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FIXED WING NEWSLETTER

October 2023 | Volume XXIII | Issue X

SAFETYWIRE

Excursions: Running Out of Runway and Options

Page 1

FAA Stresses Legal Protection of Voluntary Reporting Programs

Page 10

SAFETY MANAGER'S CORNER:

Safety Report Searching

Page 12

Excursions: Running Out of Runway and Options

(Source: By Gordon Gilbert, Contributor– Accidents and Regulations, AIN Network)

The NTSB found an improperly installed wheel caused this HondaJet to depart the runway after landing at Atlanta's Cobb County Airport. (Photo: NTSB)

There is an old axiom among pilots that says the three most useless things in aviation are fuel on the ground, air above, and runway behind.

In the context of "runway behind," similar themes thread through many runway excursions: an un-stabilized approach, an attempt to salvage it instead of making a go-around, a short final too hot and high, a touchdown too long and too fast, improper use of braking and other slowing systems, and a delayed or improper decision leading to being unable to stop the aircraft before running out of control, options, and, ultimately, runway.

These scenarios were found in an **AIN** review of 164 excursions (33 percent) out of a total of 494 reported accidents and incidents of a selected group of aircraft make and models starting from the year when these airframes entered service. (FAA defines a runway excursion as a "veer off or over-run from the runway surface.")

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Our study mirrored the results of previous studies—runway excursions account for about a third of all reported accidents/incidents. Charter operations accounted for nearly 20 percent of business jet excursions worldwide.

The jets in our study comprised 11 models, four of them approved for single-pilot operations. They are the HondaJet, Embraer Phenom 100, Raytheon Premier, Cessna Citation 550 and Citation 560XL, Gulfstream series (except model 200s), Dassault Falcon 900, Bombardier Challenger 300 and 600, and Learjet 45 and 55. In addition to the excursion analysis of the sample aircraft models, AIN performed a separate NTSB search for incursions that captured 67 occurrences of incursions from 2008 through 2022 for which the investigation was completed.

Besides unstabilized approaches leading to hot and long landings, other predominant implicating and frequently overlapping causal factors include loss of direction control on ground (LOC-G), system malfunctions, maintenance errors, contaminated runways, unfamiliarity with aircraft systems or procedures, failure to use checklists, and a lack of cockpit resource management (CRM). See accompanying table for a complete list.

Excursions typically do not result in fatalities, but there are exceptions. Five fatal landing excursions and three fatal takeoff excursions took the lives of 32 crew and passengers. Two of the accidents occurred under Part 135 and two of the three fatal excursions outside of the U.S. were charters.

The worst fatal excursion in terms of loss of life (seven perished) was on May 31, 2014, when a Part 91 Gulfstream G-IV attempted to takeoff with its gust locks engaged. There were so many issues surrounding this accident that the NTSB published a special investigation report and issued more than a dozen recommendations.

The other G-IV takeoff fatal excursion was on Oct. 30, 1996, and the sequence of events began when the aircraft began its takeoff roll in a 24-knot crosswind. About 1,340 feet after the start of the takeoff roll, the airplane veered left and departed the runway. Tire marks indicated no braking action was applied. One of the pilots said, "Reverse," then the other pilot said, "No, no, no, go, go, go, go, go." As the airplane traversed a shallow ditch that paralleled the runway, it began shedding parts and became airborne after it encountered a berm at the departure end of the runway. The aircraft caught fire and all four souls on board perished.

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The nose wheel steering select control switch was found in the "Handwheel Only" position, and not in the "Normal" position. The pilot and copilot comprised a mixed crew in accordance with an interchange agreement between two companies that operated G-IVs. The companies' operation manuals and the interchange agreement did not address mixed crews, procedural differences, or aircraft differences training.

Probable cause of this accident was the failure of the pilot-in-command (PIC) to maintain directional control of the airplane in a gusty crosswind, his failure to abort the takeoff, and “failure of the copilot to adequately monitor and/or take sufficient remedial action to help avoid the occurrence.” Factors relating to the accident included the gusty crosswind, the flight crew's inadequate preflight, the nose wheel steering switch in the "Handwheel Only" position, and the lack of standardization of the two companies' operations manuals and interchange agreement.

Disturbing issues regarding the flight crew and the operator were also discovered during the NTSB’s investigation of a Part 135 Falcon 50 landing excursion on Sep. 27, 2018, in which two people died. The other Part 135 fatal excursion was the Sept. 19, 2008, overrun crash of a Learjet 60 attempting to takeoff “with known maintenance issues,” including low tire pressure, according to the NTSB’s final report. This accident killed four of the six aboard.

