COVID-19 Impacts on Aviation Ecosystem

Mike Robinson
The MITRE Corporation

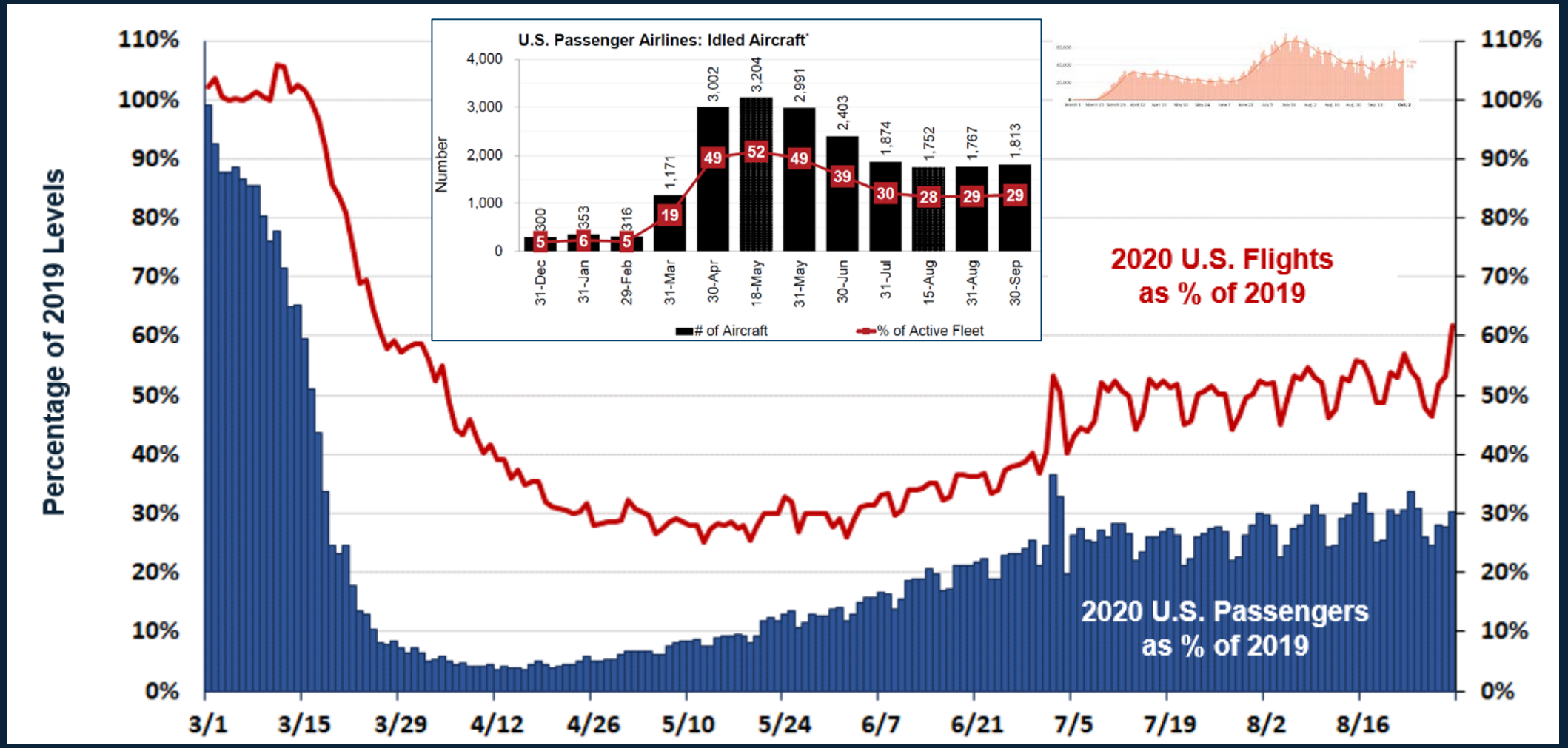
MITRE | SOLVING PROBLEMS FOR A SAFER WORLD

Outline

- **Air Traffic Operations during Pandemic – Summary**

- **Pandemic Consequences Closer to Aviation Weather Community**
  - Reduced Aircraft Based Observations (ABO) and NWP – Eric James (NOAA GSL)
  - Impact of COVID-19 on European METARs – Gordy Rother (FAA)

COVID Impacts on Passenger / Flight Operations (U.S.)



Passengers: TSA passengers screened
Flights: OAG Flight Data: scheduled flights flown with at least one endpoint at a U.S. airport. (Includes a negligible amount of scheduled cargo flights.)

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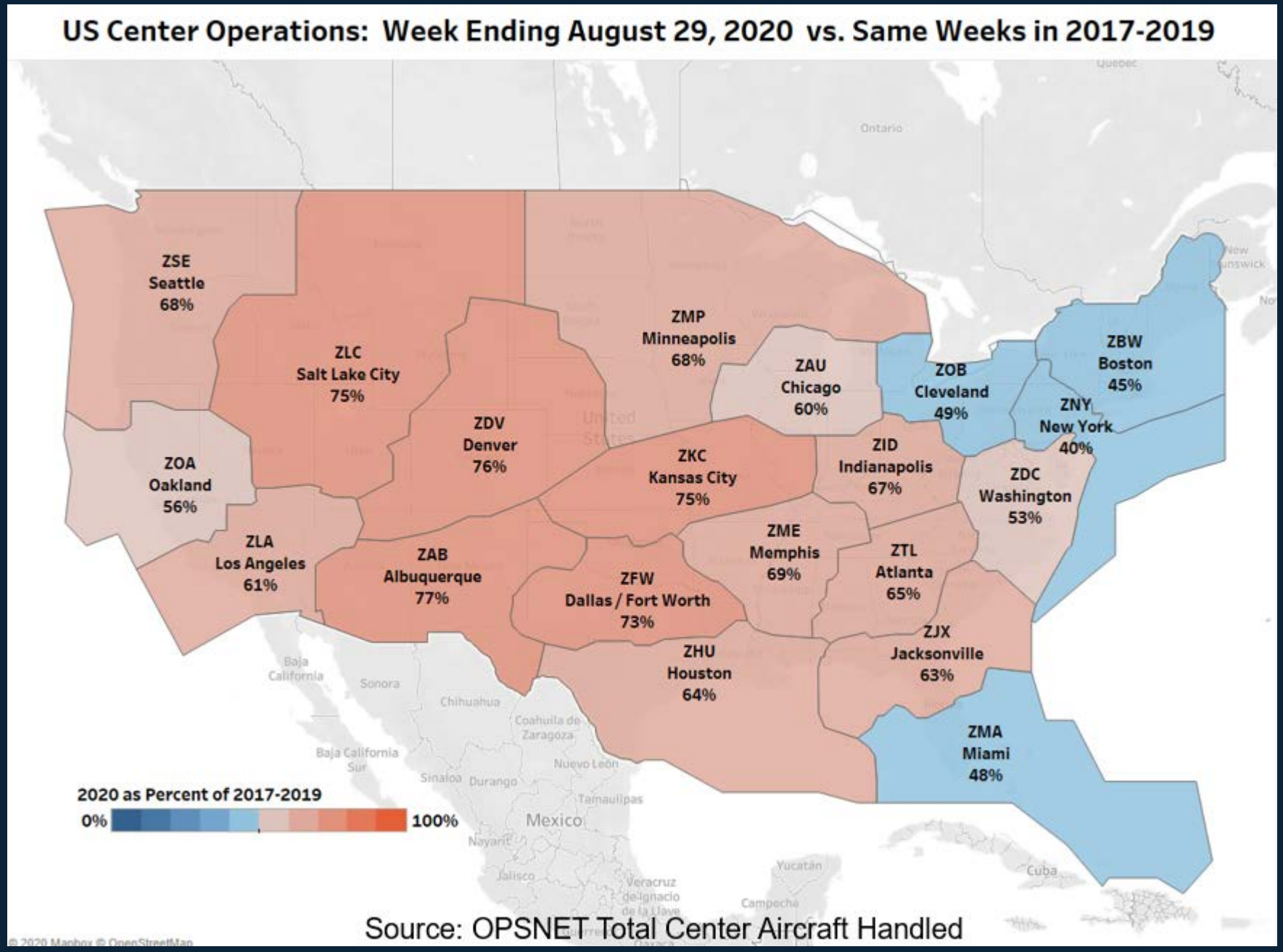
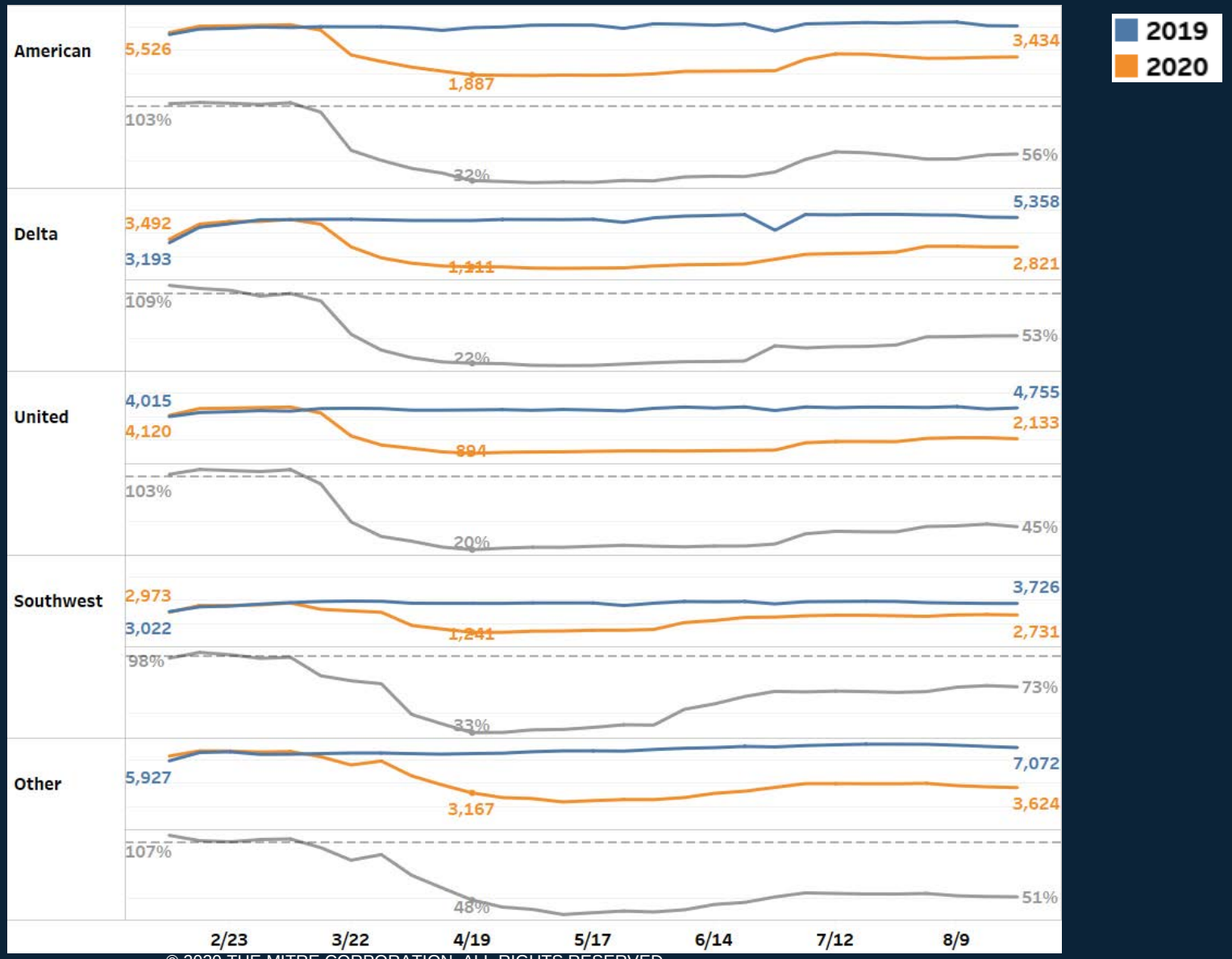
U.S Airspace Utilization

