J11.4 NWS PROVISION OF AVIATION WEATHER INFORMATION VIA THE FAA QICP-CERTIFIED CONSOLIDATED AVIATION WEB SERVICES (CAWS) SYSTEM

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1. INTRODUCTION

In 2002 the Federal Aviation Administration (FAA) issued Advisory Circular (AC) 00-62, recommending that all aviation weather data providers who provide data over the Public Internet become a Qualified Internet Communications Provider (QICP). The National Centers for Environmental Prediction (NCEP) Aviation Weather Center (AWC) answered the FAA's call by creating a highly robust multiple web farm system called the Consolidated Aviation Web Services (CAWS). This paper will cover the history of Internet-based delivery of products at the AWC from inception through the transition to becoming a QICP. The major components of CAWS (Figure 1), including the Aviation Digital Data Service (ADDS), International Flight Folder Documentation Program (IFFDP), and the World Area Forecast System (WAFS) Internet File Service (WIFS) will be described and several brand new experimental products and services will be introduced. The paper will also address the role played by the Aviation Weather Testbed (AWT) in CAWS and a vision for how CAWS may play a role in the Next Generation Air Transportation System (NextGen).

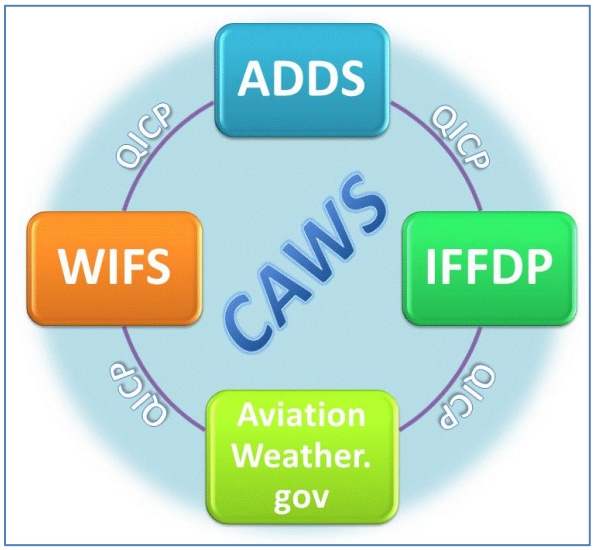

Figure 1 Core CAWS Components

2. HISTORY

In the late 1990s the AWC began serving basic aviation weather briefing information on the web primarily for the purposes of General Aviation self-directed weather briefings. That early web site has grown into what is known today as http://www.AviationWeather.gov. As the demand grew for more and more online weather information, the AWC formed a partnership with the National Center for Atmospheric Research (NCAR), the NOAA Earth System Research Laboratory (ESRL) Global Systems Division (GSD), and the FAA Aviation Weather Research

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Program (AWRP), to create an enhanced web site with additional products and services leveraging emerging visualization capabilities. The result of that partnership was Experimental ADDS (http://weather.aero). In September 2003 the AWC released the first version of Operational ADDS. AWC's successful partnership with the AWRP, NCAR, and GSD continues today, with NCAR and GSD continually improving Experimental ADDS and the AWC merging those improvements into Operational ADDS. ADDS continues to be extremely popular and is currently receiving over eleven million hits per day (Figure 2).

3. QICP

In 2002, the FAA introduced a new standard that describes the process for any person or organization that provides access to aviation weather via the Internet to become a Qualified Internet Communications Provider (QICP) (Washington 2002). FAA AC 00-62 pertains to Internet communications between a civil aviation user and a QICP and it addresses data quality only to the extent of considering QICP security practices to protect data from unauthorized modification and encouraging the identification of the operational or experimental status of QICP products (Washington 2002). The QICP advisory establishes requirements for service reliability, accessibility, and security (Table 1). The reliability component refers to service outages of a QICP provider's web site. To be QICP-compliant, a provider cannot have any single service outage greater than ten minutes or any combination of outages greater than thirty minutes in a continuous three month period. The accessibility requirement states that a provider's web service must be capable of responding to 100% of user requests within two minutes. Finally, the security requirement requires the QICP to provide site authentication and take measures to ensure data integrity. In addition to the basic requirements, there are two recommended practices - user authentication and identification of products in experimental status.

