 87 percent said CR has reduced fatigue-related performance decrements during critical phases of flight, and 83 percent said CR has reduced instances of uncontrolled napping.

However, some national regulators, including the FAA, prohibit CR. Controlled rest was considered when the latest FAA flight and duty time rules were developed, but it was excluded from the final regulations. The report notes, however, that "the absence of a CR procedure does not prevent flight crew from napping, let alone from inadvertently falling asleep" and that concerns about CR "can be managed through an effective CR procedure, crew training and integration" of CR into effective fatigue risk management.

CR is permitted for some or all operators in Australia, Canada, New Zealand, and most states in Europe.

https://flightsafety.org/wp-content/uploads/2018/11/Controlled-Rest.pdf

Incident: Frontier A320 at Las Vegas on Nov 30th 2018, engine doors separated

A Frontier Airlines Airbus A320-200, registration N227FR performing flight F9-260 from Las Vegas,NV to Tampa,FL (USA) with 166 people on board, was climbing out of Las Vegas' runway 26R after being handed off to departure, when the crew reported cabin crew reported they got some problem with one of their engines (CFM56), flight attendants saying there was some fire. Departure responded tower just observed the right hand engine cowl was open. The crew declared emergency and requested to return to Las Vegas. The next departure on runway 26R reported there was some large foreign object debris (FOD) on the runway. The A320 landed safely back on Las Vegas' runway 26L about 15 minutes after departure.

The airline reported the engine cowling came loose and separated from the aircraft.

Timeline of occurrences and regulatory actions on Airbus A320-family engine fan cowl door loss incidents

On November 30, 2018, an Airbus A320-214 operated by Frontier Airlines lost the fan cowl doors of engine no.2 upon takeoff from Las Vegas-McCarran International Airport, Nevada, USA. This incident was at least the 45th fan cowl door loss event involving an Airbus A320-family aircraft.

In July 2015 the U.K. AAIB published an investigation report into a fan cowl door loss accident involving an Airbus A319. Prior to this May 2013 accident , there were a total of 34 previous occurrences of fan cowl door loss on Airbus A320-family aircraft, including 21 events for aircraft fitted with IAE V2500 engines and 13 events for aircraft fitted with CFM-56 engines. Following the A319 accident, three further instances of fan cowl door losses occurred, bringing the total number of occurrences to 38. ASN was able to trace 29 occurrences, of which seven after the publication of the AAIB report, bringing the total to at least 45 occurrences.

A common safety issue among these incidents is the fact that the cowl doors were not closed and latched following maintenance. This was not detected by the engineers, nor by flight crew members during the walk-around check. The design of the fan cowl door latching system, in which the latches are positioned at the bottom of the engine nacelle in close proximity to the ground, increased the probability that unfastened latches would not be seen during the pre-departure inspections.

Timeline of occurrences and regulatory actions:

1992

- 9 February 1992; A320-231 of Mexicana at Mexico City, Mexico

1993-1996

no occurrences known to ASN

1997

- 21 November 1997; A320-232 United Airlines at Washington, USA

1997-1999

no occurrences known to ASN

2000

- 20 January 2000; A320-231 of Airtours International at London-Gatwick, U.K.
- 12 June 2000; A320-232 of America West at Las Vegas, USA
- 13 September 2000; A320-232 of Skyservice at Toronto, Canada
- 11 October 2000: Transport Canada issues Service Difficulty Alert AL 2000-06: "Engine Fan Cowl Loss"
- 31 October 2000: DGAC France issues AD 2000-444-156(B), mandating fan cowl door latch improvements.

2001

- 5 September 2001: DGAC France issues AD 2001-381(B), superseding AD 2000-444-156(B), and requiring the installation of additional fan cowl latch improvement by installing a hold open device.

2002

no occurrences known to ASN

2003

- 29 October 2003, FAA issued AD 2003-18-06, requiring that the door latches for engine fan cowls on certain Airbus airplanes be modified and that a new hold-open device be installed; all operators were required to comply by April 2005.