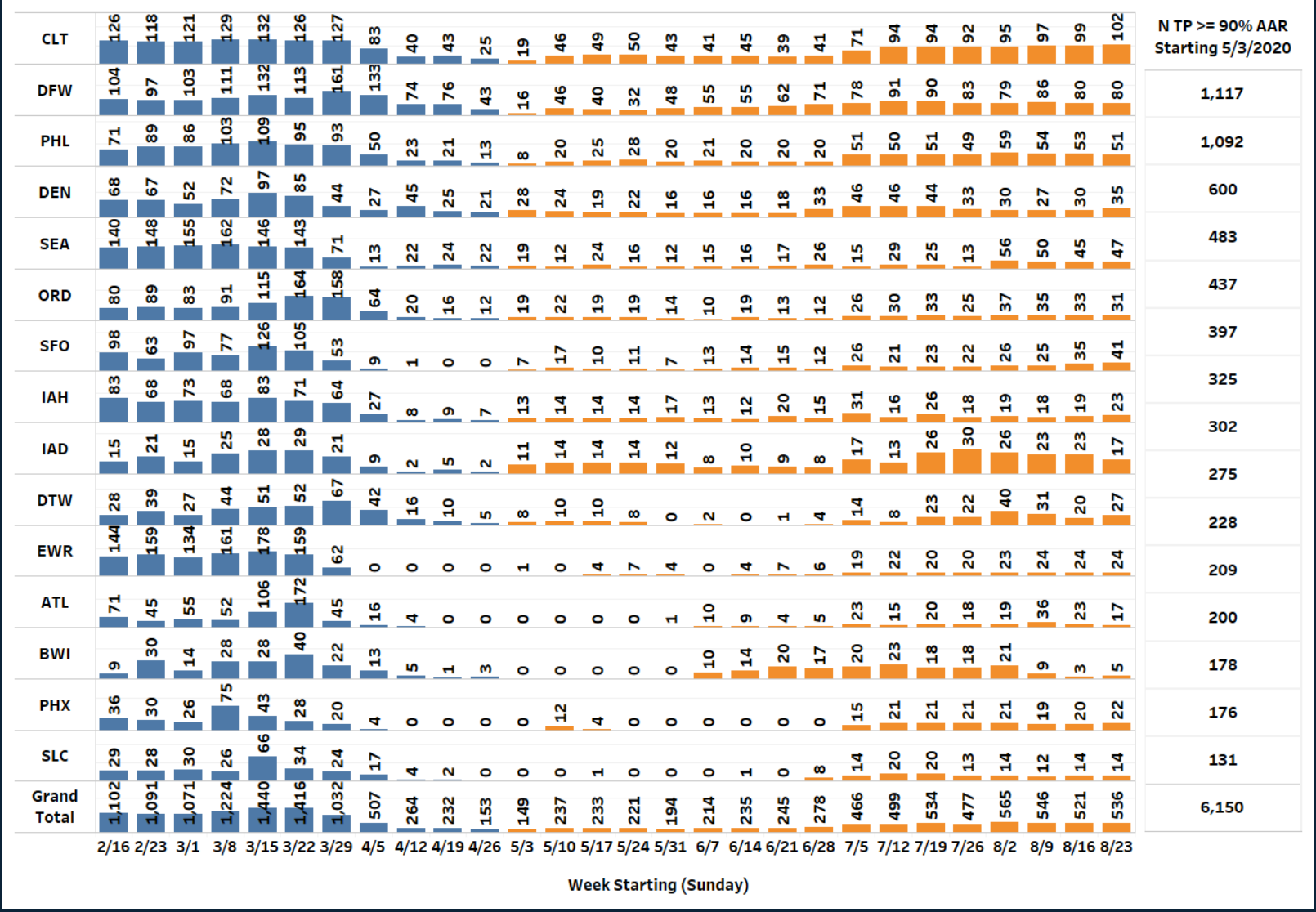


Average Daily U.S. Departures for Four Largest Carriers



Number of Peak Arrival Periods By Airport and Week

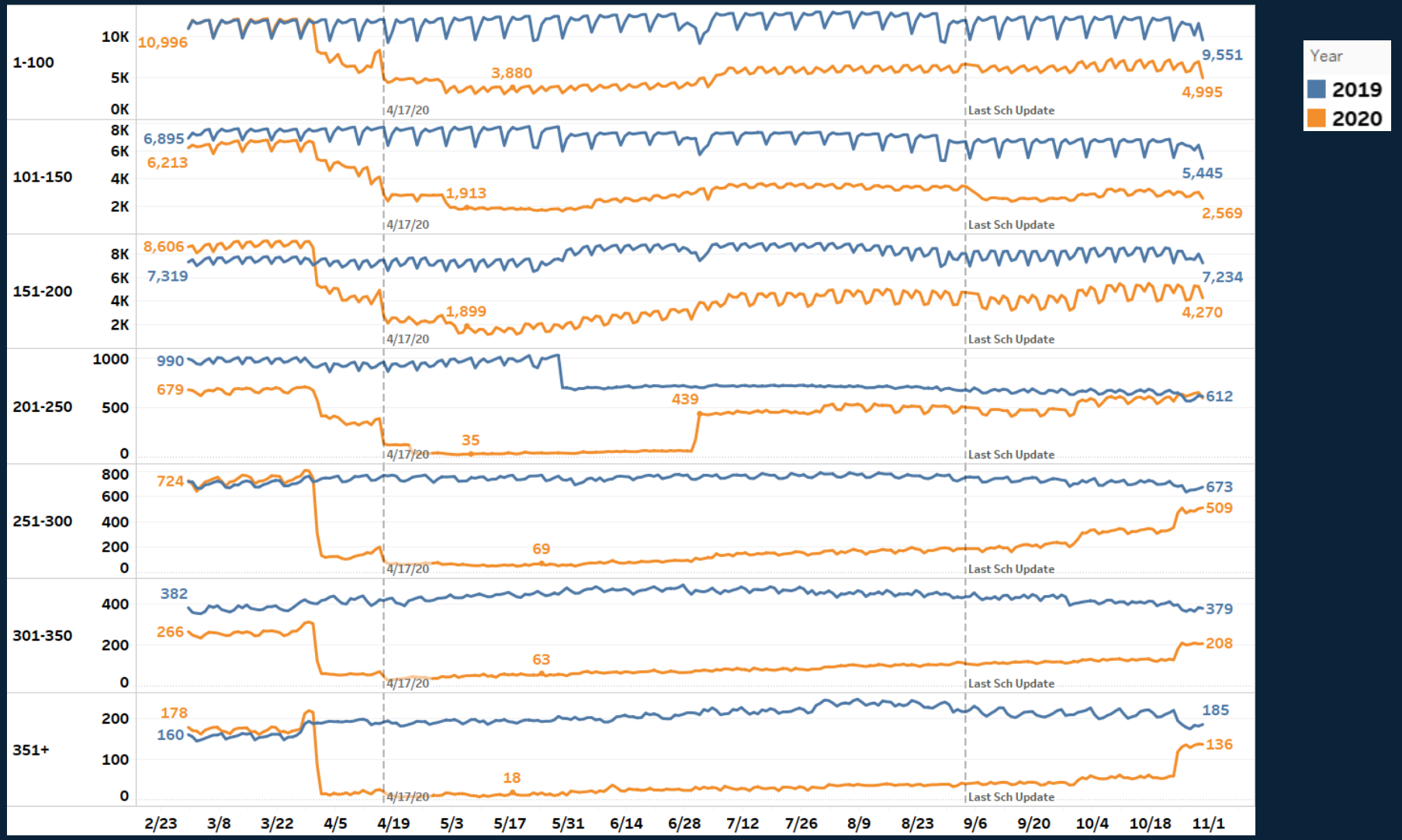
For Airports with Most Peak Periods Starting May 3, 2020



