**Weather Safety through Online Weather Briefings**

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## Introduction

Weather is the single factor that most impacts the safety and profitability of helicopter operators. In fact, a large, global, publicly traded helicopter company in its annual report listed weather as the most important financial risk in the company's outlook. According to the US National Transportation Safety Board (NTSB), one third of all helicopter accidents are weather related. Clearly, adverse weather, including low visibilities, thunderstorms, and rapidly changing weather conditions can result in unsafe operations.

Pre-flight weather briefings and enroute weather monitoring are both critical components of executing a safe and efficient helicopter flight. Unfortunately, few operators leverage weather services that are available and created specifically for helicopter flight operations. Today, many companies use free weather information whose sources are of questionable quality for aviation purposes.

A web-based weather briefing and in-flight alerting system that has proven effective in the United States has recently been expanded to encompass the entire globe. The key features of this system, called AviationSentry Online, are described below. In addition, a unique new monitoring and alerting capability called RotorWatch is presented, which aids safe flight operations by monitoring helicopters in flight, and alerting communications centers when helicopters approach hazardous weather conditions, all in real-time.

## Pre-flight weather briefings

Pre-flight weather briefings provide a helicopter pilot with a picture of the weather conditions they will experience during their flight. There are several weather elements that are essential for a pilot to know, as they affect the safe operation of the flight. The source of the information used in the briefing needs to be carefully considered, and a tool for helping pilots make good decisions about the information they have absorbed is described.

## Essential weather briefing elements

A safe helicopter flight depends on avoiding weather conditions that are beyond the pilot's or aircraft's ability to operate. A weather briefing should include both a current depiction and a forecast of essential weather elements, using all weather information available, including:

| Element | Meteorological Depiction |
|---|---|
| Ceilings | METAR/TAF (nearby airport) Weather satellite imagery Ceiling/visibility analysis |
| Visibility | METAR/TAF (nearby airport) Weather radar (precipitation) Ceiling/visibility analysis |
| Winds | METAR/TAF (nearby airport) |
| Hazards Thunderstorms  Icing Etc. | Weather radar Lightning detection SIGMET/AIRMET |

*Table 1. A list of the essential weather briefing elements, and the associated meteorological data used to depict them.*

## Sources for weather briefings

For safe flight operations, all of the weather information described above needs to be timely, reliable, and accurate. A professional, business-grade, web-based aviation weather system called AviationSentry Online is described below, and then its information is compared to that found on free internet sources. There are significant differences that impact safe flight.

### AviationSentry Online

AviationSentry Online Helicopter Edition is a weather briefing and display system created

specifically for helicopter users. It is currently used by over 70% of all helicopter operators in the United States, and has been recently expanded to encompass the entire globe. It has achieved this level of use because it provides timely and accurate weather information in a reliable fashion.

AviationSentry Online is a subscription-based (pay) service, requiring a login and not accessible to non-aviation users. Because of its focus on professional helicopter users, all of the weather information it presents has been quality controlled and is monitored for accuracy and reliability.

In addition, AviationSentry Online has been certified as a Qualified Internet Communications Provider (QICP) by the United States Federal Aviation Administration (FAA). A QICP certification ensures the aviation weather provider has met certain minimum standards. These include:

> *Reliability*: The provider is committed to specific reliability standards that ensure the data is available when users request it.
>
> *Accessibility:* All responses to 100% of the users are within 2 minutes. In fact, AviationSentry Online provides the data nearly instantaneously based on its service oriented architecture.
>
> *Security*: AviationSentry Online provides site authentication and maintains data integrity via the implementation of security technologies such as server digital certificate technology and Secure Sockets Layer protocol. In addition, QICP certification requires the establishment and implementation of security practices to prevent unauthorized access to or modification of provider data, software and hardware.

In short, QICP certification provides an assurance of the reliability and security of the weather information service provision.

