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A Major Way to Mitigate Diversions & Delays From Weather-Caused Hub Disruption

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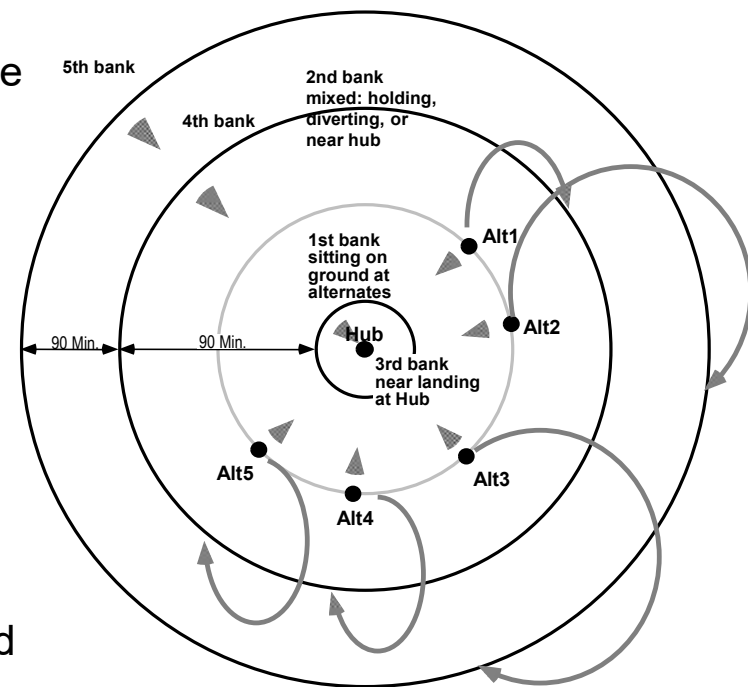
The Leadership Challenge: Predictable Hub Meltdowns

- Weather-related hub disruptions are no longer rare exceptions — they are a structural, recurring cost driver.
- Two distinct disruption types
 1. Prolonged regional events (hurricanes, multi-day snowstorms)
 - Now managed through pre-cancellations — not our focus here
 2. Single-day weather events (fog, thunderstorms, snowbursts)
 - The true operational risk
 - Every carrier with >100 aircraft faces several per year
 - Example: American Airlines has recorded >10 diversions at DFW on 20+ days and ORD on 35+ days annually
- The cost reality
 - Each diversion >\$100,000
 - Even one major day = millions lost and days of recovery
- Why severity is increasing
 - More intense weather patterns
 - Load factors rising from ~75% to 90–95%
 - Passenger reaccommodation now drives recovery timelines, not fleet or crew availability
- Leadership takeaway:

This is a predictable, recurring, high-cost problem — and it is solvable with better planning science.

Why Today's Diversion Strategy Fails

- Standard operating practice:
 - Pilots hold until fuel is low, then divert
 - Holding consumes 60–90 minutes; diversion to alternate adds another 30–45
 - At the alternate: refueling queues, departure queues, out-of-sequence arrivals
- Business impact:
 - 4–5-hour final delays per aircraft
 - Massive operational ripple: missed connections, cancelled banks, illegal crews
 - Passenger disruption lasting *days*
- Leadership takeaway:
 - A reactive process guarantees lost money
 - A proactive process preserves schedule integrity — and millions of dollars





A Solution Already Proven... and Ready for Today's Technology

In 1991, **American Airlines** tested an idea decades ahead of its time — **planned enroute fuel stops** during forecasted hub disruptions

- The results:
 - 50 expected diversions
 - Only 2 occurred
- The economics:
 - Planned enroute stop: ~\$10,000
 - Unplanned diversion: ~\$100,000+
- Why it wasn't deployed then:
 - Required ~20 specialized dispatchers coordinating in real time
 - 1991 technology couldn't automate these decisions
- Why it *can* be deployed now:
 - AI + ADS-B real-time flight tracking
 - Historical corner-post flow-deterioration models
 - Automated hold-time and fuel-margin prediction
 - Direct integration into flight-planning and flight-following systems
- Leadership takeaway:

What was manually impossible in 1991 is algorithmically simple today



A New Alternative for Irregular Operations Dump Enroute Instead of Divert



- **Pre-plan enroute first-tier operational alternates for all flights beyond first tier cities. Prepare to implement on a day when there is severe weather forecast for the hub. Prepare multiple flight plans and plan fuel accordingly for all farther out than first tier flights into the hub on that day.**
- **Implement plans to land the entire airborne portion of the next inbound complex if a "ground stop" exists in the first-tier cities when flights have reached approximately 45 to 60 minutes out from the hub (DFW or ORD). The triggering "ground stop" would be for conditions unacceptable for landing, not just for reduced traffic flow.**
- **Land immediately at the operational alternate. Do not hold.**
- **If the complex has already come in past the first tier when a weather situation commences, immediately divert to the operational alternate without holding.**
- **At the interrupted flight destination, do not proceed to a gate, unless required for fueling. Add minimal fuel (3000-5000 pounds) needed to resume flight. Get back into air as soon as receive ATC clearance, after hub opened up again.**
- **Resume flight into hub**



DFW Example: Predicting the Breaking Point

Every major hub has inbound “corner posts” with known hourly flow profiles. Weather degrades those flow rates in historically consistent ways

- AI-driven modeling uses:

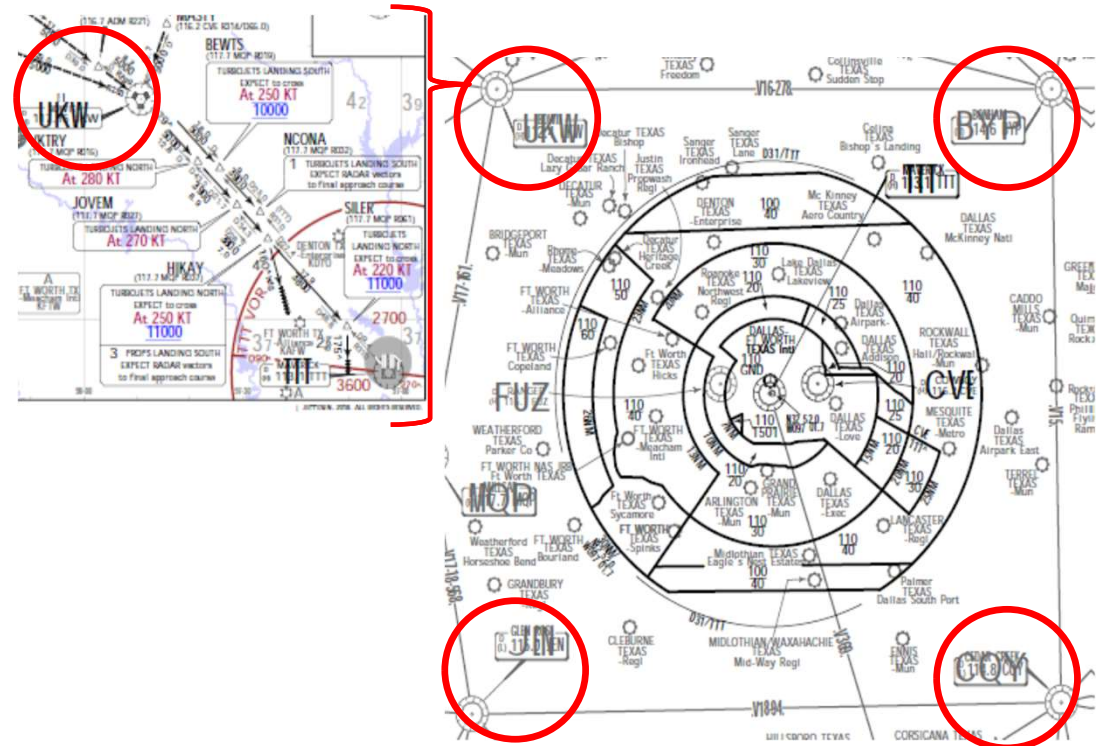
- Real-time ADS-B position data.
- Active flight-plan fuel data.
- Scheduled vs. actual traffic load.
- Historical degradation curves.