Source: ASPM number of quarter-hours per week where actual arrivals greater than 90% of AAR is the measure of peak periods used

Traffic Management actions are often needed during peak periods

Daily Scheduled US Air Carrier Flights By Number Of Available Seats



US scheduled arrivals and departures by day for Jan – Oct 2020 (orange) and same dates in 2019 (blue) for 9/4/20 schedule update

By number of scheduled seats

Note large decrease in use of scheduled 201+ seat aircraft in July

Source: Innovata

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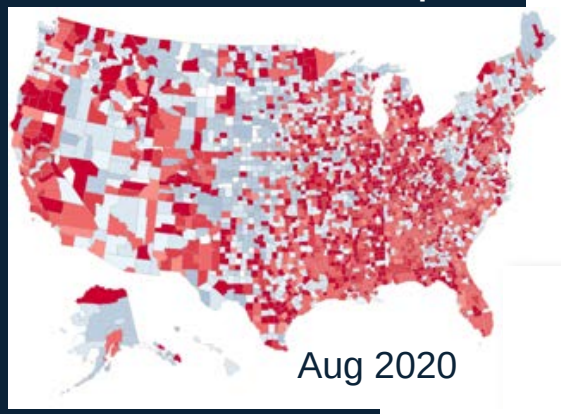
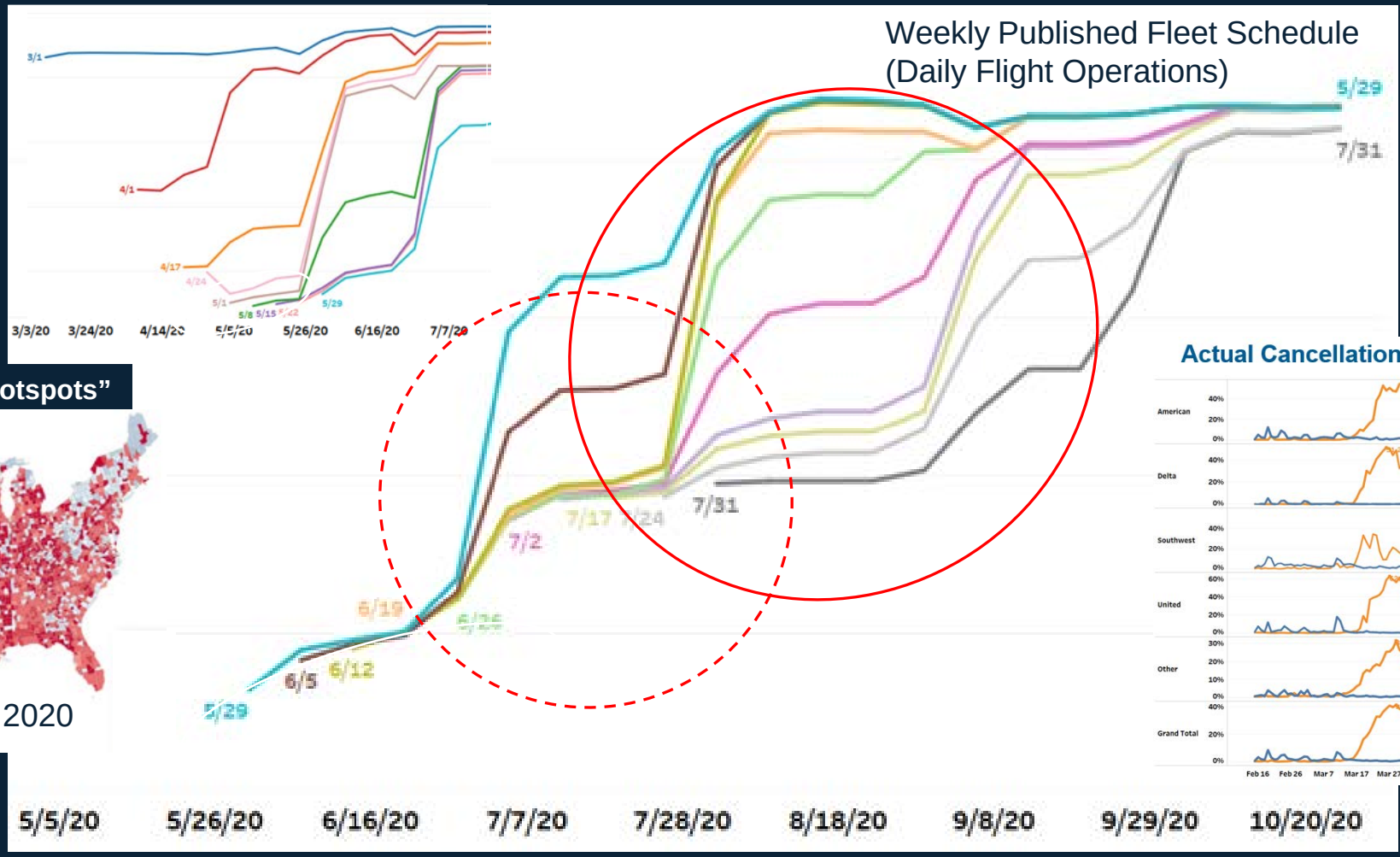
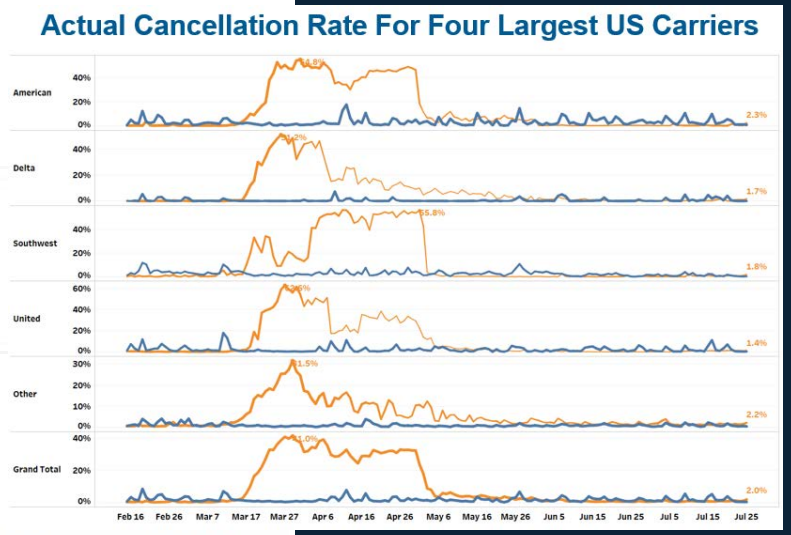
Pandemic and Passenger Sentiment Driving Distinct Air Travel Demand Responses

MITRE COVID-19 "Hotspots"