Shortly after the FAA released the QICP advisory in 2002, the AWC began conceptualizing the evolution of its web sites to meet QICP requirements. However, due to the extensive amount of resources that would be required, the project took some time to get started. The CAWS project was finally started in 2008 and received FAA recognition as a QICP in February 2010.

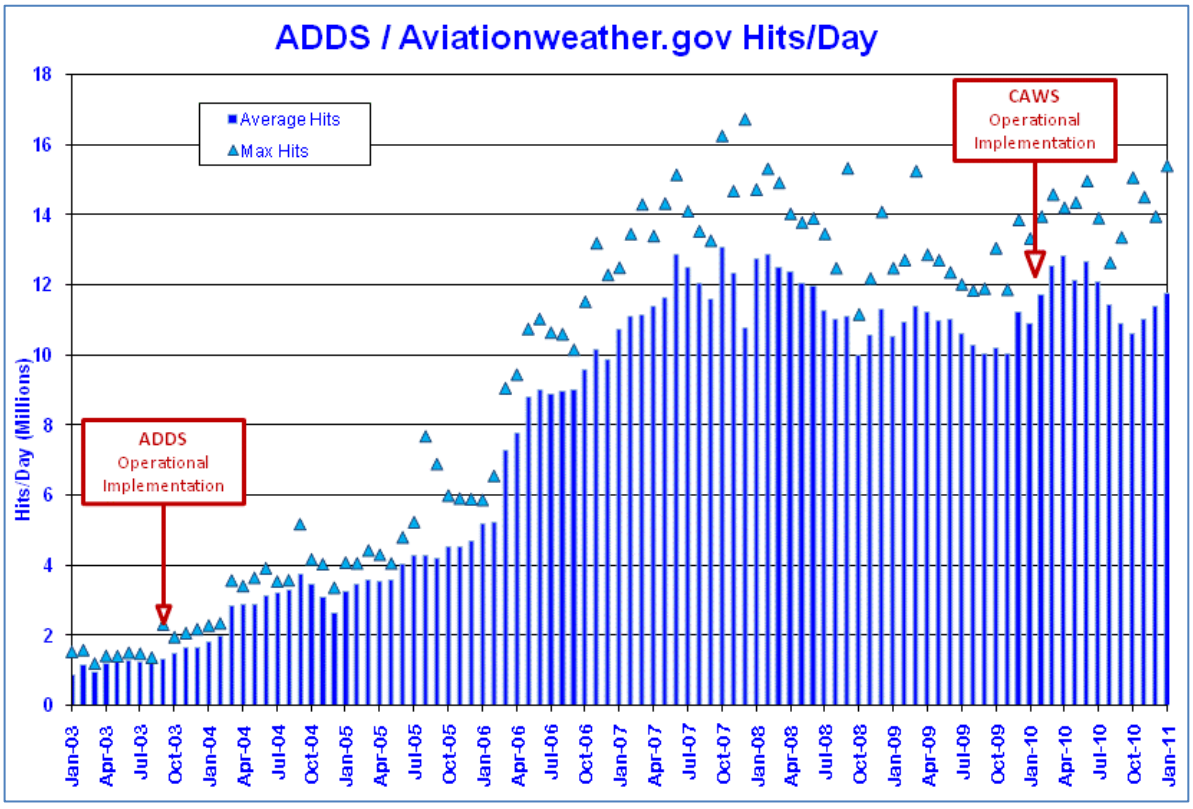

Figure 2 Volume of Web Traffic

Functional Area	Requirement
Reliability	No single service outage greater than 10 minutes No cumulative service outage greater than 30 minutes in a continuous 3 month period
Accessibility	Response to 100% of user requests within 2 minutes
Security	Internet site authentication, secure transactions

Table 1 Summary of QICP Functional Requirements

4. CAWS

In the early phases of the CAWS project, it became clear that in order to meet the requirements outlined in AC 00-62 (Table 1), a re-architecture of the web sites was required. The original AWC web presence was hosted on a single web farm at the AWC making it susceptible to many risks including power failures, hardware failures, network hiccups, and satellite communication losses. In order to build CAWS robust enough to provide the reliability, accessbility, and security needed to meet the QICP requirements, the decision was made to create three globally load balanced web farms at geographically diverse locations; thereby minimizing the risk of power and communications disruptions due to inclement weather in any particular region. Each web farm has independent data feeds as well as inter-farm communication channels to further enhance the redundancy and reliability of the system (Figure 3).