- Output:

- Predicted hold time per inbound aircraft.
- Fuel adequacy by flight.
- Recommendation: continue or land short.

- Leadership takeaway:

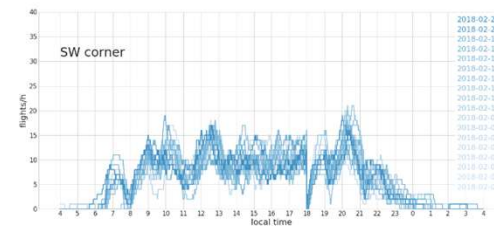
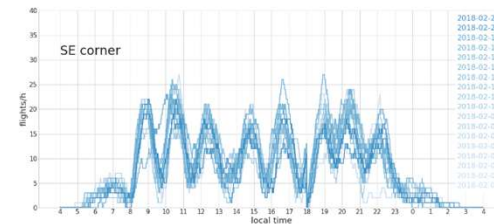
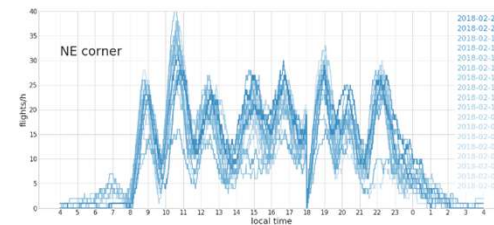
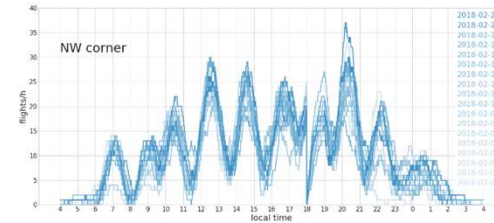
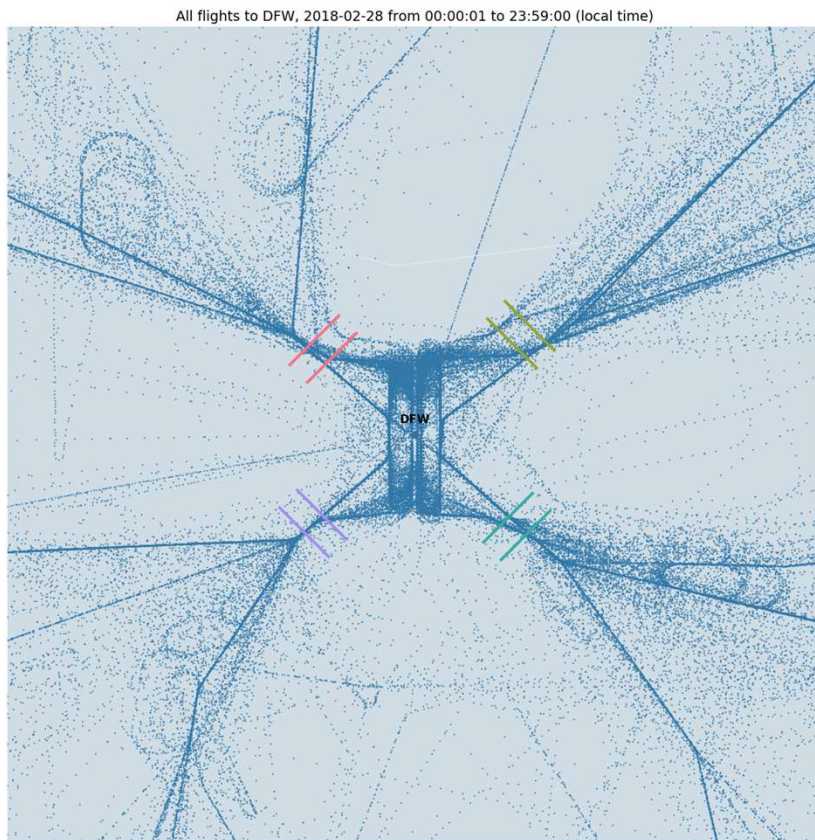
Disruption forecasting is no longer guesswork — it’s measurable, model-driven, and fully automatable





