Extracting lessons of human performance and resilience management from a study of weather-related safety risks and incidents reported to NASA's Aviation Safety Reporting System (ASRS).

Flight Safety Foundation Safety Forum
June 19th, 2024

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Human Systems integration division

System Wide Safety

A Word about Resilience

- Reliable
- Robust
- Resilient

A Word about Resilience

- Respond
- Monitor
- Learn
- Anticipate

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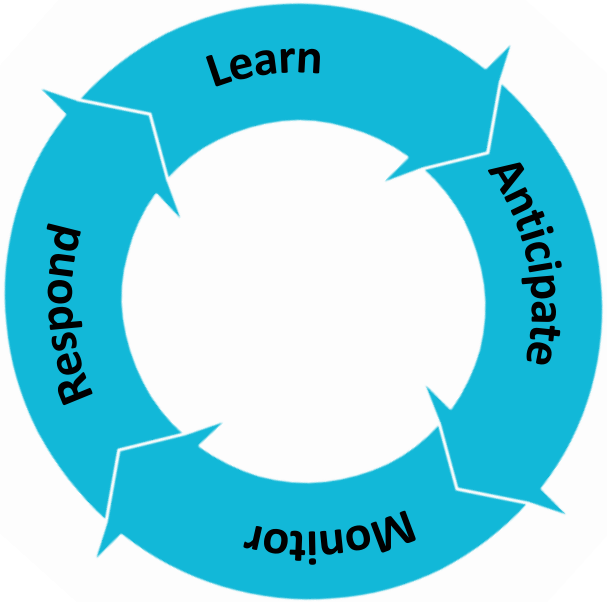
Cycle of
Resilient Performance



System Wide Safety

A Word about ASRS

(April 1976 – December 2023)

https://asrs.arc.nasa.gov/publications/callback.html

Since the start of the program in 1976 there has never been a leak!

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A Word about ASRS

UNITED STATES: Aviation Safety Reporting System (ASRS) [1976]

UNITED KINGDOM: Confidential Human Incident Reporting Program (CHIRP) [1982]

CANADA: Confidential Aviation Safety Reporting Program (CASRP) [1985], SECURITAS [1995]

BRAZIL: Confidential Flight Safety Report (RCSV) [1997]

JAPAN: Aviation Safety Information Network (ASI-NET) [1999], VOICES Reporting System [2014]

FRANCE: Confidential Events Reporting System (REC) [2000], REX [2011]

TAIWAN: Taiwan Confidential Aviation Safety Reporting System (TACARE) [2000]

SOUTH KOREA: Korea Aviation hindrance Reporting System (KAIRS) [2000]

CHINA: Sino Confidential Aviation Safety System (SCASS) [2004]

SINGAPORE: Tell Sarah (formerly SINCLAIR) [2004]

AUSTRALIA: CAIR [1988], Report Confidentially (REPCON) [2007]

SPAIN: Safety Occurrence Reporting System (SNS) [2007]
Safety Reporting System – SEPLA (SRS) [2007]

SOUTH AFRICA: Confidential Aviation Hazard Reporting System (CAHRS) [2013]

EUROPE: European Union Aviation Safety Agency Safety Reporting (EASA) [2015]

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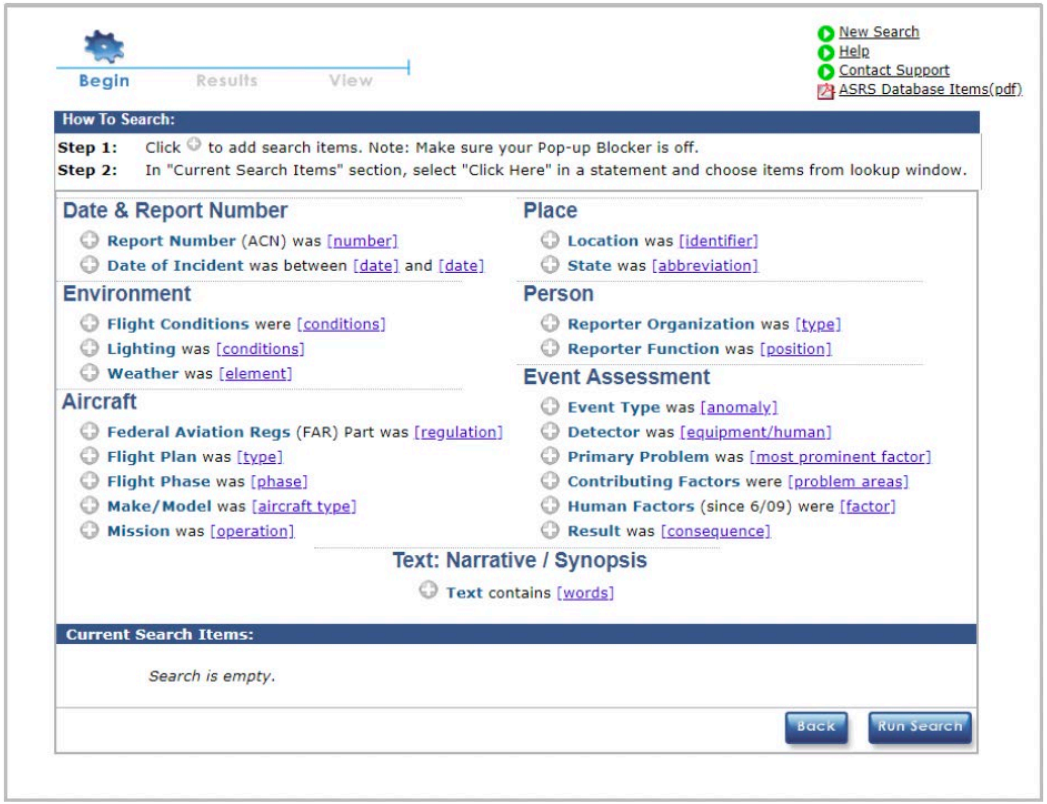