**Free internet weather**
Many helicopter pilots and operators use free internet sites for weather briefings, but free internet sources of information are typically not QICP certified by the US FAA. A close examination of many of these sites reveals that they are of questionable value for aviation purposes.

First of all, many free weather sites contain a legal disclaimer somewhere on the web site that indicates that the information on the "*site should not be used for operational decision making*". Such a disclaimer is a clear indication that the information provided from the site is not suitable for flight decisions.

Many free internet weather sites are web sites that are funded by ads. Their whole business model is to provide information at the lowest possible cost, which often means that the information they provide is significantly aged or out of date. Other sites that are operated by government agencies, even those operated by National Meteorological Services, are usually not supported on a 24/7 basis, and are not part of what the agency deems as critical infrastructure.

These problems are often not immediately evident when looking at free internet weather. Table 2 below summarizes the differences between a good safe source for weather briefings, and those that are not so good.

| Capability | Free Internet | AviationSentry Online |
|---|---|---|
| Radar Update Frequency | 5-30 min | 5 -15 min |
| Time Stamp on Data | Not available | Yes |
| Rain/snow information | Sometimes | Yes |
| Pop-up ads restricted | No | Yes |
| Plot your location on the display | No | Yes |
| Smallest base map at full resolution | 100 km+ | 0.1 km |
| QICP certified by the US FAA | Sometimes | Yes |
| Available for commercial use | Sometimes | Yes |

*Table 2. A comparison of free internet and professional weather briefing sources for usefulness for aviation purposes.*

## A weather briefing checklist

Checklists are a common practice used in aviation to insure that all necessary actions have been performed. In fact, checklists are ingrained into the culture and practice of all pilots. A "best practice" that has shown promising results is to use a checklist for a weather briefing.

Figure 1 shows an example of an interactive checklist for weather conditions called FlightRisk.

The FlightRisk checklist is completed by a pilot by checking boxes on a web page screen. Each row pertains to a specific weather risk, and contains a check box for the pilot to indicate whether he has checked both current weather, and forecast conditions. Once the checklist is completed, the pilot clicks on the "Calculate Risk" button, and the page then displays the results:

- Green OK – the weather conditions are acceptable

- Yellow Caution – weather conditions are marginal, and consultation is advised

- Red Warning – Conditions are unsafe, and flight is not advised

This type of approach has proven to be very effective, because it is quick, easy, and conforms to the pilot's operating culture. This is highly recommended as a means to improve flight safety.

## Flight Risk

| Weather | Current | | Forecast | |
|---|---|---|---|---|
| **Starting Point** | No | Yes | Deteriorating | Improving |
| Clear | ○ | ● | ☐ | ☐ |
| Yellow (Check Wx before departure) | ○ | ● | ☐ | ☐ |
| CIG within 152 m VFR Wx mins | ● | ○ | ☐ | ☐ |
| Wx at VFR mins | ● | ○ | ☐ | ☐ |
| Wx below VFR mins | ● | ○ | ☐ | ☐ |
| **Enroute** | No | Yes | Deteriorating | Improving |
| Clear | ○ | ● | ☐ | ☐ |
| Yellow (Check Wx before departure) | ● | ○ | ☐ | ☐ |
| CIG within 152 m VFR Wx mins | ● | ○ | ☐ | ☐ |
| Wx at VFR mins | ● | ○ | ☐ | ☐ |
| Wx below VFR mins | ● | ○ | ☐ | ☐ |
| **Destination** | No | Yes | Deteriorating | Improving |
| Clear | ○ | ● | ☐ | ☐ |
| Yellow (Check Wx before departure) | ● | ○ | ☐ | ☐ |
| CIG within 152 m VFR Wx mins | ● | ○ | ☐ | ☐ |
| Wx at VFR mins | ● | ○ | ☐ | ☐ |
| Wx below VFR mins | ● | ○ | ☐ | ☐ |
| **IFR** | No | Yes | Deteriorating | Improving |
| Wx for IAP to be flown > 610-3 | ● | ○ | ☐ | ☐ |
| Wx for IAP to be flown < 610-3 | ● | ○ | ☐ | ☐ |
| Alternate airport required | ● | ○ | ☐ | ☐ |
| Forecast Wx at alt. < 244-2 | ● | ○ | ☐ | ☐ |
| Wx at or below 122-1 | ● | ○ | ☐ | ☐ |