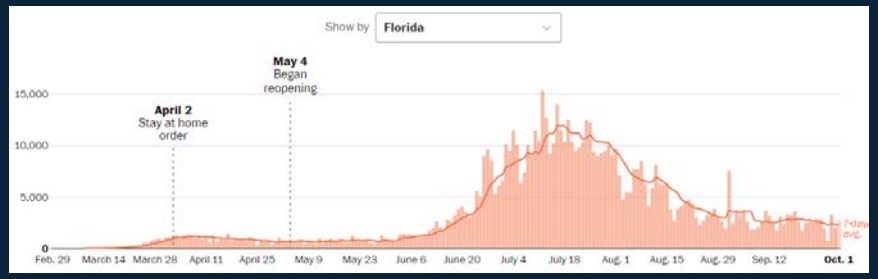


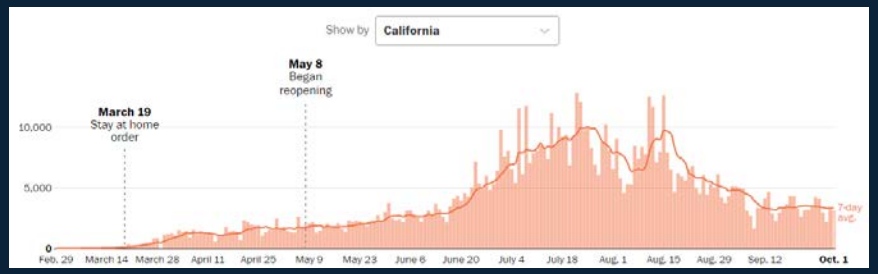


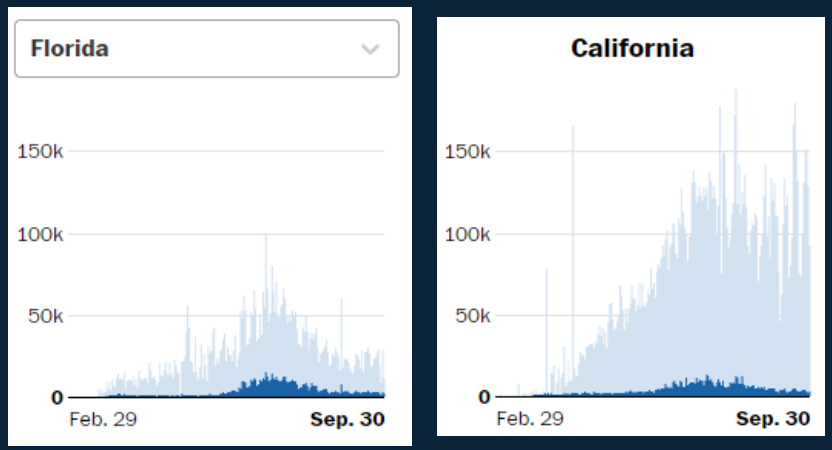
Takeaway: Flight operators trying to anticipate passenger sentiment, ability to travel – and struggling MITRE working to anticipate demand behavior given new type of constraint management

Infection Rates Only Part of the Story…and Can Be Misleading

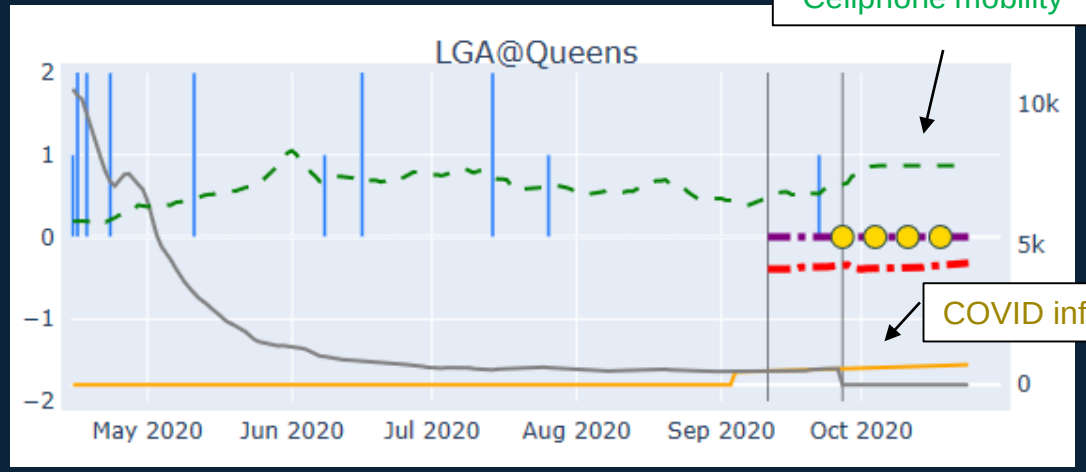
Daily Infections







washingtonpost.com



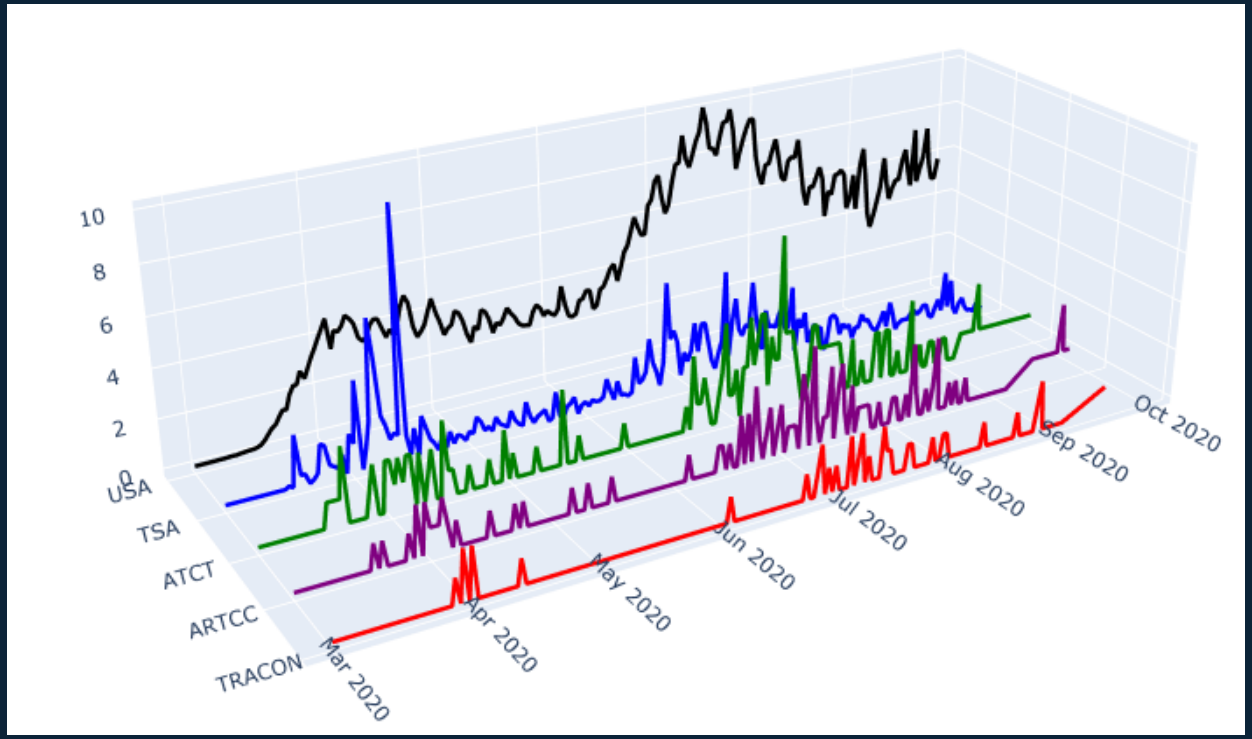
New York

Alabama

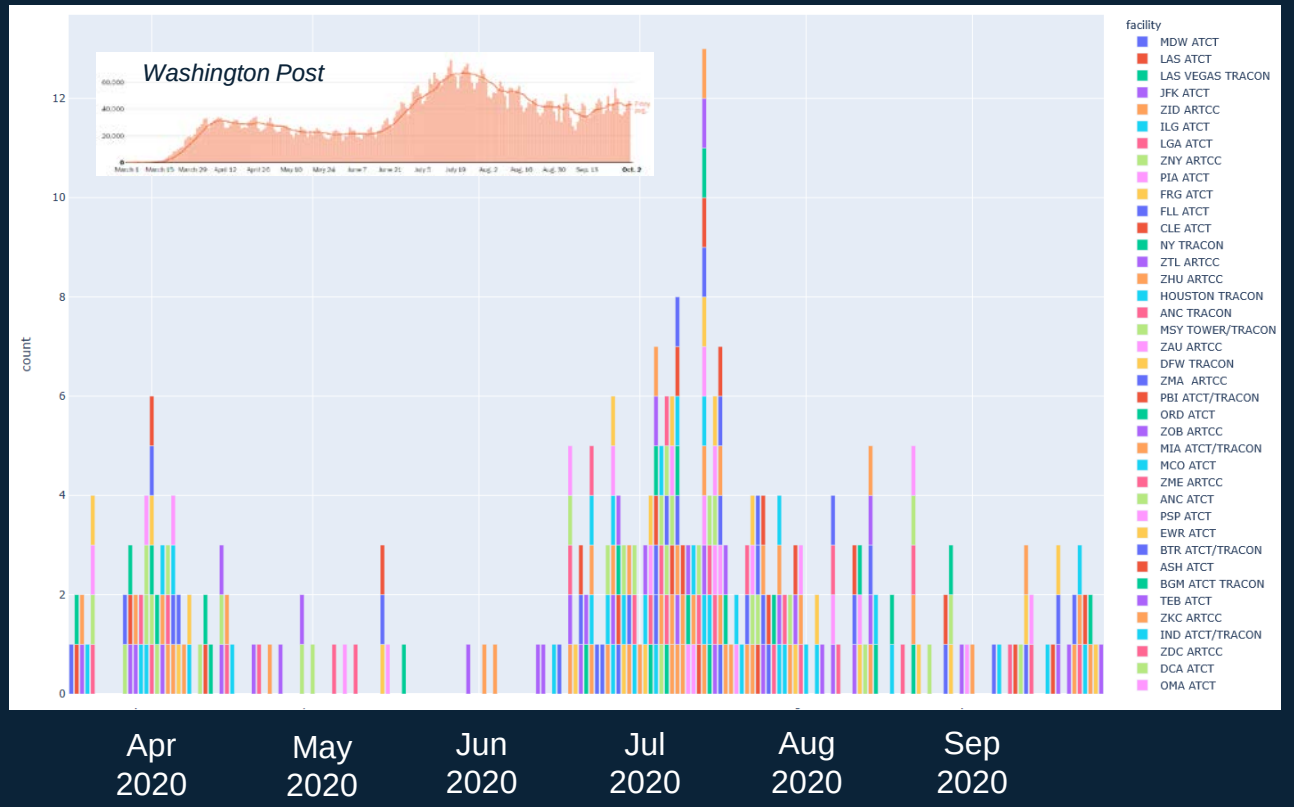
NY Times

At Its Core, COVID-19 Impact in Aviation is Also a Human One

COVID-19 Infections



COVID-19 Infections at Individual ATC Facilities



Takeaway: COVID-19 impact, at its core, is a human impact – and air traffic operation is no exception
But, infection incidents are foundational data only – risk-managed air traffic operations during pandemic requires much more data intelligence

