



The economic value of accurate aviation weather insights

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Since the early days of flight, weather insights have played a critical role. While forecasts and other data have obvious, important operational benefits, they also provide enormous economic value.

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Overview

Today, commercial aviation is driven by economic factors, such as fuel costs, fleet utilization, and customer service. They are just as important as operational factors, like safety and scheduling.

While costs vary from organization to organization, costs-per-hour can be closely estimated. Depending on the size of the aircraft, operating costs can range from \$1,500 to \$9,000 USD for a single hour.

The impact of weather insights

Accurate weather insights support large cost savings by helping reduce flight times and minimize significant route changes or flight delays. They can also help maximize revenues by keeping schedules on track and reducing the number of canceled flights due to bad weather.

While some cancellations cannot be avoided, a high-quality suite of weather forecast services can greatly reduce

unnecessary cancellations through more accurate, targeted insights. They also allow pilots, dispatchers, systems operations controllers, and ground crews to better manage such events.

There are two windows where the judicious use of weather insights can greatly reduce costs:

- **The tactical period** — one to six hours into the future. Encompasses the preflight, departure, en route, and arrival phases.
- **The strategic period** — extends from the next six to 24 hours, and beyond.

The value of terminal forecasts

Real-time Atmospheric Monitoring Terminal Area Forecasts (RAMTAFs), produced by DTN, provide important, short-term insights for select airports worldwide. More specifically, they forecast ceilings, visibilities, winds, and important weather conditions at or near an airport.

RAMTAFs dictate whether restrictions will be placed on incoming aircraft. Such restrictions may prohibit aircraft operations or require inbound aircraft to carry enough fuel to reach an alternate airport.

Government-produced Terminal Area Forecasts (TAFs), which are free of charge, typically focus on the worst-case weather scenario and tend to be more operationally restrictive. What's more, TAFs in the United States are mostly automated, produced strictly off of model data with little initial human input.

In comparison, DTN RAMTAFs include operational considerations and thresholds to keep in mind. While they are initially produced via model and internal business rules, they are then assessed and edited by professional meteorologists to include more specific details.

When a RAMTAF calls for restricted conditions — such as ceilings below 2,000 feet or visibility of less than three miles — time periods are very specific. If conditions are expected to improve earlier than originally forecast, an amendment will be issued as soon as possible. This ensures that the DTN RAMTAF restricts the terminal for less time than the government TAF, allowing for optimal operations.

One potential result of a restrictive forecast is the plane may be forced to carry extra fuel to ensure it can reach an alternate airport. Since carrying extra fuel uses more fuel, energy costs can increase by 10% per flight. To accommodate the weight of the extra fuel, paying passengers and/or cargo may be offloaded.

In recent DTN verification studies, RAMTAFs have been shown to be 17% more accurate than government TAFs in all restrictive flight categories. This translates into one to three hours of less restrictive flight rules at any airport, on average. These additional hours mean less fuel is required to reach an alternate airport, thus lowering fuel costs and ensuring greater revenue through additional payloads.

Greater terminal forecast accuracy also enhances fleet utilization by reducing the number of diverted flights. These diversions, which occur when conditions deteriorate at an airport, temporarily restrict landings. Without sufficient fuel to hold, the aircraft is forced to divert to an alternate location. Each diversion can add a minimum of six hours to an aircraft's cycle time, cost tens of thousands of U.S. dollars, and prevent additional revenue.

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Verifying RAMTAF accuracy

In addition to providing RAMTAFs, DTN also verifies the forecasts to determine their accuracy over time — both inherent accuracy and in comparison to government-produced TAFs.

The most common method compares the U.S. Federal Aviation Administration (FAA) Flight Category Restrictions in the RAMTAF to the corresponding hourly report from the Meteorological Aerodrome Report (METAR), using a hit/miss comparison.

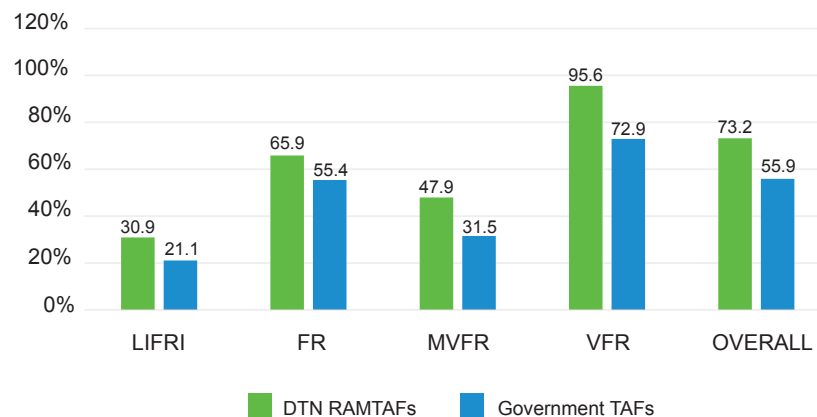
Therefore, if the RAMTAF has a marginal visual flight rule (MVFR) visibility or ceiling condition, and the corresponding METAR does as well, it would be considered a hit. If a RAMTAF included an instrument flight rule (IFR) condition and the METAR had a MVFR condition, this would be a miss. It is then graded on a point scale or percentage of hits/misses.

We can also drill down further into the data and look for hit and misses in any of the categories in the RAMTAF, such

as precipitation, precipitation types, and wind. For example, if the RAMTAF forecast two statute miles (2SM), but the METAR reported one statute mile (1SM). This can show a more detailed look of the misses and how far off the forecast was; not simply that it missed. This offers more insight into the accuracy of RAMTAFs.

The most important part of a terminal area forecast — which is arguably the first six hours — can be examined. This provides a more detailed look at critical timelines. In a recent monthly verification, regularly-scheduled DTN RAMTAFs outperformed government TAFs by nearly 17% overall. The general overall accuracy of RAMTAFs for all categories combined is nearly 75%. When translated into dollars, this accuracy can deliver tremendous savings over time — having a direct impact on costs for an airline.

Accuracy comparison (2018)



Overall, regularly-scheduled DTN RAMTAFs outperformed government TAFs by nearly 17%.

Enhancing RAMTAF accuracy

A team of more than 70 professional meteorologists continually monitors DTN RAMTAFs via an interactive editing and display system. The system refreshes every 60 seconds and compares the current RAMTAF with the reporting METAR. It uses color-coding to display the status, bringing more important or significant differences to the attention of the meteorologist. When needed, this allows the forecasts to be amended more quickly. Real-time lightning strikes within 20 miles of the airport are also included to further enhance the forecasts.

In addition, nearby METARs are checked, when available, to help monitor changing area conditions and support proactive forecast updates.

Summary

Weather forecast services that go beyond the traditional free terminal forecasts, such as DTN RAMTAFs, can:

- Lower fuel expenses
- Increase fleet utilization
- Improve customer relations
- Enhance operational efficiencies

About DTN

For more than 35 years, DTN has provided forecast services to the commercial aviation industry. Currently, over 250 airlines rely on various DTN forecast services, ranging from terminal forecasts to written or verbal system route briefings.