Three more landing G-IV excursions claimed 11 lives (plus two on the ground). On July 7, 2013, a U.S.-registered G-IV on a positioning flight crashed and burned after overrunning the runway at an airport in France. All three aboard were killed. The crew failed to arm the ground spoilers, which delayed the deployment of the reversers despite their selection, according to the final report. Investigators also attributed the accident to the failure of this flight crew in particular, and the operating company’s flight crews in general, to “systematically perform the checklists” using a challenge and response method.

After touching down at the 3,900-foot point of a 6,500-ft runway in the Congo, a U.S.-registered G-IV carrying government officials on a charter flight overran the end and broke apart. The Feb. 12, 2012, accident killed four of the 12 onboard and two on the ground. The operator’s certificate was revoked.

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Although contaminated runways (water, snow, ice) were implicated in more than 40 excursions (about 17 percent of the total), only one of the eight fatal excursions occurred on a contaminated runway. On Aug. 31, 2010, a Citation 550 was completing a charter flight in heavy rain to Papua New Guinea. With a tailwind, the twinjet touched down long on a wet runway that was too short. The pilot attempted to abort the landing and go around, but the aircraft was not able to gain flying speed and descended into terrain beyond the end of the runway. Of the five people on board, the co-pilot was the only survivor.

Two Pilots vs One Pilot

Among those aircraft models in our sample, there was no apparent correlation of excursions in terms of the number of pilots in the flight crew for those aircraft models approved for single-pilot operations, with the exception of the Premier. Seven of 13 Premier excursions were being operated by one pilot.

Available data produced two of the 12 HondaJet excursions to be crewed by a single pilot. However, from the information available, the number of flight crew could not be determined in roughly half of the HondaJet excursions. Of the 26 known number of flight crew in Phenom 100 excursions, 10 were being flown by one pilot.

According to NTSB data of final reports of U.S.-registered excursions separate from our sample, only one of the eight fatal excursions involved a one-pilot crew. On Sep. 29, 2013, a Part 91 Citation 525 went out of control while landing, collided with a hangar, and caught fire resulting in the loss of the pilot and his three passengers. The NTSB said the pilot delayed the application of both wheel brakes and speed brakes but could not determine why. The Board also was not able to conclude if several unrestrained pets, including a large dog, might have interfered with the pilot.

EXCURSIONS AS A PERCENTAGE OF TOTAL ACCIDENTS/INCIDENTS
(By greatest percentage)

AIRCRAFT MODEL	ENTERED SERVICE	ONE-PILOT EXCURSIONS	TOTAL ACCIDENTS/ INCIDENTS	TOTAL EXCURSIONS	PERCENT OF TOTAL
Embraer Phenom 100	2008	10	34	31	91%
Raytheon Premier I/IA	2001	7	28	14	50%
Honda HondaJet	2012	1	27	12	46%
Bombardier Learjet 55	1981	--	25	9	36%
Cessna Citation 550	1978	5	115	39	34%
Bombardier Learjet 45	1998	--	28	9	33%
Dassault Falcon 900	1986	--	35	10	29%
Gulfstream large-cabin series	1967	--	65	14	25%
Cessna Citation 560XL	1989	--	54	13	24%
Bombardier Challenger 600	1996	--	69	11	16%
Bombardier Challenger 300	2003	--	14	2	14%
Total/Average%		23	494	165	33%

Two pilots were predominant when it came to the larger Cessna 500 series approved for single-pilot operations: just five of the 29 excursions involving the Citation 550 series were being crewed by one pilot and all 13 Citation 560 series excursions were under the command of two pilots. In all, of 96 total excursions by the four lightest single-pilot models, 23 (or just under a quarter) included one-pilot crews.

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The one known single-crew Honda excursion in our sample involved hydroplaning off the runway and resulted in the aircraft being destroyed in the post-accident fire, but the commercial pilot and his five passengers escaped injury. After touching down at a Vref of 120 knots with full flaps, the pilot immediately applied full brake pressure. According to the NTSB preliminary report, the pilot said "…the brakes immediately began to pulsate in anti-skid mode and because of that, very little braking effort was being done to slow the plane despite full pedal pressure."