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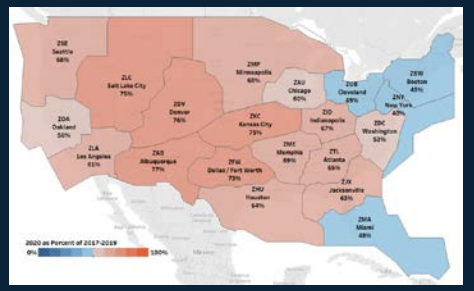
COVID-19 Impact on Aviation Ecosystem
Summary and Takeaways

- **COVID's crushing impact, some recovery, then stagnation**
- **Impact / Recovery varies (some) regionally**
    - Impact similar across airlines, but SWA operating model may make it a bit dissimilar



- **Parse the data and 'squint', congestion evident at times in system (during pandemic)**
- **COVID impact driving fleet schedule uncertainty (even in short term)**
- **Pandemic data is multi-dimensional and complex**
    - Consequently, very challenging to anticipate evolving impacts (1-2 months, let along 6-18 months)
- **In aviation ecosystem, pandemic very much a human impact as well**

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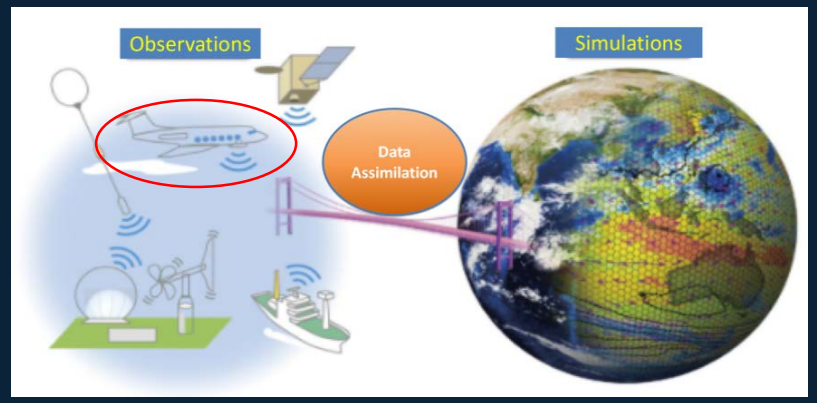
Pandemic Consequences Closer to Our Aviation Weather Community

NWP Data Assimilation during COVID



Zhaoxia Pu, University of Utah

Changing Operation, New Constraints in Focus

Business

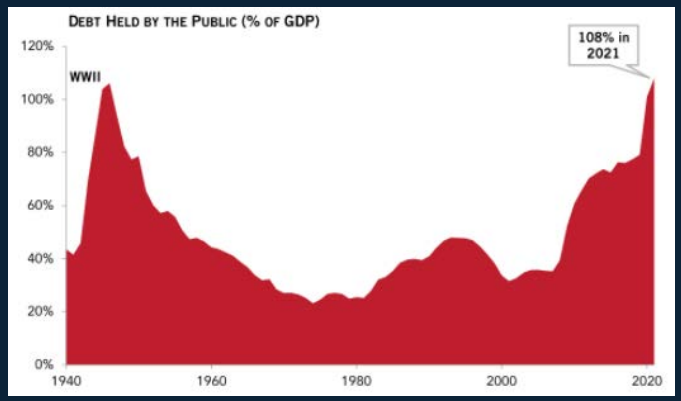
Another Regional Airline Falls to the Covid-19 Recession

ExpressJet's CEO says the hub-and-spoke carrier model still has a future, even if his airline doesn't.

By Justin Bachman
August 4, 2020, 4:00 AM EDT
Updated on August 4, 2020, 10:05 AM EDT

Passengers board a United Express passenger aircraft, operated by ExpressJet Airlines, in Santa Fe,

Weather Research Priorities in New Economic Reality

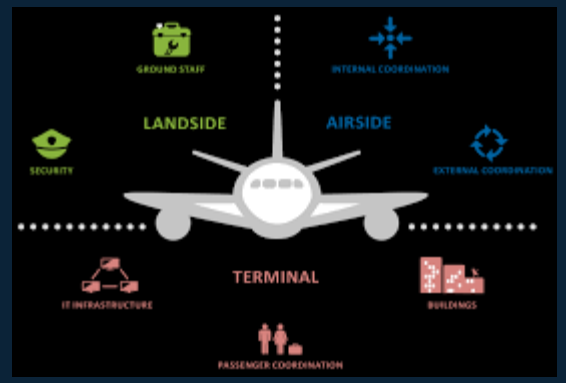


Climate-Forward Opportunities?