| Flight Profile | |
|---|---|
| **Yes** | **Flight Conditions** |
| ☑ | Night |
| ☐ | Scene, new LZ or no IAP within 8 km |
| ☐ | Concerns related to availability of fuel |
| ☑ | Terrain (mountainous) |
| ☐ | Wx within 152 m of mins at destination/alt |
| ☑ | Pilot not recent on IAP to be flown |
| ☐ | Flight conducted over water |
| ☐ | Winds > 26 kts, gusts > 13 kts |
| ☐ | Severe Wx, icing, thunderstorms |

**Overall Assessment**

Complete the **Weather** and **Flight Profile** sections of this form and choose **Calculate Risk**.

[ Calculate Risk ] [ Reset ]

*Figure 1. The FlightRisk web tool is a weather checklist for pilots to use to evaluate weather conditions after they have completed their weather briefing.*
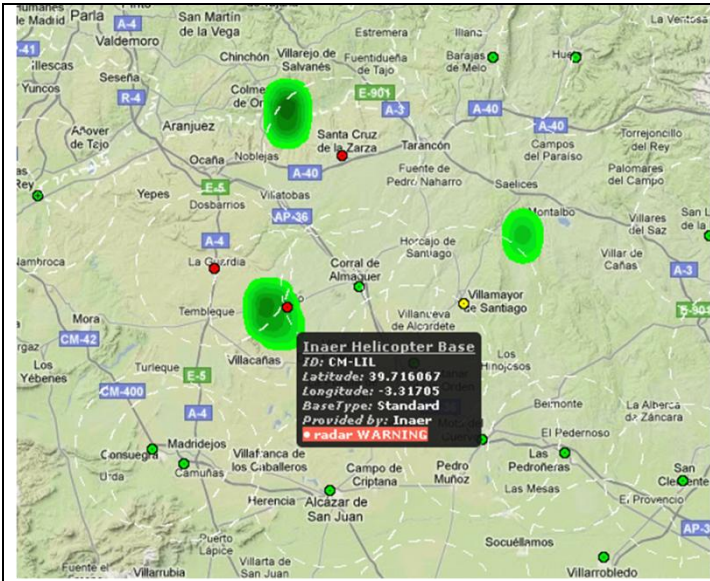
## Standardized Process

AviationSentry Online provides an opportunity for a commercial aviation organization to standardize the distribution of weather information amongst operational staff to ensure an appropriate level of pre-flight weather briefing is achieved for each and every flight. Weather can dramatically affect the safety risk of any given flight and standardized distribution of weather information throughout a company's entire pilot and dispatch staff minimizes risk due to weather.

The global aviation industry operates with specific operational processes to ensure safety. The decision to fly an aircraft on a specific mission involves the coordination of many people and coordination of information plays a significant role for each flight conducted. It would be unfortunate if the wrong weather based decision were made based on two people viewing two different free web sites who received conflicting information. The Aviation Sentry Online product ensures that a "common operating picture" is developed that facilitates the best possible weather decisions is made on a day to day basis.

## Decision Support Services

The aviation weather information in AviationSentry Online is not merely presented. It is presented in such a way that it facilitates rapid decision making based on company specific criteria. For example, in Figure 2, helicopter operating bases are color coded green (OK for flight), yellow (marginal for flight) or red (flight not recommended) which can be customized to meet specific company operating standards.

| An example decision making aide for helicopter base locations. The bases are color coded green, yellow, or red, indicating their suitability for flight, based company specific thresholds for aviation specific information (see example to the right). | A company can manage their own decision making criteria within AviationSentry Online to facilitate the standardization of weather based decision making. |
| --- | --- |