About halfway down the runway, the pilot said he considered a go-around, but the left brake "grabbed" and the airplane's nose suddenly yawed to the left. This began a sequence of left and right skids. The pilot said he used the rudder pedals to keep the airplane on the runway and was able to straighten the nose out right before they went off the runway into the grass and slid down several embankments before stopping and catching fire.

The NTSB's final report of the runway excursion of a Part 91 Cessna 560XL on July 21, 2021, is a case in point of an accident involving two pilots not on the same page. The captain was the pilot flying (PF) and said while on final approach, the airplane was "eating up a lot of runway" before it settled on the pavement. He applied full brakes and activated the reversers, but it was not enough to stop the airplane, and it collided with an Engineered Material Arresting System, resulting in substantial damage.

The pilot admitted that he became fixated on landing and thought he could salvage the approach despite the pilot monitoring (PM) issuing repeated go-around commands. The PM stated that about two miles from the runway threshold, the airplane's descent rate increased, which activated the ground proximity warning "Terrain, Pull Up." The PM commanded a "go-around," which was not acknowledged by the PF. When the twinjet was on a one-mile final, the PM called for a "go-around" a second time, followed by a third time as they crossed the runway threshold about 30 to 40 knots too fast.

The Dec. 10, 2015 landing excursion after a hard landing of a Premier I is another example where the PIC did not respond to the second pilot's commands. But in this case, the second pilot literally took the initiative. The first pilot, who was the owner of the light jet and had recently received a type rating in the airplane, was acting as PIC in the left seat. A second pilot, also type-rated and experienced in the airplane model, was accompanying the first pilot as a mentor.

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As they neared the destination airport for an approach, the pilots received the most recent weather information, which included a crosswind at 16 knots with gusts to 29 knots. Shortly thereafter, another pilot on the frequency reported wind gusts of 50 knots upon landing. The first pilot expressed concern about landing in such windy conditions, but the second pilot encouraged him to continue.

The first pilot told the Safety Board that, about 45 feet above the runway, the airplane experienced a strong gust of wind and the second pilot "grabbed" the flight controls "without calling out, 'my plane.'" The left wing impacted the ground, and the second pilot initiated a go-around. The second pilot said that he had called for a go-around before taking the controls, but that the first pilot "seemed to be frozen." The second pilot then reconfigured the airplane for landing.

The NTSB concluded: the maximum demonstrated crosswind component of the airplane was 25 knots. Given the reported wind conditions at about the time of the accident, the crosswind component was at least 16 to 29 knots and may have been greater based on the pilot report of gusts. “Thus, the pilots should not have attempted the landing, because the gusts had the potential to exceed the airplane's maximum demonstrated crosswind component.”

A lot of things were wrongly handled by both pilots in the Feb. 13, 2021, attempted takeoff excursion of a Falcon 900EX EASy that resulted in substantial damage but no injuries to the five people on board. The flight crew—comprising two non-type rated pilots—attempted to rotate 2,975 pounds over the mtow and with a center of gravity close to the most forward limit, an incorrect stabilizer trim setting, a rotation speed 23 knots slower than the speed required at maximum weight, and using a runway that was 575 feet shorter than the takeoff distance would have required.

It took the investigation of this accident to expose the fact that the PIC not only never had a Falcon 900 type rating, but two years earlier had been stripped of all his certificates and ratings, so he wasn’t even qualified to fly any aircraft. On Feb. 3, 2019, the FAA issued an emergency revocation of all his certificates because he allegedly had falsified logbook entries and records for pilot proficiency checks, competency checks, and training events on 15 separate occasions while employed as a check pilot for a Part 135 operator.

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Yet, even during this period of having no valid pilot certificate, he was able to enroll in Falcon 900 initial training at FlightSafety International. He was not issued a type rating because he never finished the ground or flight simulator training. The first officer was not authorized to serve as PIC because he had logged just 16 hours of flight experience in the Falcon 900EX EASy and was also not typed.

Save the brakes but lose the airplane could be the mantra for the Oct. 7, 2011, runway excursion of a Citation II in Brazil. The nose gear collapsed as the aircraft came to rest in shrubs, and the twinjet was later written off as “damage unrepairable.” The five occupants escaped unhurt. According to the accident report, the captain was in the habit of braking the aircraft using only reverse thrust to save the braking system. Thus, he belatedly used the aircraft's normal braking system allowing the aircraft to overshoot the runway. His “piloting judgment” was included in the report as a contributing factor.