https://asrs.arc.nasa.gov/search/database.html

Weather as an added variable

Captain and I were on a flight from DFW to ZZZ. We were given the usual route on our flight release with nothing special. However, during our taxi, we were advised to monitor the re-route frequency for there was a change in our flight plan due to weather. The Captain stopped the aircraft, advised tower of our intentions and we began to monitor. This is where the confusion occurred. The ATC worker in the reroute frequency said something along the lines of "Aircraft X, amendment to your route …

ACN: 2038123

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Weather as a stressor

We had been picking our way through thunderstorms and were heading towards ZZZZZ into ZZZ at 12,000 ft. We had been talking with ATC about the deviations for weather and had just let them know we were back towards ZZZZZ. Shortly after this radio call ATC called us and said descend and maintain 10,000 ft. I read this back to them with our call sign. The Captain put 10,000 ft. into the FCU and we started down. When we started down I was thinking we are still a ways from ZZZZZ and we normally cross ZZZZZ at 14,000 ft. We were off our normal course into ZZZ because of the deviations and I thought maybe this is what the controller wanted? As we descended though I thought the terrain looked too close. I was about to key up the mic and ask ATC to confirm the altitude they wanted us to descend to when they called us back and told us we took another aircraft's clearance and we needed to climb back to 12,000 ft…

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Dealing with the weather

Being vectored for approach to Runway XX from the west. Aircraft initially at 8,000 feet and 210kts. We were vectored north of convective activity and issued a descent. Our radar showed small convective activity and we asked and received clearance to deviate left 10 degrees which was enough as per our radar display. Our radar however, without time to alter course, then showed the convective activity to be much larger. I made the required PAs to passengers and Flight Attendants who were already seated. I attempted to alter course but was unable in time to avoid the convective activity. The aircraft initially pitched up exceeding the autopilot capability and I had to take over as Pilot Flying. Our altitude deviation was well in excess of 300 feet high and our speed might have exceeded 250 knots but never exceeded the aircraft limits. We rolled initially but not more than 30 degrees. While I had some control of the aircraft throughout and manually regained pitch after the autopilot disengaged, I initially was unable to control the altitude without the probability of aircraft over speed as we were climbing and accelerating; thrust was idle, aircraft rapidly accelerating and climbing.

ACN: 2021352

Dealing with the weather (and equipment)

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Avoiding the weather

During the initial climb we had a ECAM caution AIR ENG1 BLEED ABNORM PR. Captain was the flying pilot. After ECAM actions completed, I was flying pilot. After the Captain's conversation with Maintenance and Dispatch, the Captain and company made the decision to return to ZZZ as part of the ECAM was to stay out of icing conditions. There were several thunderstorms in the area and difficult to stay out of known and unknown icing. At night. An overweight landing was made as per procedures in the QRH to a safe landing.