*Figure 2. Weather decisions based on company policies are facilitated by uniform presentation of conditions, clearly showing sites (colored in red) where safe flight is not possible.*

Another example of the decision support services can be provided via the Route Brief function. Route brief allows a pilot to receive a full weather forecast briefing along an expected route of flight. During the specification of the report graphs can be generated to help visualize the forecast information. In Figure 3, the dew point forecast graph is color coded to indicate the risk of fog development by showing the forecast temperatures as green, yellow, or red depending on the dew point depression. Pilots do not have to remember at what dew points versus temperature fog might develop because the intelligence is built into the application. With this information, the pilots know the specific times during which fog could develop during the operation.

In general, systems like AviationSentry Online are designed to facilitate an appropriate and safe flight weather based decision by not only presenting the information but by recasting it in the terms the pilots and dispatchers must make their decisions in.
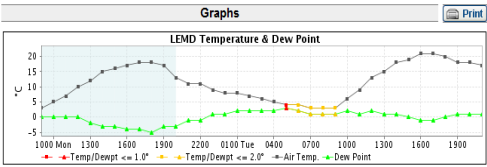


*Figure 3. Graphs showing the trend forecast of temperature and dew point are colorized to indicate which hours will be riskiest.*

## Enroute Monitoring and Alerting

For most helicopter operations, once the flight actually takes off, the pilot is blind to any weather changes or threats other than those that can be seen from the cockpit. They depend on communications centers and/or dispatchers to inform them of any

hazardous weather.  Obviously, this job is much easier, and the operation is much safer, when the ground personnel can see both the current location of the aircraft and the current weather on the same screen.  This is the concept behind SiteWatch and RotorWatch.

Over the past 15 years, weather information has been integrated into GIS technology, and that has made possible the development of real-time monitoring and alerting systems.  The simplest of these systems monitors fixed (static) locations for a variety of adverse weather conditions, such as lightning, and then generates and distributes real-time alert messages.  Far more sophisticated are the SiteWatch and RotorWatch applications, which monitor and alert on moving (dynamic) assets such as aircraft.

## SiteWatch

The SiteWatch product is a customizable monitoring and alerting system, in use at several helicopter operations today, that monitors the current position and route of flight of aircraft, helicopters, and other moving assets in real-time, compares these to current and forecast weather conditions, and then applies user-defined rules to determine which assets need to be alerted to current or anticipated weather hazards.

- Monitors the current position of helicopters, aircraft, and other assets in real-time
- Monitors the future route of flight by integrating flight plans with the current position to calculate the actual route of flight
- Converts the current and forecast weather conditions (both surface and aloft) into spatial fields
- Allows the user to specify their own, customized, alert criteria, using their own business rules and Operating Specifications (Ops Specs), to define what combination of weather conditions and other factors (such as restricted airspace) constitute alert or hazard conditions, and the recommended action for each condition is
- Uses the patented GIS alerting technology to determine if the current position and planned route of flight will intersect current

or forecast weather or other conditions that meet the users criteria
- Provides an alert management application that allows users to see all active alerts on one screen
- Automatically logs and archives all alerts, and allows for event reconstruction
- Provides a display of the real-time position and projected route of flight of all assets, along with their current alert status and the current weather (e.g. radar, etc.) on a single screen.

SiteWatch was developed for large helicopter operators to improve safety and efficiency, and is currently used by PHI Inc. the largest helicopter company in the US, and Air Methods Inc., the largest air medical operator in the US.

Once helicopters are in the air, the amount of weather information they have is very limited.  The single screen allows communications center specialists who are flight following to see all of the relevant information about the position and status of each helicopter on one screen, rather than on multiple screens where they would have to stare and compare.  The alerting function insures that no aircraft gets overlooked, and that all aircraft receive timely alerts about hazards with enough time to make good decisions.

