Predictive Mishap Recognition using the Metrics of Unusuality in Commercial Flight Operations


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Negative Stressors (sample list)

Environment:
Low visibility, below minimum weather, convective weather, compressed ATC vectors, non-precision approach, unfamiliar and uncontrolled airports, high terrain, night ops, high frequency IMC ops, in-flight icing, runway contamination, windshear.

People:
Fatigue, weak training, low experience, dispatcher disconnect, automation confusion, unstable approach, FMS errors, crew authority gradient and compatibility, lack of supervisory oversight, human factors, language difficulties, hand flying skills, IOE training flights.

Equipment:
System and automation complexity, inconsistent/vague SOP and AOM, inside-outside cockpit maneuver, performance limiting MELs, ground de-icing and anti-icing.

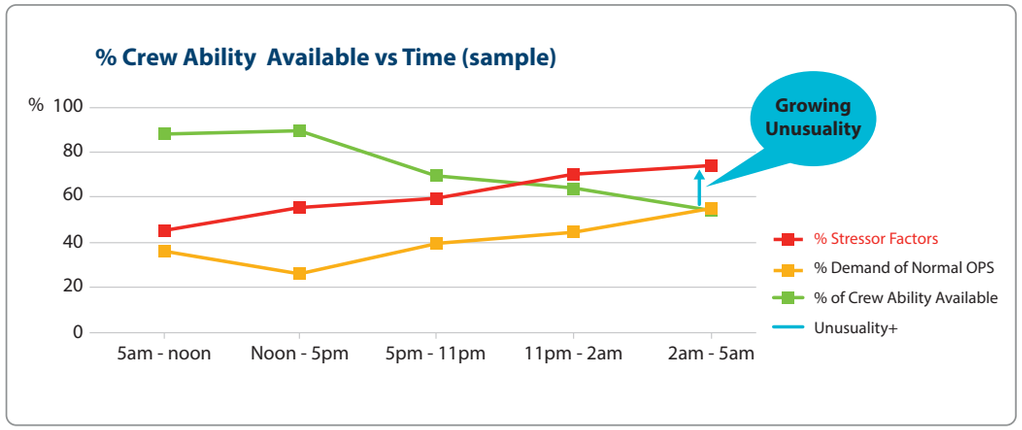
Unusuality

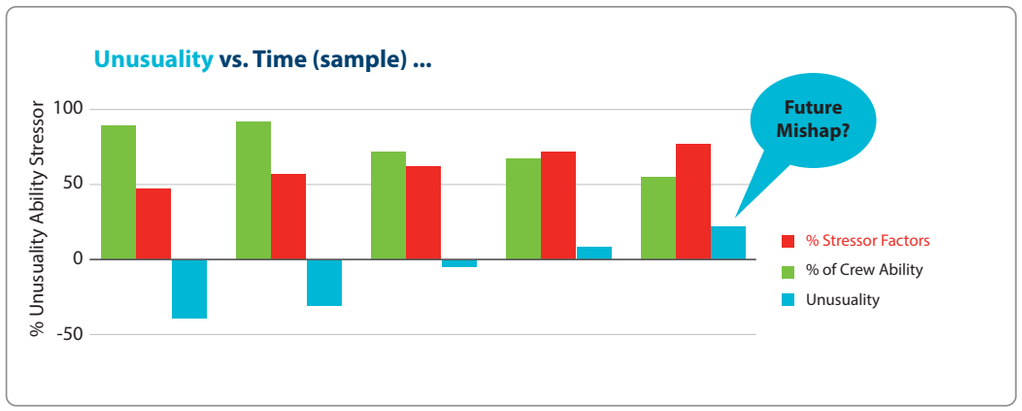
Unusuality is the difference between collective Negative Stressors (shown in red on the graphs) & Crew Ability at any given time (shown in green). When Unusuality is measured to be positive, hazardous conditions may exist. Local procedures should be adjusted to bring Unusuality back towards zero, meaning that the crew ability meets or exceeds collective operational demands. In this example, between 11pm and 2am Unusuality value is positive, meaning that hazardous conditions may exist.

Unusuality Recognition Metrics

- Look at the **people**, the **equipment** and the **environment collectively** vs individually
- Compare Negative Stressors collectively with current crew ability to determine level of Unusuality
- **Adjust local operational procedures to decrease or eliminate Unusuality**
- Locally generated procedures, Jointly agreed upon by company, pilot union, FAA or regulator

(data from Miller and Williams Predictive Mishap Recognition Using Unusuality Study, 2015, SafetyForecast.com)





Mishaps examples where negative stressors exceeded ability of crew to cope, per AAR of investigating board: KLM 4805 & PanAm 1736 Tenerife, AF447, American Eagle 4804 Rosemont, Swissair 111, Singapore 006 Taipei, AA1420 Little Rock, Alaska Air 261, Asiana 214 SFO, UPS 1354 BHM, Korean 801 Guam, Colgan Air 3407 Buffalo, SWA 1248 MDW, American Eagle 5401 SJU.

(data from Williams and Miller Study of Commercial Mishaps, SafetyForecast.com)