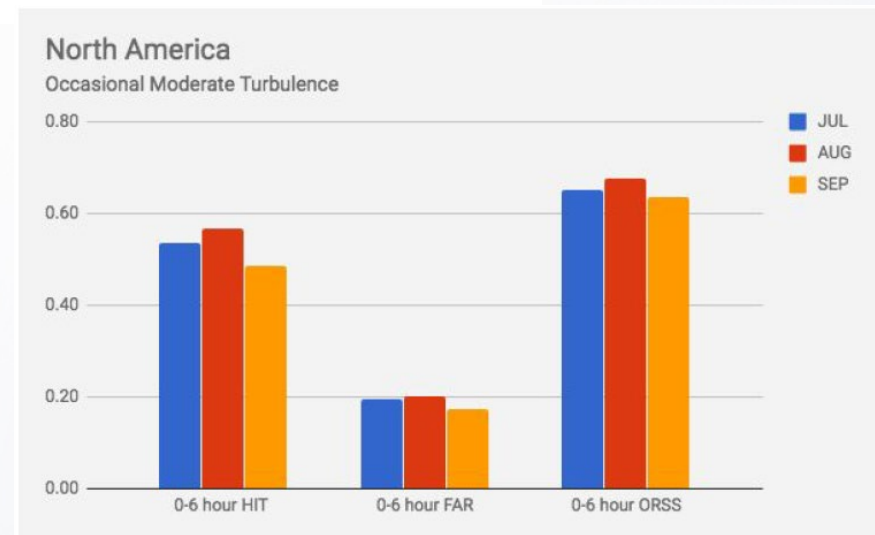


Assessing Weather Forecasts in Commercial Aviation

- Commercial Airlines with either internal or contract weather services must demonstrate product verification via Enhanced Weather Information System or EWINS
- EWINS approval, from FAA, certifies the airline, not the weather provider
- The Weather Company (TWC), AA's Provider, delivers QA reports for TAFs and Enroute Turbulence Forecasts
- These evaluations are strictly weather, not tied to operational decisions



Assessing Weather Forecasts in Commercial Aviation

- Significant Event Reviews also requested/prepared, mostly when AA Hub severely impacted, or when event was a surprise
- Meteorology not the only assessment in these events...Performance reviewed in dispatch, schedule reduction (did we cancel proactively, not enough), airports operations (enough de-icing trucks?), and FAA traffic management initiatives
- Growing trend with regards to risk reduction as more TWC products include information on event confidence
- Bringing this all together is very complex, weather just one contributing factor in complex airline decisions.

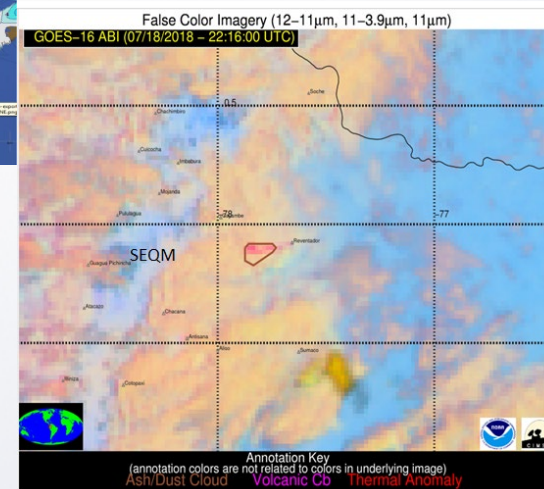
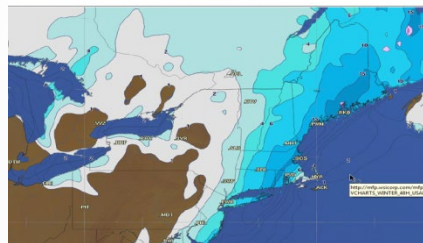
Outlook for NYC 4 Jan (issued 3 Jan)

Valid Times		Category	Forecast weather	Wind (knots)	Temperature (F)	SNOW		ICE	
GMT	Local					PERIOD	TOTAL	PERIOD	TOTAL
06 -09Z/4	0100-0400/4	A	-SN	01015G24KT	28 - 27	0.5-1	0.5-1		
09 -12Z	0400-0700	B/C	SN/+SN/BLSN	36019G30KT	27 - 27	1-2	1.5-3		
12 -15Z	0700-1000	B/C	SN/+SN/BLSN	36021G34KT	27 - 26	1.5-2	3-5		
15 -18Z	1000-1300	B/A	-SN/SN/BLSN	35021G34KT	26 - 28	1-2	4-7		
18 -21Z	1300-1600	A	-SN/SN/BLSN	33019G30KT	28 - 28	0.5-1	5-8		
21 -00Z	1600-1900	A	-SN/BLSN	31020G32KT	28 - 26	T	5-8		

Forecast Concerns: Light snow will overspread the NYC area near 1 am. Snow may become moderate-heavy at times around and after 4 am. The heaviest snow will likely be 6-11 am when there is the greatest risk for 1/4SM +SN. Snow will taper off during mid-afternoon and end around 5 pm. Overall, forecast data has trended heavier with total snowfall for NYC and confidence is increasing. There are still some differences between the forecast models, so some further changes are possible. Snowfall of 5-8", lowest at EWR and highest at JFK. This will be a powdery snow with blowing and drifting.