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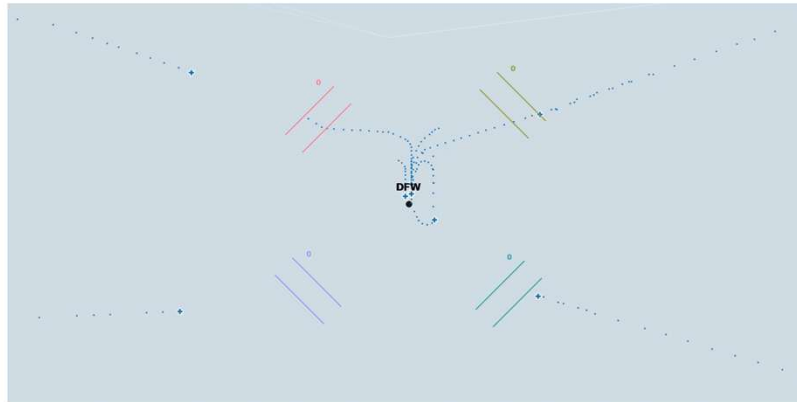
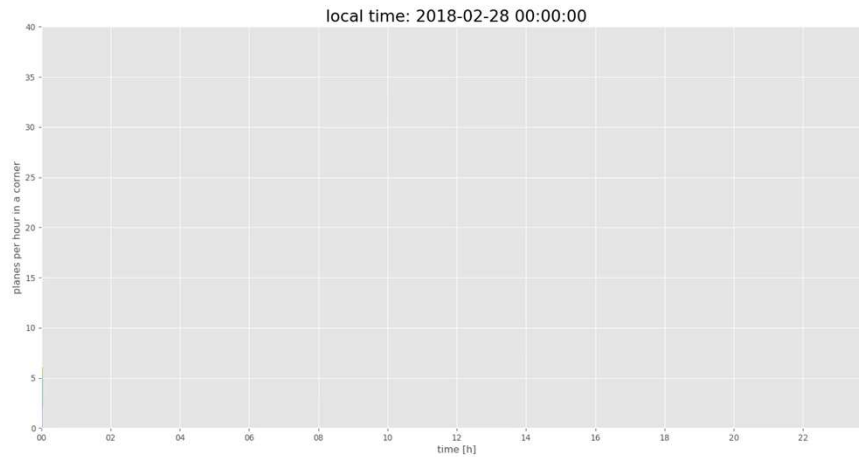
Trajectories of Flights Destined to DFW: All Airlines





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One Day at DFW (animation): All Airlines



Worst Days

date	no_divs	no_delays	no_flights	avg_delay
2018-02-20	47	415	778	93.519525
2018-02-28	44	176	781	13.953297
2018-04-13	47	330	789	34.032810
2018-06-07	66	244	841	36.268428
2018-07-12	47	264	856	50.521292
2018-08-18	50	162	762	27.519766