BBC

Increased sUAS Opportunities

Increased Ops Integration



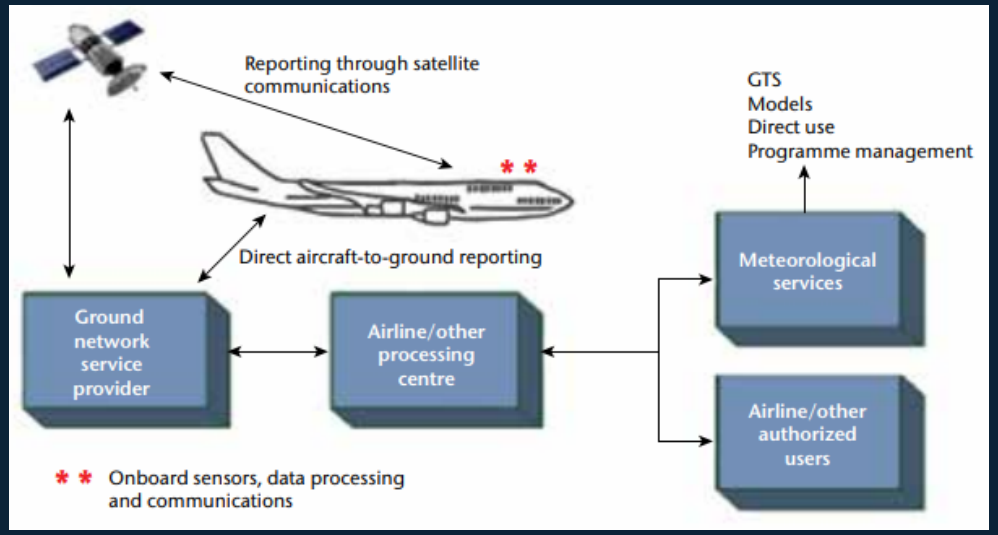
Human impact on Met Operations

NWS AWC

NOAA

avweb.com

Reduced Aircraft-Based Observations (ABO) and NWP



WMO

businessinsider.com

AP

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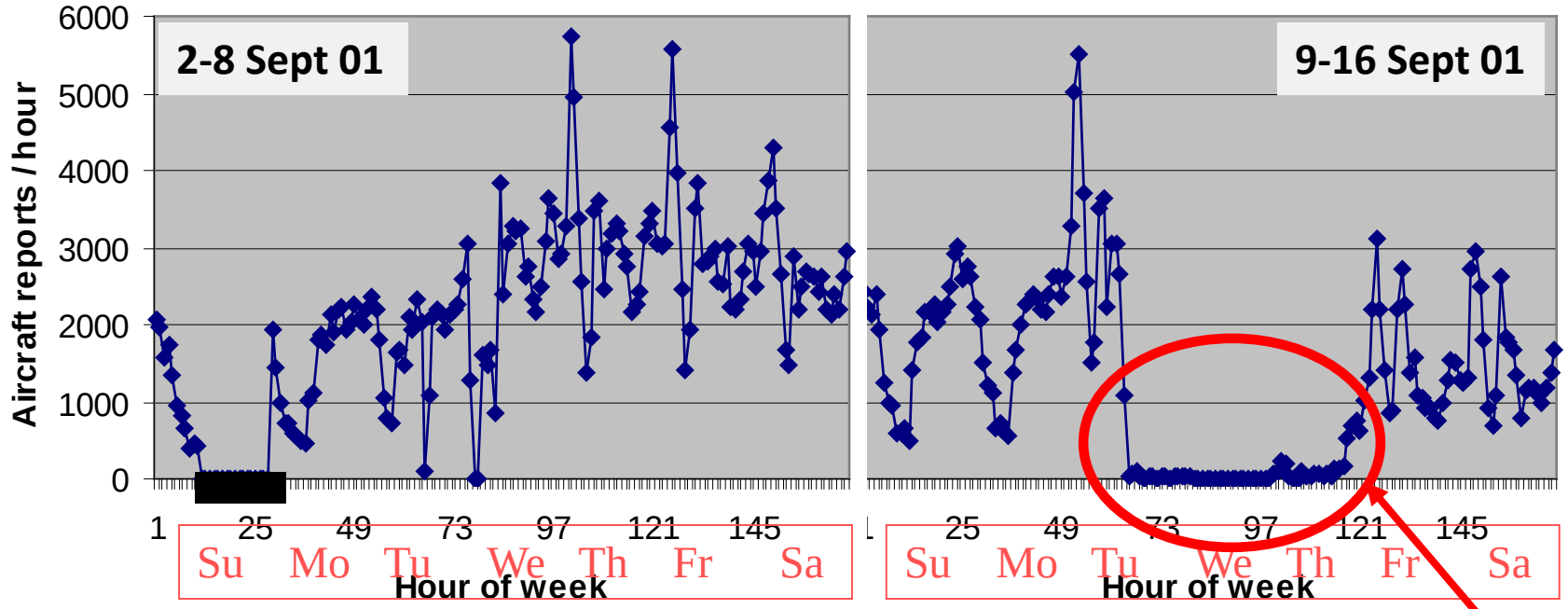
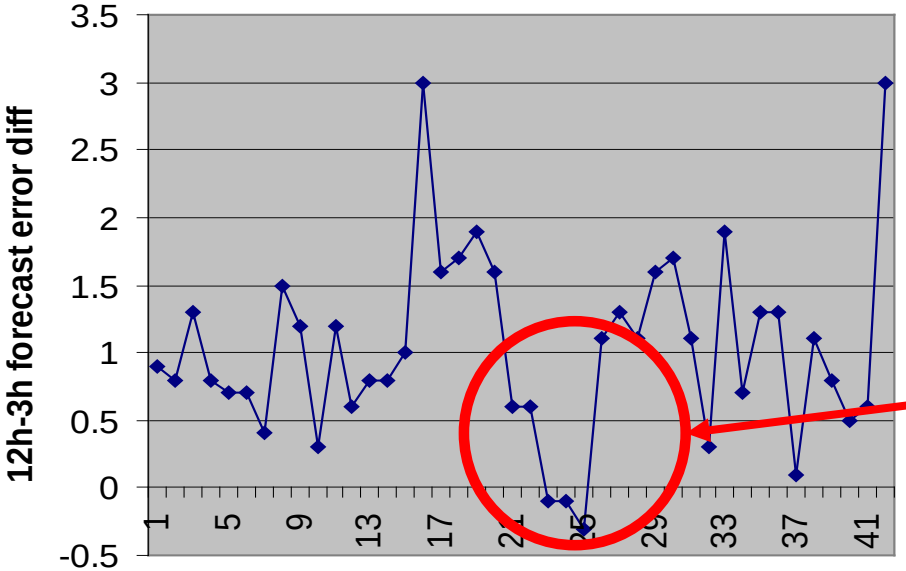
AP

A previous real-time data denial experiment: September 2001



Hourly ACARS volume 2-15 Sep 01 (starting 00Z 2 Sep)



RUC 250hPa wind forecasts: 12h – 3h forecast RMSE

11-13 Sep 2001

A real-time denial of ***all*** aircraft observations produced a ***clear degradation*** in RUC forecasts

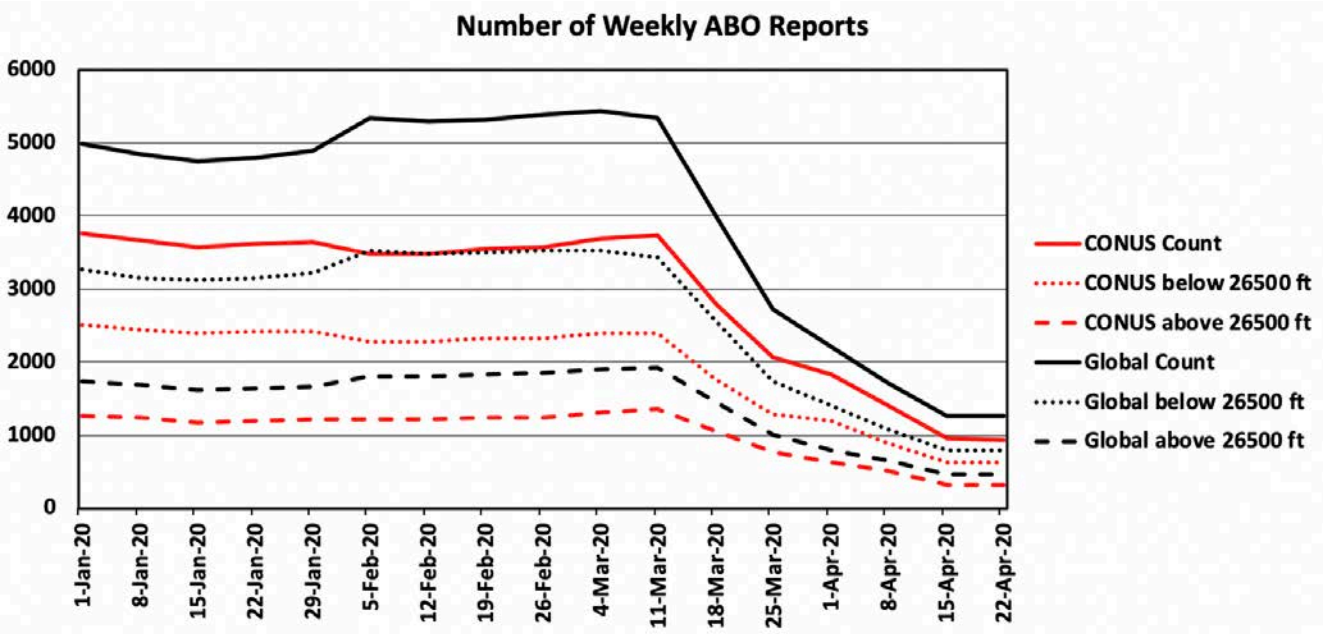


Figure 9. Time series of weekly ABO counts globally (black) and over the CONUS (red) during 2020. Also shown are ABO counts below 26500 feet (dotted) and above 26500 feet (dashed). 26500 feet is approximately 350 hPa.

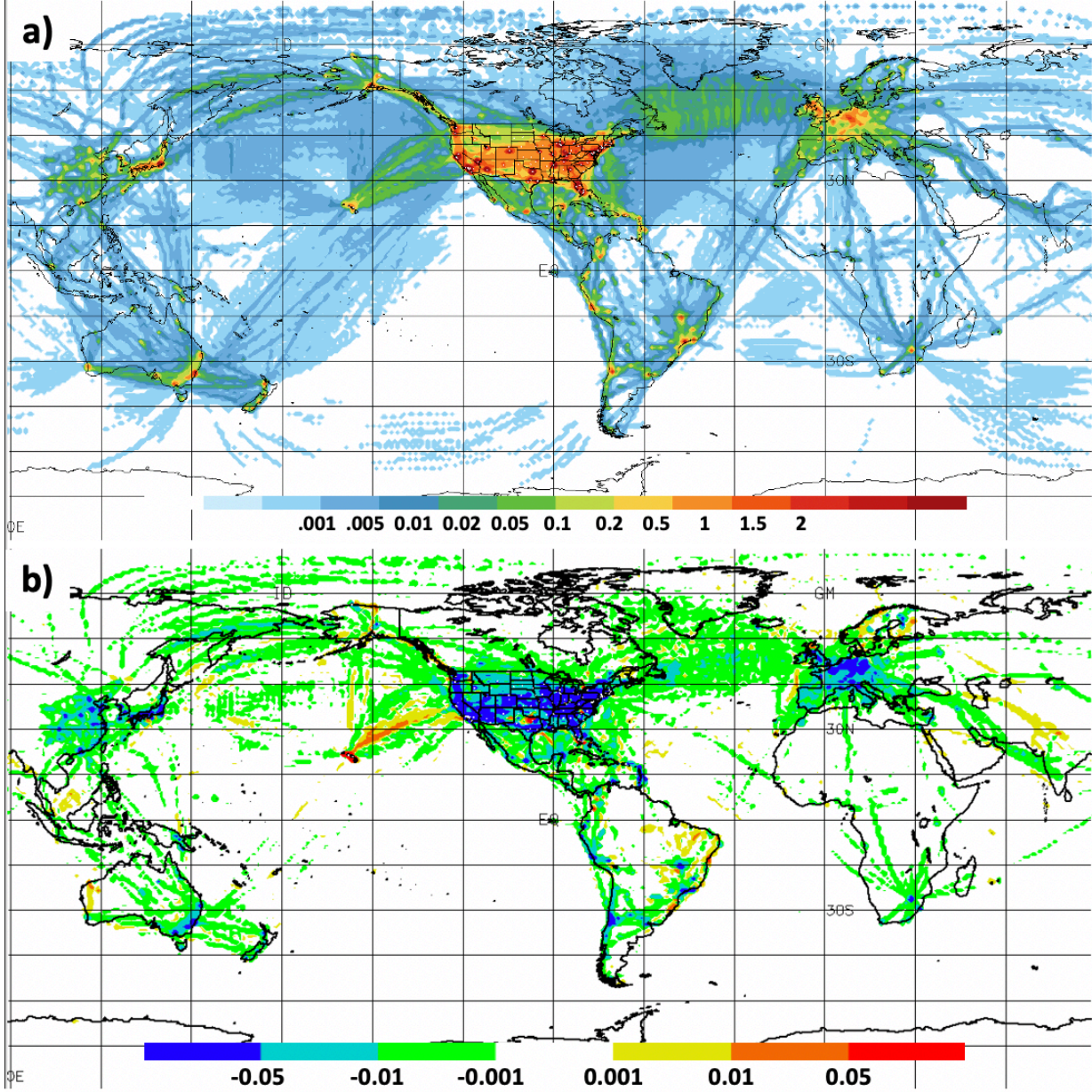
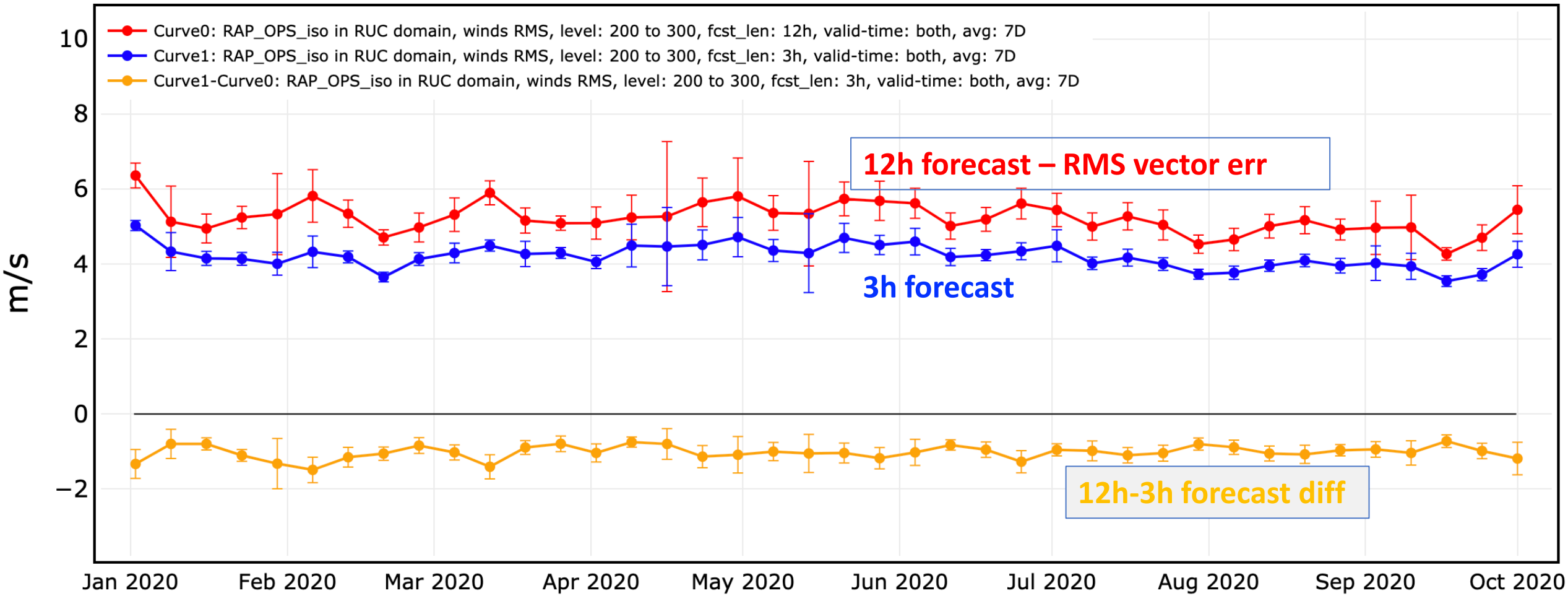


