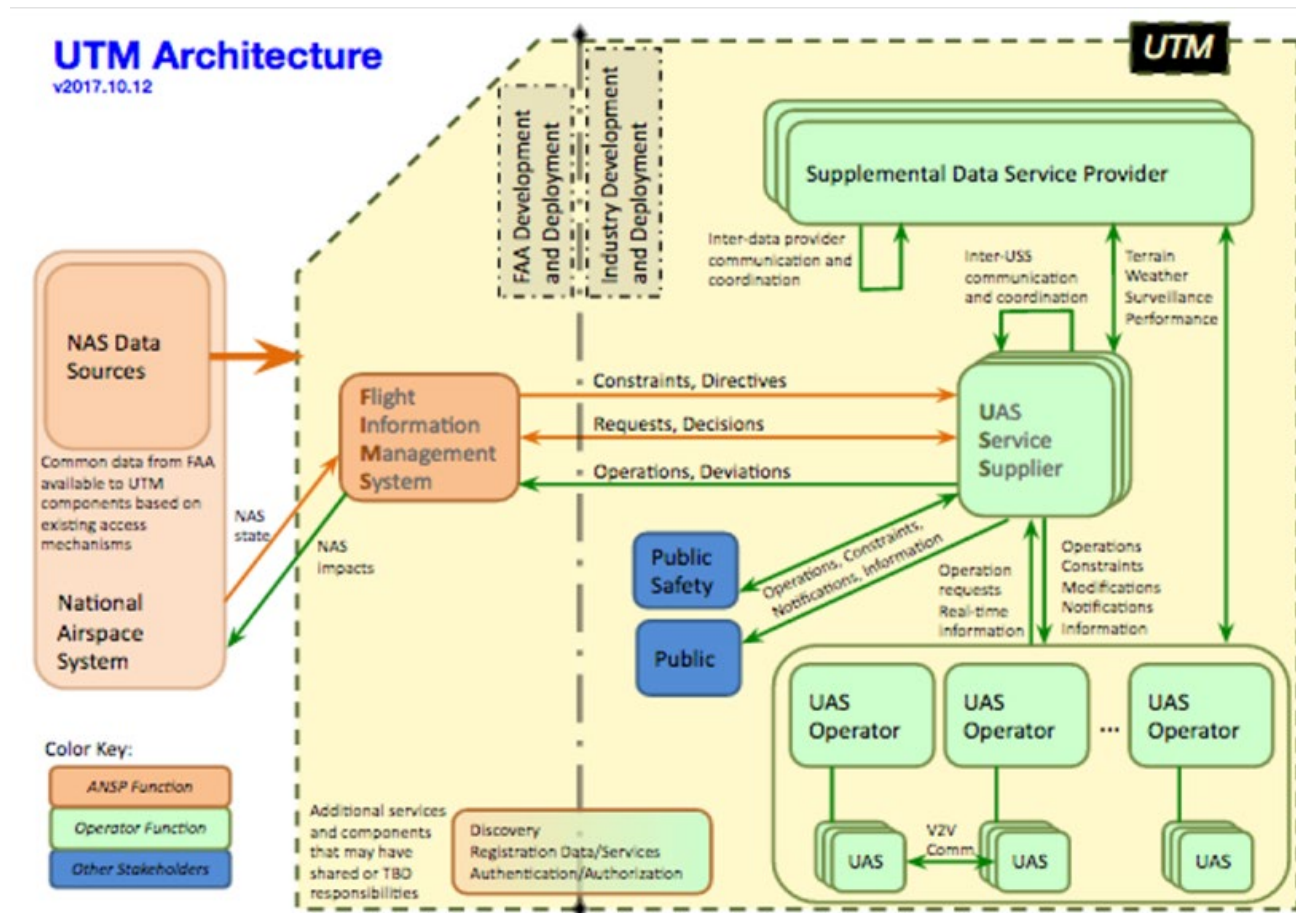# Weather and Automation - Changing Landscapes for Weather Requirements with Evolving Automation Technology

