



Mitigating the Role of Weather in Runway Safety Occurrences



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Runway Safety: The Threat

- Runway Safety A safe flight from its start to its conclusion.
- Runway Safety:
 - Remains one of the most serious threats to aviation safety.
 - Continues to be one of the industry's highest priorities.



Safety: Last 20 years

- Since 1997...
 - Reduced the hull loss rate by around 70%.
 - Reduced the fatal accident rate by around 80%.
- **Runway Excursions (RE)**
- ✓ 3rd major cause of fatal accidents by numbers.
- Single biggest cause of hull losses.







(Airbus, 2017, p.24)





(Dutcher, 2018 after IATA, 2017)





Runway Safety: The Role of Weather

Weather and Runway Safety Accidents (2012 - 2016) [Percentage Contribution]



(Dutcher, 2018 after IATA, 2017)





Runway Excursion – Top Contributing Factors



49% of Runway Excursions between 2012 and 2016 had Weather as a Contributing Factor.

Latent Conditions	Threats	Flight Crew Errors	Undesired Aircraft States (UAS)	End State
Flight crew Training	Meteorology	Manual Handling Flight Controls	Vertical, lateral or speed deviations	Runway Excursion
Flight Ops SOPs	ANSP/ATC Interface	SOP Adherence / Procedural	Long, forced, bounded, firm or off-centreline landing	
Operational Pressure	Airport Facilities	Communication	Unstable Approach	
Safety Management	Aircraft Malfunction	Failure to go- around after destabilisation	Continued Landing after Unstable Approach	



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THREATS

Decision Making

- Flight crew decisions making contributed to approximately **66%** of the accidents (NTSB, 1994).
- Of these, about 75% have been identified as "plan continuation errors."

✓ Why?

- Inappropriate assessment of risk; and
- External factors.

✓ "Plan Continuation Errors (PCEs)"

Decisions to continue with an original course of action in the face of cues that signal that conditions have changed.

(Orasanu, 1993; Orasanu & Davison 2001).



SITUATION ASSESSMENT Recognise and interpret cues Assess risk (present and future)

THREATS

Assess time available



Failure to GOA & Unnecessary Weather Penetration

70% of pilots were dissatisfied with weather radar training (Goold, 2008)



(Source: IATA, 2017, p.124)





MURPHY'S LAW IS WRONG!!



WHAT CAN GO WRONG USUALLY GOES RIGHT, BUT THEN WE DRAW THE WRONG CONCLUSION







Normal people doing normal work...











Weather Safety Nets

- SIGWX Progs
- TAFs
- METARs
- SPECIs
- PIREPs / AIREPs
- SIGMETs
- AIRMETs
- Aerodrome Warnings
- LLWS Warnings









Agreement between MET & ATS

ICAO Annex 3 – 4.2

- Recommendation.— An agreement between the meteorological authority and the appropriate ATS authority should be established to cover, among other things:
 - a) the provision in air traffic services units of displays related to integrated automatic systems;
 - b) the calibration and maintenance of these displays/instruments;
 - c) the use to be made of these displays/instruments by air traffic services personnel; \sum_{sep}
 - d) as and where necessary, supplementary visual observations (for example, of meteorological phenomena of operational significance in the climb-out and approach areas) if and when made by air traffic services personnel to update or supplement the information supplied by the meteorological station; [10
 - e) meteorological information obtained from aircraft taking off or landing (for example, on wind shear); and
 - f) if available, meteorological information obtained from ground weather radar.
- <u>**Note:</u> See the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377).**</u>











ICAO Annex 3 – 4.4 - Special observations and reports

- 4.4.1 A list of criteria for special observations shall be established by the meteorological authority, in consultation with the appropriate ATS authority, operators and others concerned.
- 4.4.2 Reports of special observations **shall** be issued as:
 - a) local special reports, only for dissemination at the aerodrome of origin (intended for arriving and departing aircraft); and
 - b) SPECI for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET) unless
 METAR are issued at half-hourly intervals. [see]

<u>ICAO Doc. 8896 – 2.2.3</u>

"The issuance of SPECI is not necessary if METAR are issued at half-hour intervals."





