Where is using probabilities hard?

- Regulatory Compliance – FAA regulations says “appropriate weather reports or forecasts, or any combination of them”. Current interpretation causes same action if it is 10% chance or 90% chance.

- Safety Risk – If there is only 20% chance of severe turbulence, that means 1 out of every 5 days severe turbulence could be observed in this same situation. That seems like a very real risk of encountering severe turbulence. Severe turbulence can injure our customers or crews and the aircraft is taken out of service for an inspection. However, if we avoided 1% chance of turbulence, we would be overly cautious because of errors in the models. Finding ways to use probabilistic for low probability but very high impact has proven difficult.

- Customer Service – Inflight services on international flights have a little flexibility on timing. Providing probability of some turbulence thresholds so flight attendants can plan the timing of service has been discussed, but training and model reliability is still an issue.

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Where have probabilities work?

- Preparing for Irregular Operations
  - Knowing which stations are potentially impacted
  - Probability of x" vs y" of snow accumulation helps airports determine how difficult it will be to keep ramps, taxiways and runways clear or how impacted a region can be for staffing concerns
  - Move resources from stations with 0% probability to stations needing help
  - Auditors to stations with high % of occurrence

- Employee Safety – knowing which employees are at risk
  - Probability of wind > x kts
  - Probability of rainfall > y inches

- Seatcaps
  - Aircraft are planned on a city pair based on historical normal. When heatwaves occur, some flights will need to weigh less to get enough performance to complete the flight. If we know this is a risk, we can stop selling seats days before the flight departs so we don't have to deny boarding at the gate. We can use xx - percentiles to plan 1, 3 or 5 days in advance.

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Challenges Encountered

- Every airport has its own set of thresholds. For example, Fargo, ND is used to snow all winter, so we do not consider it “Irregular” until they get more than 4”. However, a station like Pensacola, Florida is “irregular” for a flake of snow.

- Training – probabilities are confusing. People want yes/no and don’t know what do do with 20% chance. Lose attention if providing many probabilities.

- Data Availability –
  - Industry website often have pre-defined thresholds. What is probability of temperature exceeding 90-degrees at 3pm tomorrow? You can likely find answer. But what is probability of temperature exceeding 93-degrees at 3pm tomorrow is hard to find. Private companies often don’t have capacity to run many different probabilities for every station for every hour.

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