Friends and Partners of Aviation Weather

October 24, 2019

Kevin Kronfeld

Collins Aerospace

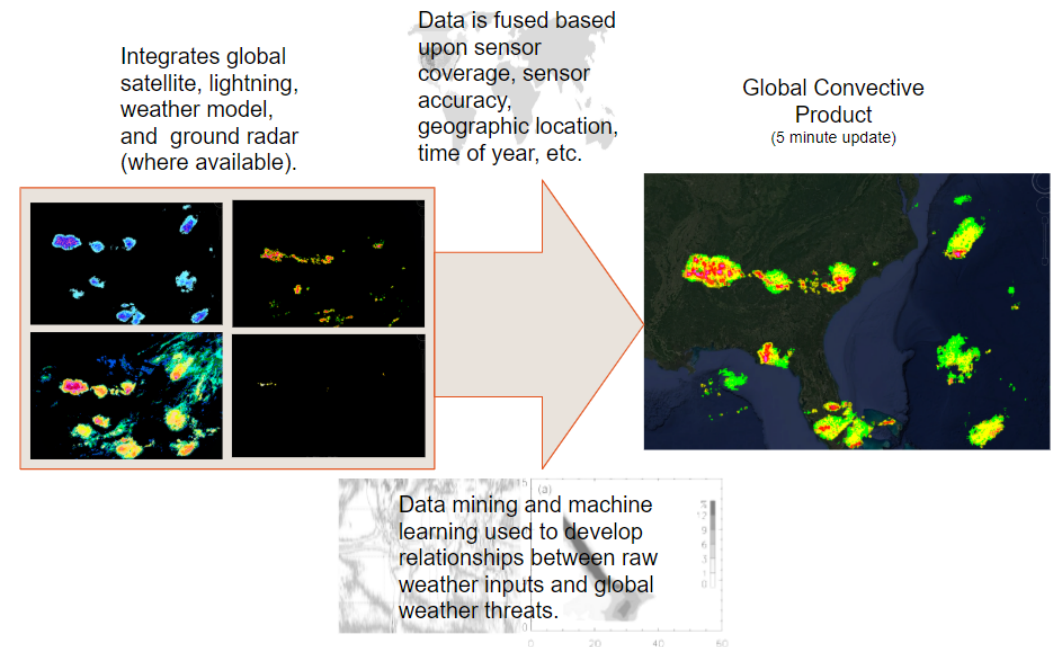# NASA/FAA UAS TRAFFIC MANAGEMENT ARCHITECTURE

Increasing demand for UAS for commerce.

Common Weather Picture shared among stakeholders
- Weather Data Fusion

Common Weather Picture

- Disparate weather sources can be integrated
  - Private and Public sector weather products and sensor networks.
  - Ensemble integration of weather data.

- Reliable Quality Metric
  - Automation Requirement
  - Passengers vs. cargo affects tolerance to weather (e.g. turbulence, etc.)
  - Compared to manned aircraft, there are no humans to assess quality of weather.
  - Meaningful Confidence value

Integrates global satellite, lightning, weather model, and ground radar (where available).

Data is fused based upon sensor coverage, sensor accuracy, geographic location, time of year, etc.

Global Convective Product (5 minute update)

Data mining and machine learning used to develop relationships between raw weather inputs and global weather threats.

Collins Global Convective Product

Collins Aerospace

Improved Weather Sensor Network Density

- Weather forecasting systems can be improved through higher density observations.
  - Augment or replace weather balloons.

- Additional Weather sensor networks needed deployment in areas where operations are desired.
  - Use currently deployed weather sensors and solutions.
    - Crowd-sourcing weather information and techniques to produce useful weather observations.
  - UAS equipped with weather sensors and communications.
    - Real-time distribution of weather sensor data into weather models.
  - Low-cost

Examples: UAS as Weather Measurement Sensors
Source: Anemoment LLC & Internet Systems

Collins Aerospace

Additional Considerations

- Understanding Impact of weather on UAS
  - To date, nearly all aviation weather impacts has been directed towards manned aircraft.
  - Larger size distribution of UAS as compared to manned aircraft.
  - Smaller UAS will be adversely affected by weather more significantly than manned aircraft.
  - Human acceptance of turbulence.

- Certification
  - Weather provider processes, sensors, and pedigree of weather data.

- Security
  - Malicious injection of erroneous weather information to cause disruption and failures.

Collins Aerospace