2004

- 11 May 2004; A320-214 of Iberia at Madrid, Spain
- 13 July 2004; A320-233 of AirTran at Atlanta, USA

2005-2006

no occurrences known to ASN

2007

- 22 April 2007; A319-111 of Frontier at Atlanta, USA

2008

- 9 January 2008; A319-114 of Northwest Airlines at Detroit, USA
- 6 May 2008; A319-132 of Spirit Airlines at Detroit, USA
- 10 October 2008: NTSB issues safety recommendations A-08-79 through -82 on engine fan cowl separation prevention

2009

- 20 August 2009: FAA issues Notice 8900.91
  FAA issues Notice 8900.91 to its safety inspectors to educate operators about revising their maintenance program

2010

- 19 January 2010; A318-111 of Mexicana at Cancun, Mexico
- 28 January 2010; A320-233 of Volaris at Tijuana, Mexico
- 5 April 2010; A320-232 of JetBlue at Newark, USA
- 27 November 2010; A319-112 of Air India at Bangalore, India
- 10 December 2010; A320-214 of Bulgaria Air at Sofia, Bulgaria

2011

- 2 August 2011: FAA recognizes, after additional research that fan cowl latching issues are found predominantly with A319 and CRJ200 aircraft and "found no records indicating engine-fan cowl separation incidents due to improper latching since August 2008

- 28 October 2011: NTSB closes recommendations A-08-79 through -82; three as 'Unacceptable Action', one as 'Acceptable Action'
- 30 November 2011; A320-232 of Wizz at Bucharest, Romania

2012

- 19 May 2012; A320-214 of TAM at Natal, Brazil
- June 2012: Airbus publishes Safety first #14 magazine: "Preventing Fan Cowl Door Loss"

2013

- 18 February 2013; A320-232 of China Southern Airlines at Harbin, China
- 24 May 2013; A319-131 of British Airways at London-Heathrow, UK
- 12 August 2013; A320-214 of easyJet at Milan, Italy
- 9 November 2013; A319-132 of Spirit Airlines at Chicago-O'Hare Airport, USA

2014

- 18 September 2014; A320-232 of JetBlue at Long Beach, USA

2015

- 26 January 2015; A320-214 of flynas at Jeddah, Saudi Arabia
- 14 July 2015 AAIB publishes 24 May 2013 A319 accident report with 5 safety recommendations (the report mentioned 40 cases of fan cowl loss events)
- 31 August 2015: EASA issues recommendations to prevent loss of fan cowl doors on A320
- 14 October 2015; A319-111 of Sky Airline at Santiago, Chile
- 16 October 2015; A320-232 of Tigerair at Singapore

2016

- 14 March 2016: EASA publishes AD 2016-0053; which supersedes DGAC AD 2001-381(B), and requires modification and re-identification of fan cowl doors (FCDs) on IAE engined A320-family aircraft.
- 13 June 2016; A320-232 of American Airlines at Phoenix Sky Harbor, USA
- 19 September 2016; A320-232 of Aruba Airlines at Miami, USA

2017

- 29 June 2017: FAA issues AD AD 2017-13-10, superseding AD 2003-18-06; requiring modifying the engine fan cowl doors (FCDs), installing placards, and re-identifying the FCDs. The AD also adds airplanes to the applicability.
- 25 July 2017; A320-232 of Bangkok Airways at Bangkok, Thailand

2018

- 7 March 2018; FAA issues AD 2018-05-04, requiring modification and re-identification, or replacement, of certain FCDs and installation of a placard. Applicable to CFM56 engined aircraft (A319/A320/A321 series - x1x); Compliance within 35 months
- 8 August 2018; FAA issues AD 2018-16-03, requiring modification and re-identification, or replacement, of certain FCDs and installation of a placard in the flight deck of A319-133 and A321-232 airplanes (IAE engines).
- 25 October 2018; A320-232 of Vueling at Bilbao, Spain
- 30 November 2018; A320-214 of Frontier Airlines at Las Vegas, USA

JAL Sets 24-Hour Booze Ban For Pilots

Japan Airlines has tightened its rules regarding alcohol consumption by employees in the wake of series of incidents that have caused flight delays and led to the arrest of one pilot. Pilots are now banned from any alcohol consumption within 24 hours of flying a company plane and the airline is also extending its mandatory random breathalyzer tests to some ground crew members. Most airlines have a 12-hour pre-flight alcohol ban and most governments mandate eight hours. Last year the airline began using more modern breathalyzers and there was an immediate spike in flight disqualifications with more than limit of .02 percent alcohol in their blood. According to CNN, at least 19 pilots have tested positive since August of 2017, resulting in 12 flight delays. It should be noted that Japan Airlines operates more than 500 flights a day so the impact of alcohol-related incidents is statistically insignificant.