Combining a tailwind and a wet runway didn’t end well for the Oct. 1, 2020, air taxi flight of a Raytheon/Beechjet 400A. The airplane touched down at a groundspeed exceeding 120 knots, about 10 knots faster than Vref. During the landing roll, the pilot believed there was a problem with the brakes, as he received “zero feedback” despite his attempts to slow down.

During the landing, the copilot deployed the speed brakes for some six seconds before retracting them, about the time he commented to the pilot that they should abort the landing. The pilot declined to abort and directed the copilot to deactivate the airplane’s anti-skid system with about one-third of the runway remaining. With no observed change in the airplane’s braking, the pilot attempted to slow the airplane by steering it from side to side, but it ultimately departed the end of the runway and was substantially damaged.

The NTSB determined the cause of the accident to be the flight crew's improper decision to land with a tailwind on a wet runway. Contributing to the accident was the copilot’s early retraction of the speed brakes and the pilot’s decision to turn off the anti-skid system.

On March 9, 2005, a Challenger 300 came to grief on an attempted takeoff because of a seemingly harmless modification—an STC’d microphone jack receptacle installed near the base fairing of both pilots’ control columns. When the PIC attempted to rotate the airplane, the control column would not move aft of the neutral position. The takeoff roll couldn’t be stopped before the aircraft went off the runway, taking out the nose gear.

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The receptacle was oriented in a vertical position on the pilot's side, but 90 degrees to the control column vertical axis on the co-pilot side. It was determined that the rearward movement of the control column could be jammed from the horizontal placement of the assembly on the copilot's column. As a result of this accident, the NTSB called the STC an "inadequate design," and an AD was issued requiring modifications to this assembly to prevent possible control movement interference.


High tailwinds were a factor in this Hawker overrun at Aspen, Colorado. (Photo: NTSB)

The classic "failure to communicate" was one of the factors behind the nonfatal excursion of a Part 91 G-IV on Aug. 21, 2021, according to the NTSB final report. After towing the aircraft, FBO personnel could not reinstall the nose gear's pip pin securely. Ground personnel left the safety clip hanging from its lanyard on the gear and a ground supervisor told the first arriving crewmember (a non-type-rated observer pilot), "per tow team, check your nose pin."

During the takeoff, the nose gear developed a "violent shimmy." As the pilot aborted the takeoff, the gear broke away, the airplane veered off the runway, and the right wing and right main landing gear sustained substantial damage. All 14 occupants escaped uninjured.

The NTSB said the accident was caused by the PIC's and SIC's failure during preflight to ensure that the nose landing gear's pip pin was properly installed. Contributing to the accident was the ground crew supervisor's "failure to inform the PIC or SIC of the anomaly concerning the pip pin." All three pilots denied that any ground personnel told them about issues with the gear. The NTSB did not address this communication discrepancy.

Business aviation turboprops also have their share of runway excursions. According to NTSB data, from 2008 through 2022, U.S.-registered single- and twin-engine turboprops were involved in 75 nonfatal excursions, including a rare Part 91K (fractional) event, and three Part 91 fatal excursions. There were no fatal excursions of Part 135 turboprops during those years.

Currently under investigation are several recent nonfatal landing excursions, including: two single-pilot Phenom 100 mishaps (Feb. 17, 2023, and March 5, 2023) and three HondaJet accidents, one a Part 135 operation with two pilots (March 9, 2022) and two private operations, one with a single pilot (May 18, 2023) and in Canada with two pilots (March 7, 2022). Depending on the circumstances and extent of damage, investigations may be undertaken for these latest excursions: a Citation 750 (May 28, 2023), a Citation 550 (June 5, 2023), and a Falcon 10 (June 7, 2023).

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Runway excursions apparently are with us to stay, but perhaps being aware of the causes and circumstances in the examples in this article, they can be reduced in number and magnitude if not eliminated altogether.

Considering the overall statistics, it is clear that they disprove some assumptions in the business aviation community. For example, excursions aren't necessarily predominant in single-pilot operations. The data showed that single-pilot excursions accounted for only about a third of all excursions by the four aircraft models in this survey that can be approved for one-pilot crews. Also, while the statistics indicate that light jets as a group may have a slightly higher percentage of excursions compared with heavy jets, no specific business jet make or make or model has the majority of excursions.