In addition to geographically dispersing the web farms, the CAWS hardware platform was built to accommodate the plethora of current products and services as well as plan for future growth and increasingly sophisticated technology Figure 3). Currently CAWS consists of four core components – www.AviationWeather.gov, ADDS, IFFDP, and WIFS; and an array of integrated sub-components that make up a rich suite of aviation weather products and services. In February 2010, the FAA approved CAWS as a QICP. The remainder of this section will briefly describe these components.

4.1 ADDS

The Aviation Digital Data Service (ADDS) is the flagship service in CAWS and is completely free to use, even for QICP users. Funded and directed by the FAA's Aviation Weather Research Program (AWRP), ADDS is a joint effort of the NCAR Research Applications Program (RAP), the NOAA Earth System Research Laboratory (ESRL) Global Systems Division (GSD), and the National Centers for Environmental Prediction (NCEP) Aviation Weather Center (AWC). The staple products available on ADDS are Significant Meteorological Information (SIGMET) reports, Airmen's Meteorological Information (AIRMET) reports, Terminal Area Forecasts (TAFs), Meteorological Terminal Aviation Routine Weather Reports (METARs), Wind and Temperature model forecasts, domestic and International satellite products, Graphical Turbulence Guidance (GTG) forecasts for turbulence from 10,000 feet to FL450, Current Icing Potential (CIP) and Forecast Icing Product (FIP) forecasts for icing from 1000 feet to FL300,

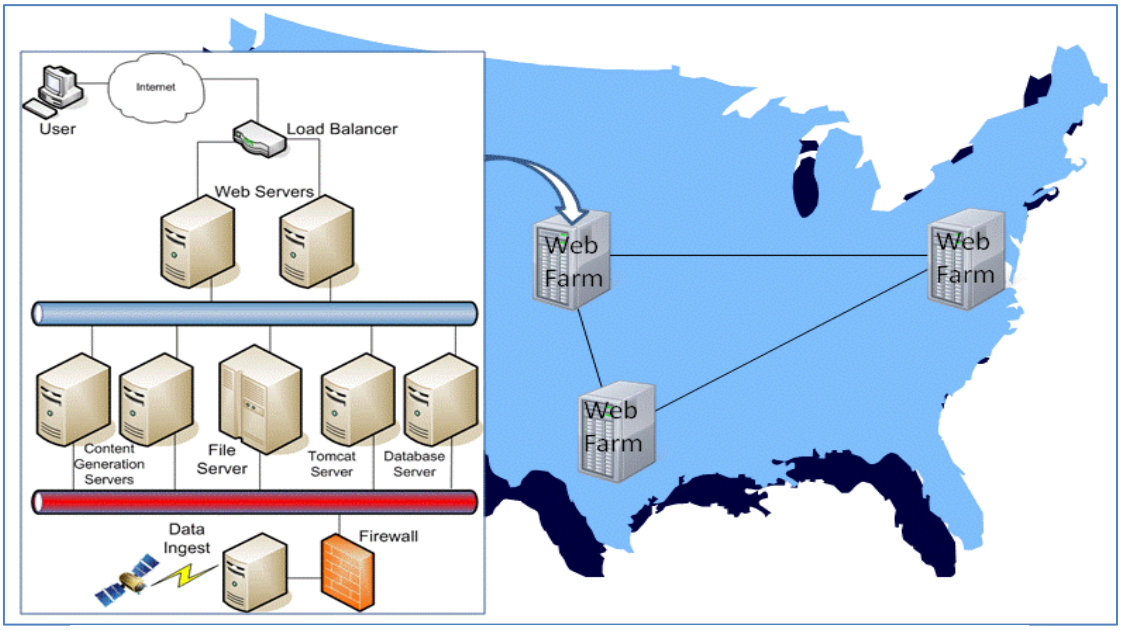

Figure 3 CAWS Web Farm Locations and Architecture

and Pilot Reports (PIREPs). New to the FIP suite of products as of January 18th, 2011 is FIP Severity which provides a categorical icing forecast. There are also a number of Java applications including the Flight Path Tool (Figure