Nevertheless, a high-profile incident in which JAL pilot Katsutoshi Jitsukawa showed up for his flight from Heathrow to Tokyo in early November with blood-alcohol content of .189 prompted the airline to review its policies.

It also led to the company president taking a voluntary 20 percent pay cut. "We feel deeply responsible for causing the (Jitsukawa) incident that should never have happened," said Japan Airlines President Yuji Akasaka. JAL announced the new policies after JAL and ANA brass met with government officials earlier this week.

Obsolete aircraft part caused F-16's engine to catch fire shortly after takeoff

An outdated aircraft part caused a U.S. fighter jet's engine to overheat and catch fire shortly after takeoff earlier this year near Misawa Air Base, Japan, Pacific Air Forces announced recently.The incident forced the pilot of the F-16 Fighting Falcon, which was conducting routine training during the Feb. 20 incident, to jettison his external fuel tanks into nearby Lake Ogawara, which is popular with local fishermen.

The aircraft then landed safely at Misawa, and there were no injuries.

An Air Force Accident Investigation Board report blamed an obsolete turbine frame forward fairing, which failed during takeoff and blocked air needed to cool the engine.

“Without the cooling air, the exhaust liner and the downstream components were exposed to temperatures beyond their heat and tolerance, resulting in a fire,” the report said.

The aircraft suffered about $987,000 in damage, it added.

“Haphazard” maintenance practices led to the obsolete part being installed on the aircraft in 2012, the report said.

Poor enforcement of standard maintenance protocols created an environment that allowed failures such as the improper completion of paperwork to account for parts, serious disorganization at the shop and the improper handling of parts, the report said.

Improvements have been made since then, the Air Force said.

“Multiple organizational and managerial changes and expansions of the 35th FW Propulsion Flight storage areas were made over the course of the last six years to improve organizational capabilities and ensure the safety and reliability of aviation operations at Misawa AB,” the Air Force statement said.

The 35th Fighter Wing has checked all its engines, including the spare ones, and confirmed they have the new fairing installed, said a statement from Japan’s Defense Ministry.

Weighing Solutions for Industry’s Helicopter Pilot and Tech Shortage

Promoting the helicopter industry to the next generation, enhancing employee benefits and apprenticeship programs are possible solutions to an anticipated shortage of helicopter pilots and maintenance technicians, according to Helicopter Association International (HAI).

An HAI commissioned study conducted by the University of North Dakota released in March projects a shortage of 7,469 helicopter pilots in the U.S. between now and 2036.

The study also projected a shortage of 40,613 maintenance technicians in that time frame.

These solutions were released in response to an industry meeting the association held at HAI's headquarters in Alexandria, Virginia on Sept. 26, when participants identified the top three major challenges to expected workforce demand. Those challenges included the lack of available pilots and technicians, retaining qualified personnel, and affordability and accessibility of education.

To promote the rotorcraft industry to the next generation, the industry publications and associations, suppliers, schools, the government, parent-teacher associations and retired military personnel, must reach out and recruit future pilots and maintainers.

Responsibility for enhancing employee benefits falls to employers, airlines and human resources officers who anticipate demand will outstrip the available workforce in coming years. Because student loan repayment is a identified hurdle for prospective pilots, HAI will host on its website a student loan repayment template citing examples and case studies of what other companies and industries have done successfully.

Industry trade associations, flight schools and even TV personalities can help implement apprenticeship programs, HAI found.