SNOW OVER NEW ENGLAND AND EASTERN MID-ATLANTIC THURSDAY.

SYNOPTIC SITUATION: A powerful low pressure center will pass well offshore of the Mid-Atlantic Thursday morning, about 75 NM ESE of Bermuda Island Thursday afternoon then depart into the Canadian Maritimes later Thursday night. This system will bring moderate snowfall and gusty winds to the eastern Mid-Atlantic and eastern NY. Heavy snow with blizzard conditions expected over parts of eastern New England including Boston. Forecast models are not doing a great job resolving the details on how precipitation bands evolve and set up with this system. Of course, that uncertainty leaves room for error and possible changes in the forecast even though we are within 24 hours of the start time for NYC and BOS. The highest potential for large shifts in the forecast is for eastern NY and the eastern Mid-Atlantic where forecast models have a wide range of solutions.



Reports from AA TAPS equipped Aircraft

Table 1: Turbulence Severity Breakdown – 2018

Month	Ride Quality	Light	Moderate	Severe
January	23,960	8,480	210	8
February	25,319	10,791	291	14
March	29,025	12,287	323	28
April	27,971	12,734	397	23
May	27,107	12,571	354	38
June	24,565	10,746	291	28
July	21,541	9,004	355	21

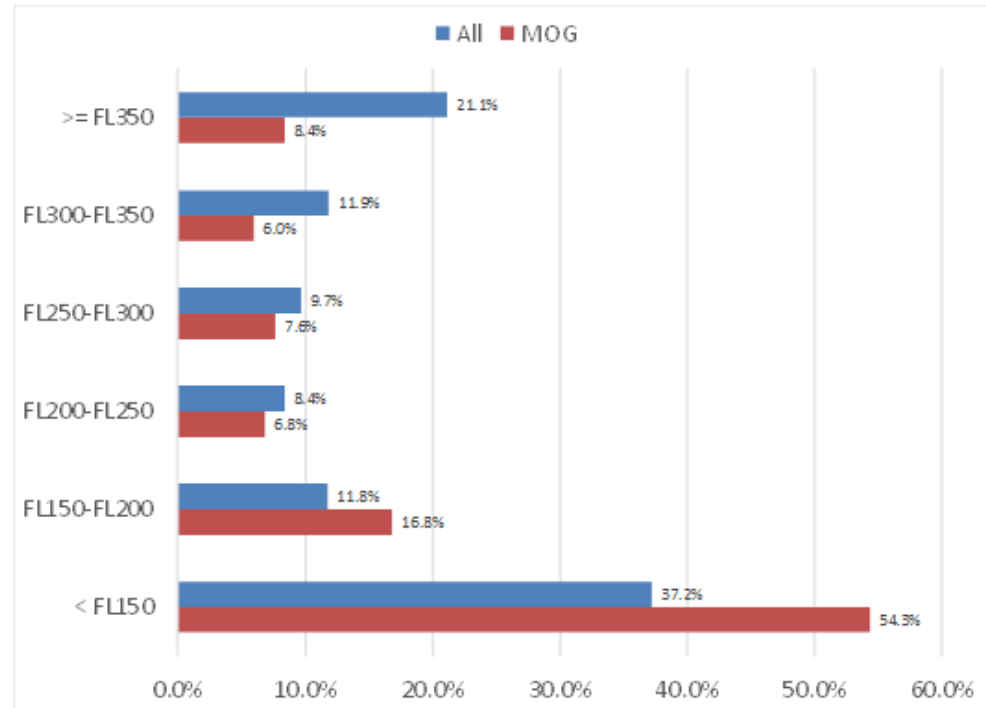


Figure 2: Turbulence Report Flight Level Breakdown

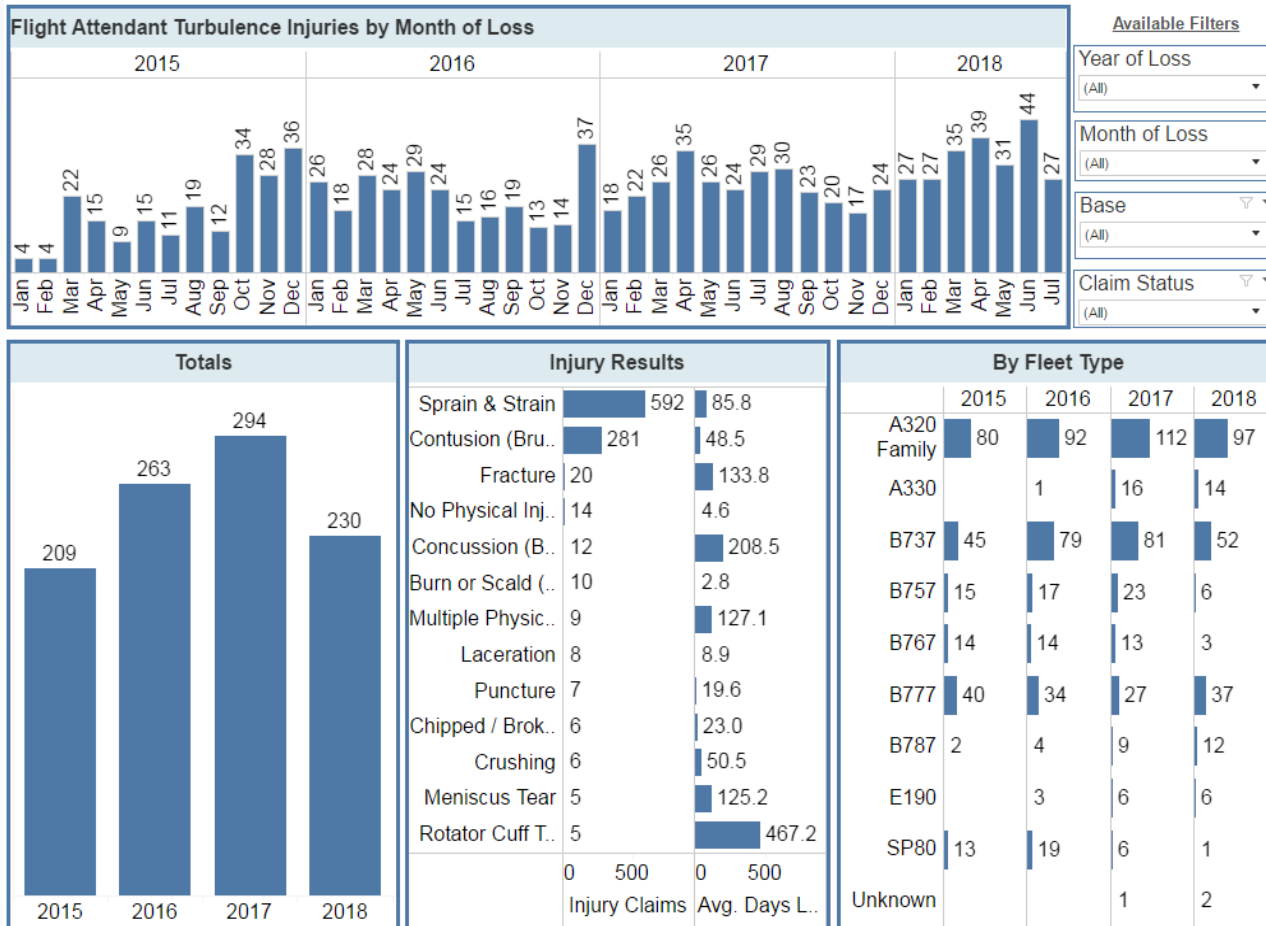
Summary

The following information and figures show a summary of reports from 2018.

1. Total Turbulence Reports – 258,482
 - a. Moderate or Greater – 2,381
2. Total Heartbeat Messages – 1,945,857
3. Estimated Number of Flight Hours – 648,619
4. Estimated Number of Turbulence Reports per Flight Hour – 0.40
 - a. Moderate or Greater (per 100 flight hours) – 0.37

Flight Attendant Injury Data

American Airlines Flight Attendant Turbulence Injury Dashboard



Noteworthy:

- Injury data not yet normalized by flight hour, so some of the steady increase due to more flights
- As noted earlier, while number of incidents seems to be on a steady state, injuries to FAs may be increasing
- This is relatively new and we are very interested in adding attributes like phase of flight, length of flight, intensity of turbulence encounter (not always available), regional analysis, and more...
- We are deep diving into injuries occurring on TAPS equipped aircraft where more objective data is available.
- Flight attendant and pilot reporting is not standard and we still do lots of manual analysis