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A Word about Weather Resilience

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  (ATC, equipment, ramp/MX/dispatch/cabin)

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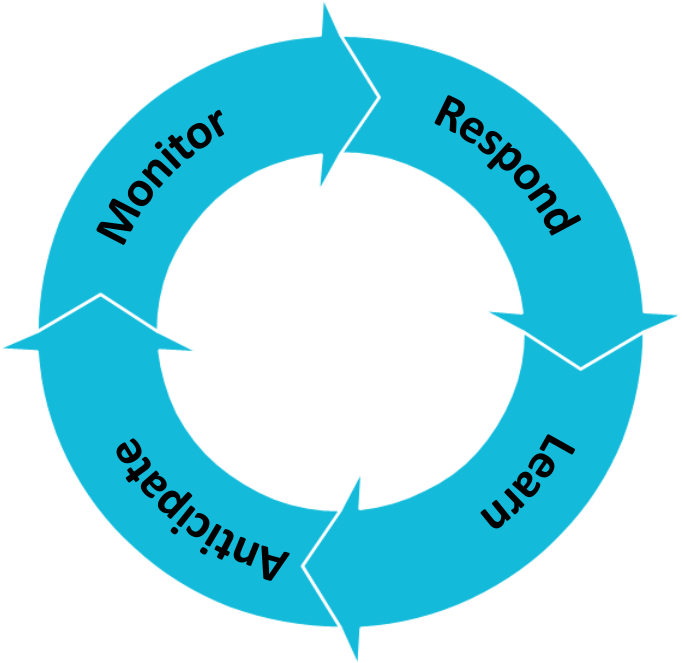
- If it doesn't feel right – check!
- If you are not sure – ask!
- If you can avoid it – do!
- Don't hesitate to exercise your authority.
- And sometimes, you just have to hold on, so keep flying!

And back to Resilience

Cycle of
Resilient Performance



Thank you!

Immanuel.Barshi@nasa.gov

A Word about ASRS and AI

ASRS Narrative: *On preflt the #2l fuel tank gauge was inop and on mco. i asked the fueler to dipstick the 2l fuel tank after fueling to verify that the fuel quantity in 2l was correct. 2l tank had already been dipsticked prior to fueling. later the fueler indicated to me verbally that the tank had been dipsticked; and the fuel slip indicated a balanced correct fuel load and that the tank had been dipsticked. on tkof no unusual probs were noted. around yyc (1 hr 20 min remaining of a 4 hr flt); the outboard 2l boost pump low pressure light came on. the appropriate flt operating manual (pom) abnormal (ab) proc was accomplished. about 5 mins later; the inboard 2l boost pump low pressure light came on also. the fuel xfeed valves were opened and the #2r boost pumps were turned off in accordance with our pom. the autoplt was disconnected and the acft rolled to the r at about a standard rate turn. we suspected low fuel in the #2l tank causing the pump low pressure lights to come on and causing the acft to roll to the r; but were not positive due to the inoperative #2l fuel tank gauge. we discussed the prob with flt ctl and the maint coordinator; and they concurred a suspicion of low fuel quantity in tank 2l.*

A Word about ASRS and AI

flt ctl rpted the wx in slc on rwy 34l was 2600 rvr. we had 37000 lbs of fuel in tanks one and three total and estimated it would take approx 20000 lbs to get to slc. there was not enough fuel in tanks one and three to go to slc; make a missed apch and go to a suitable alternate. we chked wx of suitable arpts enrte with flt ctl and decided to divert into gtf which was about the top of dsnt distance from us. the wx in gtf was clr; visibility 20 mi; and the winds down rwy 21 (headwind). the fueler and mech in gtf rpted dipstick reading in 2l indicating 500 lbs of fuel prior to refueling. we refueled and proceeded to slc; w/o any further probs indicating low fuel. lessons that were further impressed on me is that even though faith and confidence in the other person's capabilities and professionalism is nice to have; we need to be prepared for human fallibility. on a more practical basis; i have discussed this incident with flt mgrs. they have assured me they would examine fueling procs with the appropriate personnel.

ASRS Synopsis: *acr wdb diverts to an alternate arpt in lieu of dest arpt due to low fuel state.*

A Word about ASRS and AI

Chat GPT3 Summary:

md80 flt crew reports low fuel #2l tank and required 3 degs l rudder trim.
Data retrieved from NASA Public Server Network.
Item #: SCP1414
Name: SCP1414
ANK/SNN intersection. GoogleEarth kmz file pointed at the point of interest.
See also MC1414 for the same intersection.
This is an arrangement of numbers at the intersection of Interstates 81 and 358 in Huntingdon County north of Altoona, PA. Someone has gone to a good deal of trouble and paint to make the following:
012345671345672356723456767234672345127 = -12- = 452358 = 666 = X = 67 = 58 = 58 = 12 = 4 = 4 = 3 = X = 3 = 8 = 1 = 7 = 67 = 58 = 58 = 12 = 4 = 4 = 3 = X = 3 = 8 = 1 = 7 =
116723456723456723456723456723456723456723456723456723456723456723456723456 7234567234567234567234567234567234567234567234567234567234567
2345672345672345-2-15735801234567234567

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