EIGHT FATAL EXCURSION ACCIDENTS

DATE	AIRPLANE	SEGMENT	OPERATION	REG.	LOCATION	FATALITIES
12/30/96	Gulfstream G-IV	Takeoff	Private	U.S.	U.S.	4
9/19/08	Bombardier Learjet 60	Takeoff	Charter	U.S.	U.S.	4
8/31/10	Cessna Citation 550	Landing	Charter	Papua New Guinea	Papua New Guinea	4
2/12/12	Gulfstream G-IV	Landing	Charter	U.S.	Congo	4
7/13/12	Gulfstream G-IV	Landing	Positioning	U.S.	France	3
9/29/13	Cessna Citation 525	Landing	Private	U.S.	U.S.	4*
5/31/14	Gulfstream G-IV	Takeoff	Private	U.S.	U.S.	7
9/27/18	Dassault Falcon 50	Landing	Charter	U.S.	U.S.	2
TOTAL						32

Single pilot; All excursions from dry runways except for the Citation 550 accident.

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FAA Stresses Legal Protection of Voluntary Reporting Programs

Issues reported under safety programs exempt from enforcement actions

(Source: By Gordon Gilbert, Contributor—Accidents and Regulations, AIN Network)

To encourage increased participation by aircraft maintenance providers and commercial operators, especially Part 135 and 91K certificate holders, in providing the FAA information on apparent regulatory violations under the agency's several voluntary safety programs, the agency has issued Notice 8900.61 to clarify how it determines if enforcement action will be taken.

For Aviation Safety Action Program (ASAP) submissions accepted before Oct. 1, 2015, and/or Voluntary Disclosure Reporting Program (VDRP) submissions currently open (corrective action and/or follow-up surveillance not completed), FAA inspectors have the "discretion to determine the most appropriate action, either administrative action or corrective action [i.e. enforcement]," the notice says. "It should be noted that administrative action is no longer an option within the web-based VDRP system."

Decisions on accepting a submission are intended to be made according to specific criteria, including inadvertence of the apparent violation and satisfactory taking of immediate action followed by the development of a comprehensive fix. Repeated violations will be subject to additional reviews on a case-by-case basis, which could lead to enforcement action.

As of Oct. 1, 2015, automatic upload of disclosure data from the web-based VDRP system to the FAA's enforcement information system (EIS) was terminated. Files that were open in the EIS on October 1, 2015, have been purged from the EIS. "However, the option will remain for the FAA to take administrative action utilizing the legacy paper-based system, as desired."

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“The FAA’s policy of forgoing civil penalty actions when one of these entities detects violations, discloses the violations to the FAA, and takes prompt corrective action to ensure that the same or similar violations do not recur is designed to encourage compliance with FAA regulations, foster safe operating practices, and promote the development of effective internal evaluation programs,” the notice further states.

For example, the FAA reports that ASAP has more than 900 active memorandums of understanding across the nation “with activity and participation increasing almost daily. With more than 100,000 reports annually, it is a tremendous source of safety information and data. Participation is expanding across the entire spectrum of the National Airspace System with even small operators able to participate through the use of the services of third-party facilitators such as the Air Charter Safety Foundation.”

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SAFETY MANAGER'S CORNER

Safety Report Searching

Somethings that don't seem critical and are not obvious may cause serious difficulties when applied to future situations. Safety data fall exactly into that trap. Identifying and addressing hazards in a timely fashion will always remain a cornerstone of safety management. This type of activity is reactive because it relies upon initial identification, typically related to some type of event. For example, a safety report describing deer observed on a runway during a night landing heightens awareness of the possibility of a deer strike at that airport. Even though the deer strike did not occur any corrective actions associated with the event would be considered reactive.

Building data for years from safety reports creates information power, but only if it can be harnessed effectively. The value of data is immense, but only when important questions can be answered. For all its usefulness, data is also dumb. It doesn't know anything and can only effectively answer questions humans have previously anticipated. Enter the intelligent safety manager. If your safety reports forms don't contain the right searchable fields then "dumb data" can't provide the right answers.

Let's look at a potential real-world scenario. Your flight operation's safety management system has been collecting safety reports for the previous 33 months, and the data library now contains 117 reports describing flight hazards and events. The chief pilot participates in a safety roundtable conference, discussing hazards and concerns with many other like-in-kind business aviation operations. After returning from the conference you (safety manager) and the chief pilot meet to discuss the meeting's details and share information. The chief pilot describes how many of the conference's operators noticed an upward trend in the quantity of FMF entry errors over the last 18 months and is wondering if your flight operation similarly indicates the same. A quick search of the safety report data shows…nothing. Why? Because the report form used for the last 33 months doesn't contain a searchable data filed for "FMF entry errors" so now you're forced to do a combination keyword search and manual report review to derive a somewhat accurate counting. Ouch! If the safety report contained a simple checkbox for FMS entry errors then a search for that field would quickly and accurately yield the answer.