Figure 5. Global ABO coverage (number of monthly observations per km^2) (a) during Mar 2019 and (b) difference in coverage between Mar 2019 and Mar 2020. Small white dots indicate CONUS airport locations.

With a partial outage of aircraft observations, it is impossible to detect a signal in our verification



We need a controlled data denial experiment to account for changes in meteorological regimes

Additional Consequences Pertinent to Aviation Weather Community – Evolving Airline Operational Needs / Priorities

Changing Fleet operations, Airports in play

Business

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ExpressJet stops flying on 9/30 after United ends contract

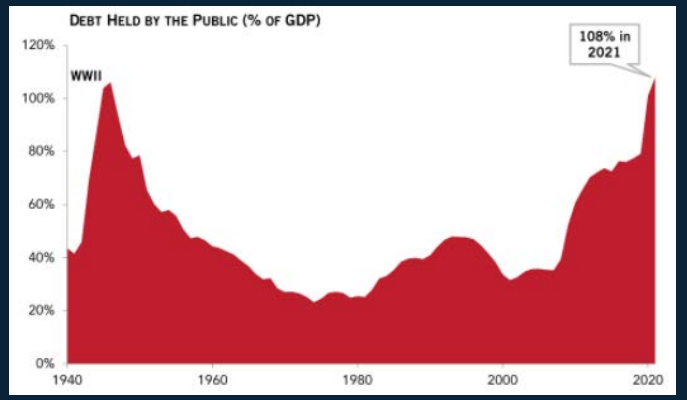
Passengers board a United Express passenger aircraft, operated by ExpressJet Airlines, in Santa Fe, New Mexico, in 2015. *Photographer: Robert Alexander/Getty Images*

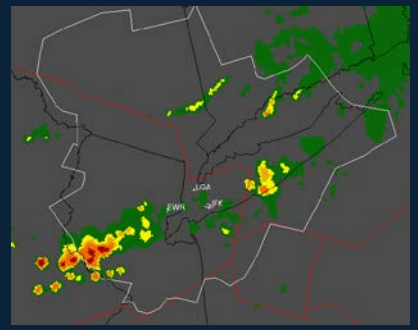
New Constraints now a Big Focus

COVID and Passenger Sentiment (driving air traffic demand)

Inform Aviation Stakeholders on Resource Needs, Evolving Risks

Weather Research Justification and Prioritization given Economic Upheaval





Additional Consequences Pertinent to Aviation Weather Community – Evolving Operations Focus

More Climate-Forward Thinking

JetBlue is the First U.S. Airline to Commit to and Achieve Carbon Neutrality for All Domestic Flying

Aug 13, 2020

-- Preparing for a New Climate Reality, JetBlue Begins Offsetting Emissions for All Domestic Flights and Investing in Sustainable Aviation Fuel, Significantly Reducing its Contribution to the Climate Crisis --

European aviation unites in calls for support for green recovery from COVID-19

24 JUNE 2020

Brussels, 24 June 2020 - With the gradual restarting of passenger air transport in the coming weeks, leaders from over a dozen air transport associations representing Europe's aviation sector today issued an urgent call for EU leaders to prioritise specific decarbonisation initiatives in their allocation of future COVID-19 recovery funding.

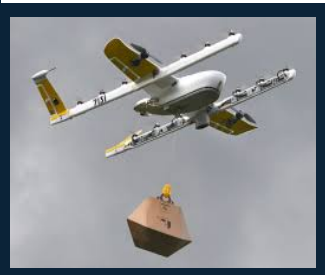
Increased sUAS Opportunities

UPS and CVS will use drones to deliver prescriptions in Florida

COVID-19 presents an opportunity to expand limited drone delivery tests

By Andrew J. Hawkins | @andyjayhawk | Apr 27, 2020, 10:36am EDT

SHARE

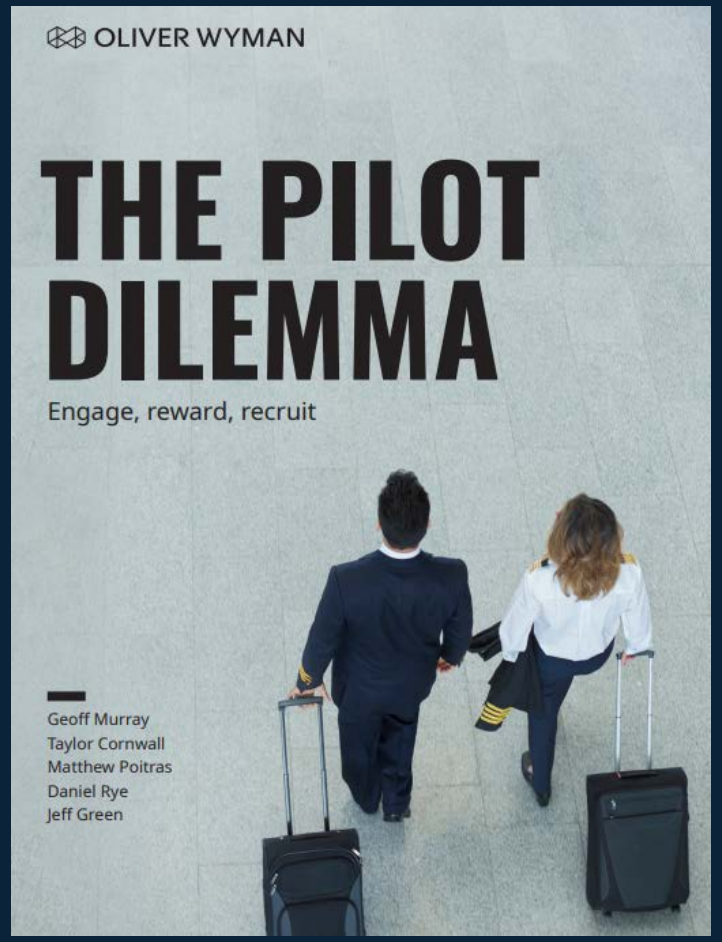


More Integrated Aviation System prioritizing Public Health

Self-driving pods and outdoor terminals: How the pandemic could change U.S. airports

A leading global airport design firm has a new vision for the future of airports — and believes now is the time to implement it.