METAR & SPECI Supplementary Information

ICAO Annex 3 - 4.5.2

Recommendation.— In addition to elements listed under 4.5.1 a) to k), local routine reports, local special reports, METAR and SPECI should contain supplementary information to be placed after element k).

ICAO Annex 3 - 4.6.8

Recommendation.— Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas. Where practicable, the information should identify the location of the meteorological condition.





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METAR & SPECI Supplementary Information



ICAO Doc. 8896 - 2.3.16.3

✓ In METAR, where local circumstances so warrant, wind shear should be included as necessary. Information on wind shear is added in the form "WS RWY 12" or "WS ALL RWY".







METAR & SPECI Surface Wind

ICAO Annex 3



- ✓ 4.6.1.3 Recommendation.— For METAR and SPECI, the surface wind observations should be representative of conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.
- 4.6.1.2 Recommendation.— When local routine and special reports are used for departing aircraft, the surface wind observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the surface wind observations for these reports should be representative of the touchdown zone.





Thunderstorm Avoidance

Section 8.X AVOIDING THUNDERSTORMS

"Do circumnavigate the entire area if the area has 6/10 thunderstorm coverage."

Section 8.X DEPARTURE AND ARRIVAL [AVOIDING TS]

"Use all available information for this judgement, including PIREPs, ground radar, aircraft radar, tower-reported winds, and visual observations. In the terminal area thunderstorms should be avoided by no less than 3 NM.

Section 8.X AVOIDING THUNDERSTORMS

"No Company flight shall be planned or caused to operate at any airport when any of the following are present:

• A thunderstorm is over the airport, along the departure or arrival path;"





What's in your Flight Folder?

Section 8.X DISPATCH BRIEFING

Prior to each originating flight duty, Flight Crew shall have reviewed latest operational documentation, including FCN.

The following self-briefing package will be provided:

- 1. Meteorological Information
- **TAF** airport forecasts for departure, destination, destination alternate and en-route alternate airports;
- METAR airport reports for the destination and the CFP alternate airport;
- Significant Weather (SIGWX) charts covering the intended duration of the flight;
- Wind and Temperature chart.

Where are the SIGMETs, VOLASH & TC Advisories?

NOT FOR USE





Airline's Policy on Use of PROB in TAF

NOT FOR USE

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Section 8.X METEOROLOGICAL INFORMATION AND INTERPRETATION

- TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM...TL, PROB 30/40 (alone)
- Deterioration:
- Transient / showery conditions: Not applicable. Mean wind and gusts exceeding required limits may be disregarded.
- Persistent conditions in connection with e.g. haze, mist, fog, dust/sandstorm, and continuous precipitation: Applicable. Mean wind should be within required limits. Gusts may be disregarded.
- Improvement: In any case should be disregarded.
- PROB TEMPO
- Deterioration: May be disregarded.
- Improvement: Should be disregarded.





Summary

- Weather plays a contributing role in 31% of all Accidents.
- **43%** for **Fatal Accidents** between 2012 and 2016.
 - Approx. **50%** of **Runway Excursions** & **Hard Landings** are Weather Related.
 - Approx. 75% of Undershoots & 1/3 of Tailstrikes.







Summary

- Weather accidents are NOT just a meteorology problem.
 "Can't control Mother Nature".
- We must further support decision making and manage the effect of weather on safety and operation ideally in a proactive manner.
 - ✓ Weather Risk Management









Summary



- Not just a "behavioural problem"... a "Cultural issue!"
 - Industry norms.
 - Company norms.
- Safety Awareness and Training Importance of Strategic (planning) and Tactical (in-flight) weather avoidance is best practice.







Conclusion



 Identify and address significant holes in MET regulations & procedures/policies.

- Can build-on existing programmes
 - 🗸 ALAR
 - ICAO Runway Safety
 - ✓ IATA Runway Safety
- ✓ Decision Support integrated into other tools
 - Translates weather into IMPACTS.
- Real-time uplink of weather data into the cockpit must be improved.
- Real-time downlink of weather data captured by the aircraft must be improved.











Thank You!

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