The final step to HAI's workforce plan is to identify "critical audiences to advance the solutions and developing steps and activities to implement the solutions," according to an HAI statement.

https://www.rotorandwing.com/2018/09/28/tackling-challenges-industrys-helicopter-pilot-tech-shortage/

Human Factors: Fuel mismanagement

“Dirty Dozen”

During preflight, always verify by sight the fuel level in each tank," says **Henry K. Cooper**. For high-wing aircraft, purchase on of the lightweight fold-up step stools from a pilot supply shop, such as Sporty’s. These easily stow in the baggage compartment and the few dollars invested may save your life."

One of my nephews is really keen on becoming a pilot. I had some time over the summer, so I committed to flying a Piper Twin Comanche up to his hometown, taking him flying over to the coast, and flying back with a lesson involved.

The flight from Wilmington, Delaware, to Cape May, N.J., proceeded without incident. I gave him some straight and level time, much to his delight. We landed and went inside for soft drinks. This was a typical, hot summer day in August, so after the run-up checklist, I leaned the engines for takeoff.

When I applied full power, both motors sputtered. I considered aborting, but with 4,000′ of runway ahead of me and an aircraft now about a mile behind and closing, I instead looked to my throttles. I fire walled them. The engines stopped sputtering and sprang to full power. Thirty-two seconds later, we were airborne and out of there.

I dropped my nephew back off at Wilmington and took off for home. At 2,000′, ATC gave me a right turn to intercept my course. Since it looked like I was going to be level for a while, I decided to switch tanks from mains to auxiliaries.

I still had the pumps running, so I simply stuck my hand between the seats, felt for the left fuel knob, and twisted into the next indent over. I repeated that action with the right-hand side.

By the time I finished and had gotten my hand back up onto the yoke, the airplane was yawing to the left. I instinctively pushed right rudder, fire walled the throttles, and let out a curse. Had I really run out of fuel? I had five hours onboard when the trip started, and the gauges had indicated at least three still onboard.

With the airplane stable and running on one full power motor and one quickly fading, I ran the engine out checklist. When I got down to the fuel knobs line, I found my problem. The left fuel knob was not completely in the indent, so no fuel from the main, and no fuel from the aux. I slammed the knob full in and the left motor roared back to life.

Later I called an airline buddy of mine to talk about how my airline training had kicked in even after being out so many years. He reminded me not to tell my wife because she might not see the bright side of my self-induced snafu.

I never deviated course, didn't have to declare an emergency, and was never in danger of a NMAC, but I filed a report with NASA's Aviation Safety Reporting System just for good measure.

What surprised me in researching this column was just how few GA pilots filed "fuel mismanagement" reports. Further research revealed why.

Fuel exhaustion, starvation, and mismanagement incidents among general aviation pilots tend to result in either significant aircraft damage and/or personal injury. Therefore, most of the reports end up in the accident files of the National Transportation and Safety Board.

Close Only Counts in Horseshoes

Another Piper Twin Comanche pilot discovered, like I did, that close only counts in horseshoes.

He was on an IFR flight plan at 8,000′. ATC cleared him down to 6,000′ and into light rain and clouds. The pilot ran his pre-landing checklist, which included switching fuel tanks back from auxiliaries to the mains.

“Just as I was reaching 6,000′, the right engine started to run rough for a few seconds and subsequently failed,” he wrote.

He was unable to maintain altitude, so he declared an emergency and requested vectors to the nearest airport from ATC. ATC complied. They pointed him toward a towered field that had fire and rescue ready to assist. The pilot landed uneventfully.

The next day, he reported: “I found that although the fuel selector had been set to the main position, the engine was still drawing fuel from the auxiliary tank, which had eventually emptied and led the engine to fail due to fuel starvation.”

The pilot concluded that this incident would make him more diligent, to ensure the fuel selector valves were properly positioned.

A sport pilot filed a NASA report after he inadvertently moved the fuel selector to off, leading to engine failure right after takeoff.

He was conducting a solo flight in his FBO’s new light-sport aircraft. He had just completed his CFI renewal and his BFR in the same aircraft a week prior.

He wrote, “I’d noted then that the aircraft had a rather complex fuel system for a simple high-wing aircraft.”