Additional Consequences Pertinent to Aviation Weather Community – Pilot Recruiting, Training and Proficiency



Additional Consequences Pertinent to Aviation Weather Community –

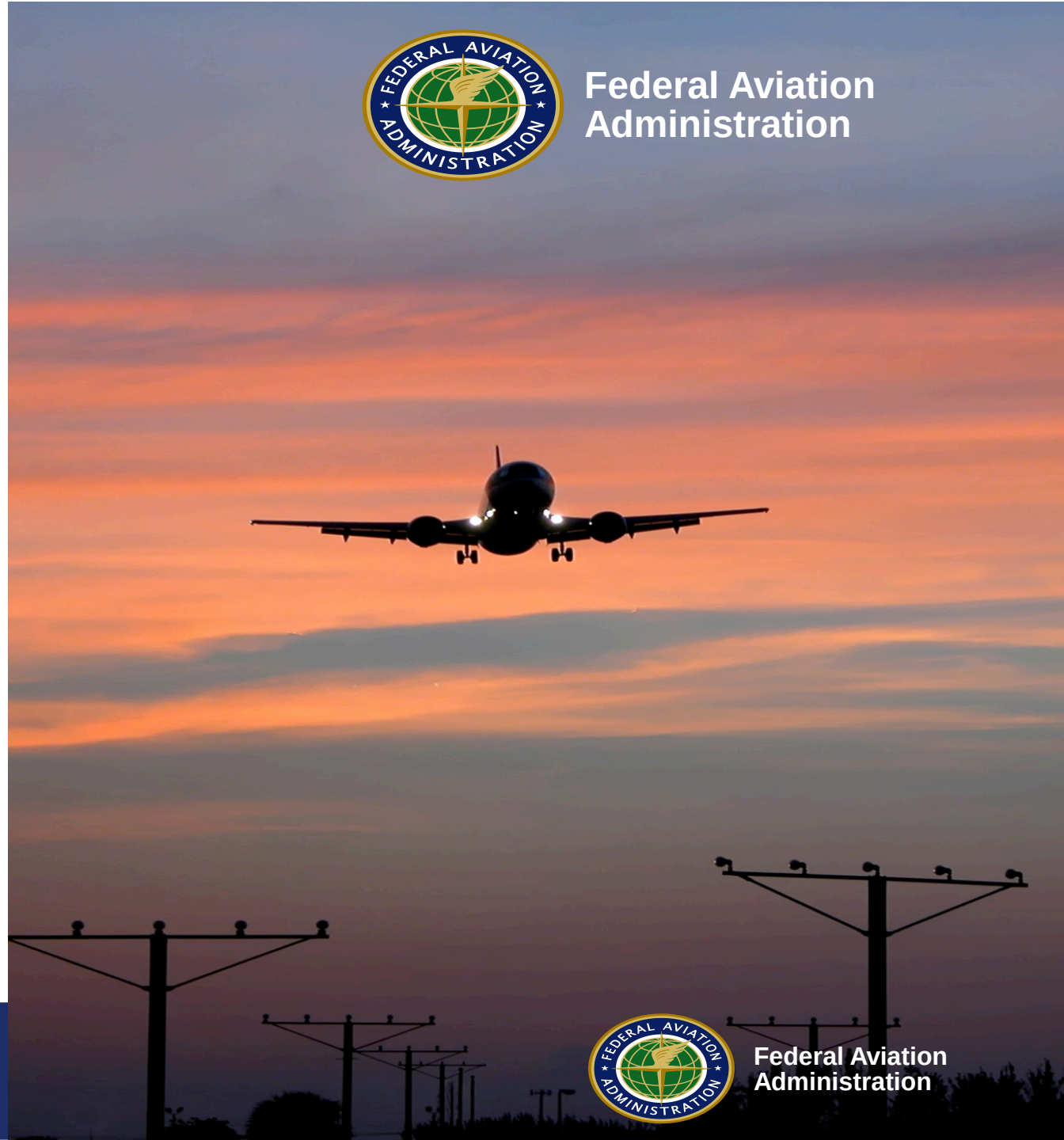
Met Forecasters, Human Weather Observations

Impact of COVID-19 on European METARs

Presented to: Friends and Partners in Aviation Weather

By: Gordy Rother

Date: October 14, 2020



Impact of COVID-19

- Due to the unexpected impact of the COVID-19 pandemic, weather reporting in some European countries has been affected in that certain elements of the Aviation Routine Weather Report (METAR) may be missing.

Impact on European Weather Reporting

- Some countries rely on certified weather observers to report ceiling, visibility and present weather information in the official METAR. When any of these elements of the METAR are missing, affected countries have published a NOTAM indicating certain mitigations required to continue operations.

Flight Standards Response

- The FAA reviewed the issue with United Parcel Service and developed mitigations based on guidance in the SaRP and FAA safety analysis.

Mitigation for missing weather elements

At airports outside the United States and its territories or at U.S. military airports, the certificate holder is authorized to operate to or from an airport that is missing ceiling, Visibility or present weather information in the official METAR report in accordance with the following conditions and limitations.

i. The Terminal Aerodrome Forecast (TAF) indicates the weather conditions from one hour before to one hour after the estimated time of arrival, will be no less than a ceiling of 1000 feet and visibility of 3 miles.

ii. The Certificate Holder plans two alternate airports that have available a complete METAR and TAF.

iii. Fuel will be provided for a diversion to the most distant alternate airport, based on nautical air miles, in accordance with the following:

Mitigation (continued)

A. Perform a missed approach at the destination airport;
B. Climb to the expected cruising altitude;
C. Fly the expected routing;
D. Descend to the point at the most distant alternate, based on nautical air miles, where an approach will be initiated, thence conduct an approach and landing.

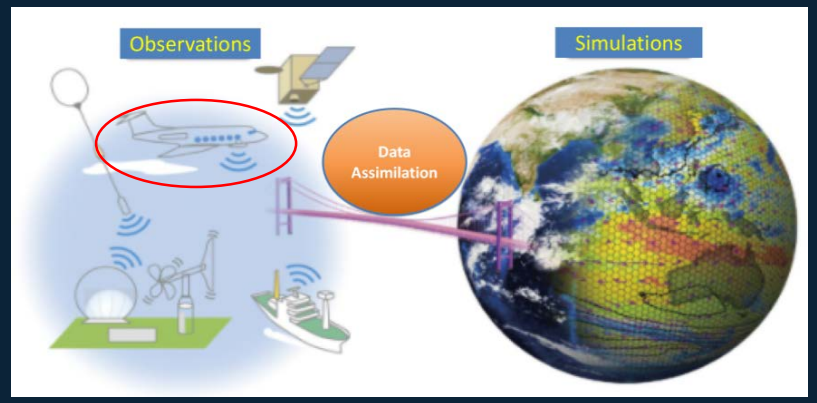
iv. The flight crew will be briefed by the dispatcher.
v. Departure operations are not authorized if freezing precipitation is forecast and the weather elements are missing any of ceiling, visibility or present weather information.
vi. No Circle to Land operations may be conducted with missing ceiling and visibility.
vii. The MDA at the destination airport with missing ceiling, visibility or present weather will be limited to 1000 ft. AGL.

Operation Specification A010

- Air Carriers are required to have OpSpec A010 which identifies the approved weather programs.
- An FAA Notice is in the publication process which outlines the issue and offers relief in optional text with the mitigation procedures listed above.

Closer Look at COVID-19 Consequences Close to Our Aviation Weather Community – SUMMARY Table-Setting

NWP Data Assimilation during COVID



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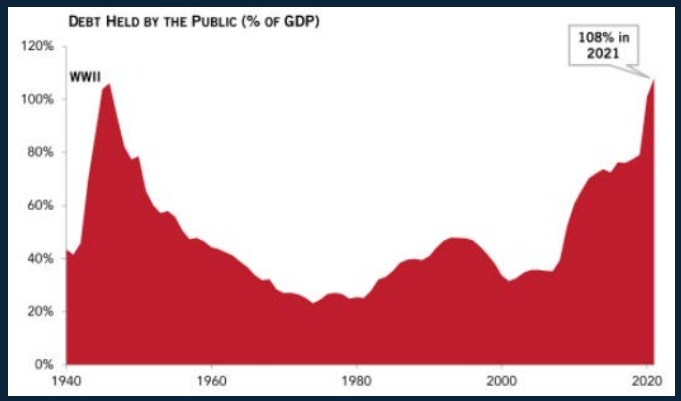

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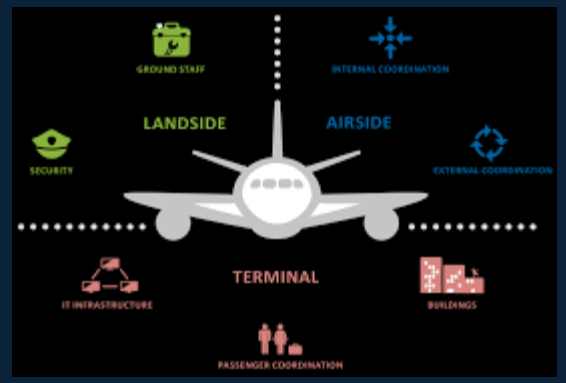

Human impact on Met Operations

NWS AWC

NOAA

avweb.com

Back-up

Partial ABO data denial experiment design

- Two 10-day retrospective tests:
  Summer (15-25 Jul 2018) / Winter (1-11 Feb 2019)
- Experiments systematically denied certain obs types.
- 80% denial experiment assimilated only observations from FedEx aircraft (~20% of total obs over RAP domain)