Certainly not every data call is predictable, but many definitely are. When constructing safety report forms, anticipate what types of question might be asked a year from now. "Will we need to know how many times XYZ occurred?" If the answer is yes, then make sure there is a searchable field so data can answer questions.

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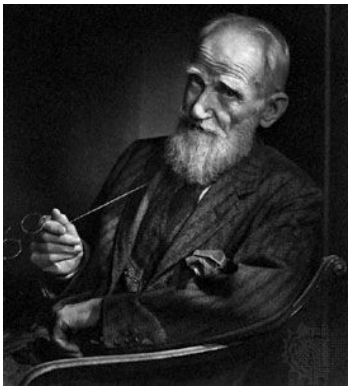
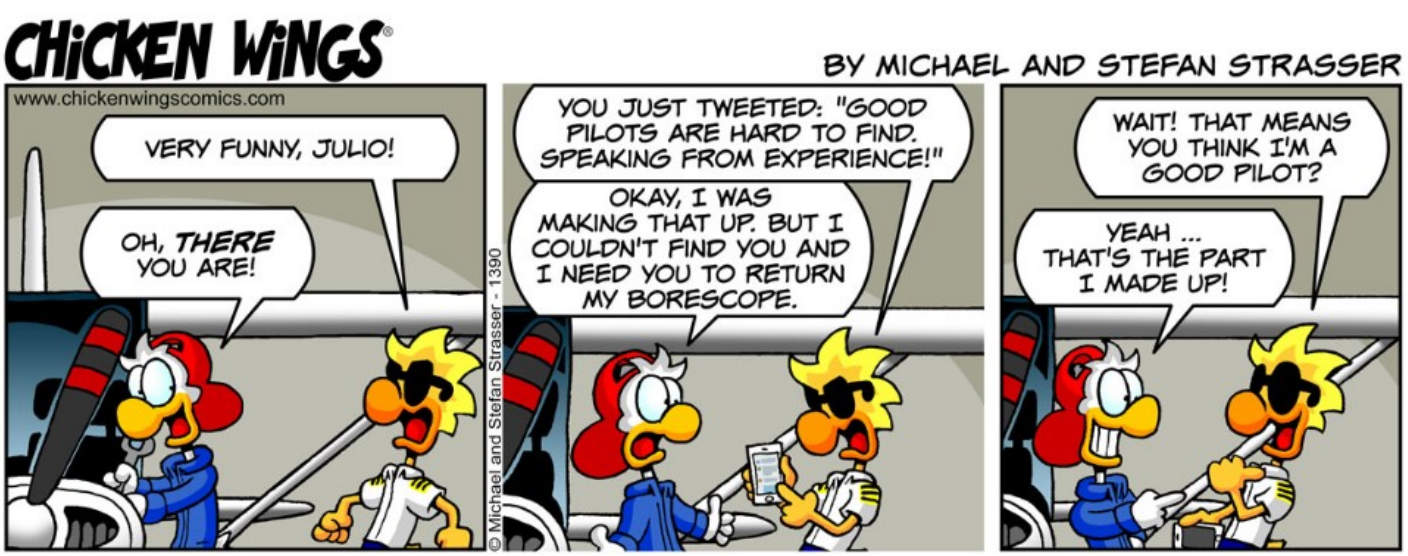
Quote of the Month

“The single biggest problem in communication is the illusion that it has taken place”

— George Bernard Shaw



Communication is too important to let yourself be fooled into thinking it’s all good. It’s not just about talking. In fact there are four types of communication: interpersonal, non-verbal, written, and oral. All of those paths of transmission make it seem like nothing can be missed, that miscommunication is impossible. Well we all know better than that. Communication really isn’t the problem at all, it’s the assumptions surrounding it that create the biggest problems. “I thought that’s what you told me,” and “You didn’t say anything so I thought it was OK” are often preceded by some really undesirable occurrence. Of course it’s soothing to figure out what was miscommunicated but it doesn’t turn back the clock and undo the event. A much better approach: proactively ensure accurate and effective communication.



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UPCOMING COURSES

Oct 30 to Nov 3, 2023—PROS Course
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