This particular airplane had both engine-driven and electric fuel boost pumps. The fuel selectors for each tank were shutoff valves — two in all — but no mixture valves. The fuel was controlled by turning the shutoff valves either to “on” or “off.”

The other complexity on his mind was the tendency of the aircraft to vent excess fuel overboard when both tanks were nearly full, instead of cross-feeding the excess fuel into the tank that contained less fuel.

The right tank had the most fuel of the two tanks. “So after startup, I positioned the selector valves to draw off the right tank only during taxi and run-up,” he wrote.

That meant he turned the left shutoff valve to the “off” position. He did not write a note to remind himself.

“After more than 50 years in aviation, I thought I could remember to turn the left shutoff valve back on,” he wrote.

When he took the runway, he turned the right fuel shutoff valve to “off” and started his takeoff roll. The plane rotated successfully, and within 200′ of its climb, the engine quit. He successfully landed on the remaining runway. He had enough momentum to make a turnoff and exit the runway.

The pilot wrote that he couldn’t figure out why the engine had quit because his inspection of the fuel selector valves proved them to be in the identical position.

“Then to my astonishment, I processed what I was seeing: They were both off!”

Once the pilot turned both valves back on, the motor started back up.

The pilot remarked that he had been so focused on managing fuel from the right tank, he’d forgotten he’d turned off the left fuel valve. He realized that his fixation on the right tank made him transpose in his mind which fuel valve he’d turned off.

In other words, left became right and right became wrong. That’s why he reached up and switched off the right valve instead of reaching up and switching on the left one.

His takeaway from the event was to write down any non-normal switch activation, note it on the associated checklist, and then look at the switch while moving it back into its normal position.

Unreliable Fuel Gauges

After a fuel starvation incident, a Cessna 180 pilot narrowly missed landing his airplane into thickly forested terrain and lived to write a NASA report about it.

“The engine quit for unknown reasons,” he wrote. “The area was mountainous and thick with timber, but about five miles west, I chose a pasture and made a forced landing.”

His 180 came equipped with factory-installed gauges. According to this pilot, the fuel gauges read both “full” and “empty” at the bottom of the gauge and close together.

Not only had he misread his gauges, he’d misremembered how much fuel was in his tanks after his last flight.

The pilot owned the plane. His normal routine, after any long flight, was to fly to his local fuel stop, top the tanks, fly back and park his plane. That’s what he’d thought he’d done on his last flight, three months prior to the flight that ended in a pasture.

The pilot concluded that he needed to do two things consistently in the future. The first thing was to do a better preflight check. The second thing he needed to do in that preflight check was to visually inspect the wing tanks. He admitted that he’d come to rely on his fuel gauges because he needed a ladder to inspect the tanks on his high wing airplane, and he didn’t always have access to one.

It is not a good idea to rely on one’s fuel gauges for accurate indication of available fuel.

Analog gauges are prone to as much inaccuracy in an airplane as they are in an automobile.

Furthermore, 14 CFR 23.1337(b)[1], the regulation governing fuel gauges in certified general aviation aircraft, states:

Each fuel quantity indicator must be calibrated to read “zero” during level flight when the quantity of fuel remaining in the tank is equal to the unusable fuel supply.”

There are too many times, including parked in a hangar or at a tie-down spot, where an aircraft is not in a perfectly level attitude. So it’s far more likely your fuel gauge is reading inaccurately than accurately.

Much better to top off than to be tipped off by a sputtering motor.

Best Nap? 10 Minutes — and Drink Some Coffee First, Scientist Says

If you're thinking about taking a nap, the shorter the better, reports CBC.

Research suggests if you sleep for more than 25 minutes, you risk falling into the REM state. And when you wake up, you have sleep inertia, where "you're still kind of asleep and a lit bit kind of spacey."Sleep inertia can take about a half an hour to wear off after you wake up from a deep sleep, research suggests.

If you really want to be rejuvenated, drink a cup of coffee, then have a 10-minute nap. Since it takes about half an hour for the caffeine to take effect, you can nap while you wait.

Get the full story at www.cbc.ca