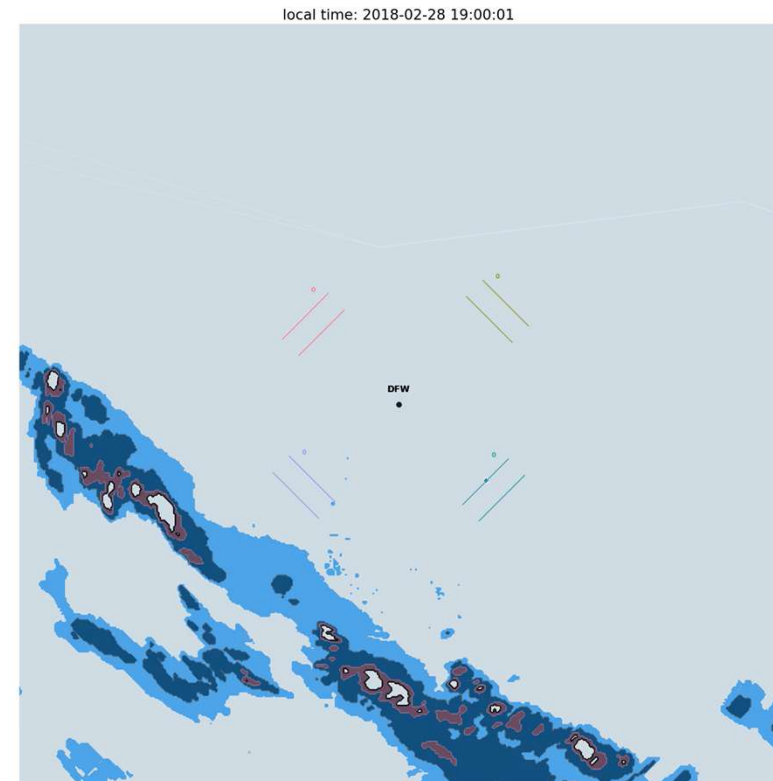
Best Days

date	no_divs	no_delays	no_flights	avg_delay
2018-01-19	0	43	765	3.740498
2018-01-20	0	25	560	3.535842
2018-03-31	0	33	602	3.893333
2018-04-24	0	41	752	4.280959
2018-04-28	0	27	641	3.540625
2018-05-08	0	56	776	5.597132

A Major Disruption Day – Flow Migration (animation)

- These visuals clearly show:
 - How traffic moves during disruptions
 - How corner-post degradation cascades
 - How predictable the patterns actually are
- Leadership takeaway:

The behavior is not random — making it manageable and useful for defining and building a solution



AI-Powered Disruption Prevention: The New Standard

- How the system works at scale:
 1. Analyze scheduled flow vs. historical actual flow
 2. Forecast degradation based on current conditions
 3. Translate degradation into hold-time forecasts
 4. Match hold-time forecasts against fuel-on-board
 5. Identify at-risk flights 45–60 minutes from the hub
 6. Land only the at-risk flights enroute — maintain flow and bank sequence
- Where this applies:
 - **Fog hubs** (ATL, LHR, FRA, AMS, etc.)
 - **Thunderstorm hubs** (DFW, MIA, MEX, SFO, etc.)
 - **ATC-constrained hubs** (JFK, LGA, EWR, etc.)
- Impact:
 - Diversions reduced dramatically (50–80%+)
 - Recovery time cut from ~5 hours to ~2 hours
 - Delay-minute costs drop >60%
 - Passenger disruption reduced from days to hours
- Leadership takeaway:

This is one of the highest-ROI operational improvements available to a modern airline

Executive Conclusions & Strategic Next Steps

- The problem
 - Weather-driven hub disruptions cost millions annually
 - Traditional diversion management amplifies the damage
 - Crew and passenger displacement compound costs
- The Solution
 - A tested, validated operational model exists
 - AI + ADS-B automation finally make it practical at scale
 - Implementation cost is modest; financial impact is transformative
 - Diversions and meltdown effects can fall by up to 80%
- The Opportunity
 - Become a first-mover in proactive disruption management
 - Strengthen brand reliability and passenger trust
 - Reduce operating volatility
 - Deliver multi-million-dollar annual savings
- Call to Action
 - The data exists
 - The algorithms exist
 - All that's missing is a decision to implement



What's needed is the decision to implement by an airline, and a collaboration with a vendor

My Background



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- A career in airline fuel efficiency & disruption management
 - Built the world's first IRROPS system for Iberia in 1989
 - Fuel management in Flight Operations at American Airlines
 - Vice president of program management for Ops. & MX at LATAM Airlines
 - Vice president of daily operations at Air Jamaica
 - A consultant on efficiency improvements to airlines, at Boeing
- A member of AGIFORS since 1987
 - Co-Chairman of this conference since 2019
- Today, a new consulting business to improve the efficiency of airline operations in **Fuel & Disruption**

Questions?



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Thank You!