One of the key features of SiteWatch is its flexibility.  It can be configured to support multiple data sets for both assets and weather.  Virtually any aircraft that has a position (whether from Air Traffic Control radar, ADS-B, or other transponder, can be monitored by SiteWatch.  The list of weather parameters that can be monitored is almost endless.

# RotorWatch

RotorWatch brings many of the monitoring and alerting features of SiteWatch to the general helicopter market and delivers these as a service, rather than as a stand-alone system. RotorWatch is currently used by several helicopter operators for both flight following and pilot briefing purposes.

- The RotorWatch system:
  - Provides a real-time display of all of a client's helicopters or aircraft
  - Colorizes each aircraft as green, yellow, or red depending on its alert status
  - Allows each company or operation to configure their own alert criteria
  - Is useful for pilots to get a quick read on go/no-go decisions (especially true for air medical operations, where a quick decision is required)
  - Is critical for dispatchers and Communication Center controllers to monitor aircraft in flight that have limited weather after they launch
  - Insures compliance with JAR Ops III Operating Specifications for helicopter operations
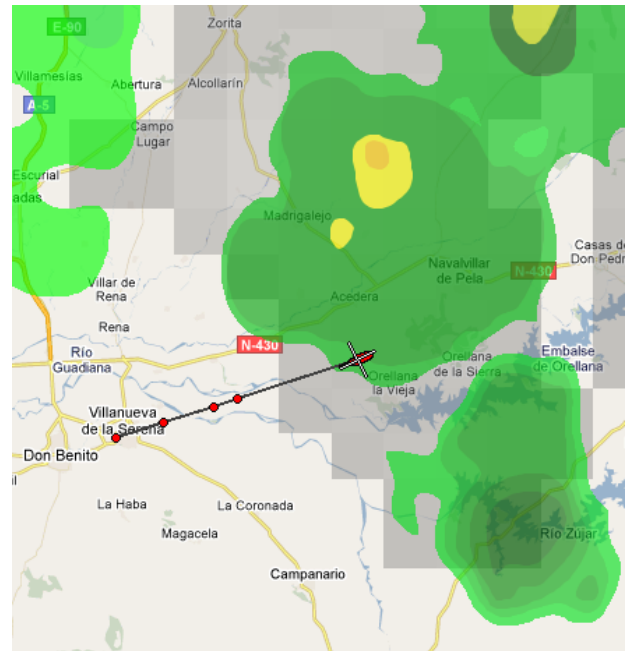  - Can be made to work anywhere in the world



*Figure 4. RotorWatch display of a Spanish helicopter flight into adverse weather. The helicopter shape is at the head of the line of flight, and the circles indicate past position reports. The circles and helicopter icon are colorized to show the weather alert status at all points in time.*



*Figure 5. RotorWatch asset alerting thresholds are user configurable, to insure that alerts conform to a company's own safety and operating specifications.*

# Summary

Safe helicopter operations require critical decisions at several levels within a helicopter enterprise. Government and company-imposed operating specifications such as AO21 (US) and JAR OPS III (EU) require that pilots, dispatchers, and communications center coordinators have detailed knowledge of weather conditions at a helicopter's origin, destination, and along the route of flight.

Use of a single, coordinated weather information platform, assuring that pilots, ground crew, and flight control personnel all share the same, real-time weather information on which their 'go/no go' decisions are based, is critical to safe operations.

The reliability of weather information can differ widely from provider to provider. Free internet sources of weather information are often unsuitable for aviation purposes, although it can be hard to discern this without doing a careful evaluation. Using a single source of weather information that is QICP certified insures that the weather information used is current and reliable enough for safe flight operations.

Use of a checklist, such as the FlightRisk tool, can enhance the safety of helicopter operations by ensuring that pilots perform a consistent and routine check of weather that is independently and objectively evaluated.

Finally, use of advanced monitoring and warning technologies such as SiteWatch and RotorWatch can further enhance safety, by extending weather information to the in-flight phase of operations. The automated and continuous monitoring of all flights for all adverse weather conditions insures that weather will not be a factor impacting safe helicopter operations.