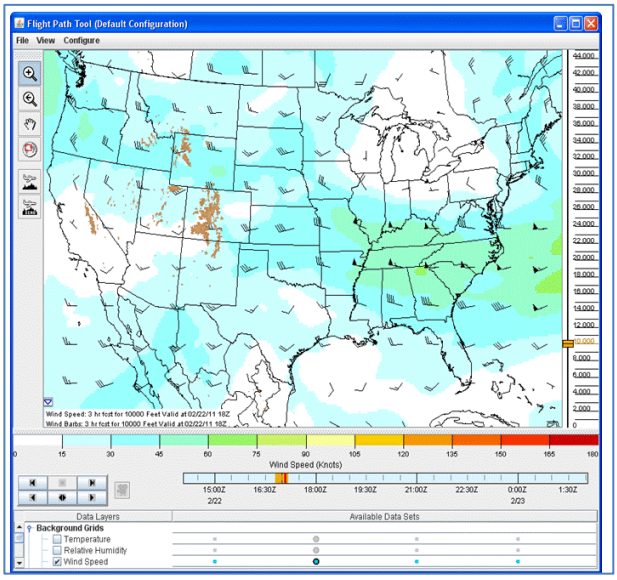

Figure 4 ADDS Flight Path Tool

4). Also new to ADDS is the Experimental Text Data Server that allows users to request text data (METARs, PIREPs, AIRMETs/SIGMETs, etc.) in XML or Comma Separated Value (CSV) format; thus allowing application developers to use ADDS as a data source for their weather displays. ADDS can be accessed at http://www.AviationWeather.gov/adds.

4.2 IFFDP

The International Flight Folder Documentation Program (IFFDP) has been a popular service provided by the AWC since 1998. It began as a facsimile service, providing thousands of weather charts directly to International air carriers for the purposes of pre-flight briefings and in-flight tactical decision aids. Despite declining use of the fax service in the last five to eight years, the AWC still faxes approximately 40,000 charts per month. In conjunction with the IFFDP fax program, the AWC maintains a web-based Flight Folder repository (http://www.AviationWeather.gov/iffdp), offering World Area Forecast System (WAFS) model forecasts of Winds and Temperatures at all flight levels, Significant Weather forecasts by the two World Area Forecast Centers (WAFCs), International TAFs, International METARs, International SIGMETs, and much more. In late 2010, the new Web-enabled International Flight Folder Documentation Program (WebIFFDP), was launched for test and evaluation by the user community. As the IFFDP fax service is scheduled for phase out in early 2012, WebIFFDP will take its place by offering users online customized Virtual Flight Folders (Figure 5). Instead of receiving weather charts by fax, users will be able to view selected charts online and print them at their leisure. WebIFFDP is scheduled for operational implementation in Spring 2011. For more information about WebIFFDP, visit http://www.AviationWeather.gov/webiffdp.

Figure 5 WebIFFDP Virtual Flight Folder

4.3 WIFS

In 2009 the FAA partnered with the AWC to create a web-based system to replace the International Satellite Communications System (ISCS). In response, the AWC created the World Area Forecast System (WAFS) Internet File Service (WIFS). WIFS is an online repository of ICAO-compliant weather information including METARs, TAFs, PIREPs, Significant Weather forecasts in BUFR and PNG formats, and GFS-derived WAFS model forecasts in GRIB and GRIB2 formats. The AWC, acting as the Washington World Area Forecast Center (WAFC), operates WIFS to serve those ICAO states covered in the Washington WAFC area of

responsibility. Authorized users can download the data using a Secure HTTP protocol tool (such as Gnu Wget). The FAA is the approving authority for all WIFS accounts. To learn more about WIFS, visit http://www.AviationWeather.gov/wifs/.

4.4 WEB PIREP SUBMIT

Pilot Reports (PIREPs) are a critical component for safe and efficient aviation. PIREPs are often the first sign to aviators and aviation forecasters that meteorological phenomena such as turbulence and icing have reached hazardous levels. The AWC provides an online PIREP entry form for approved users (Figure 6). To obtain a PIREP Submit Account, please send an email request to caws.admin@noaa.gov.

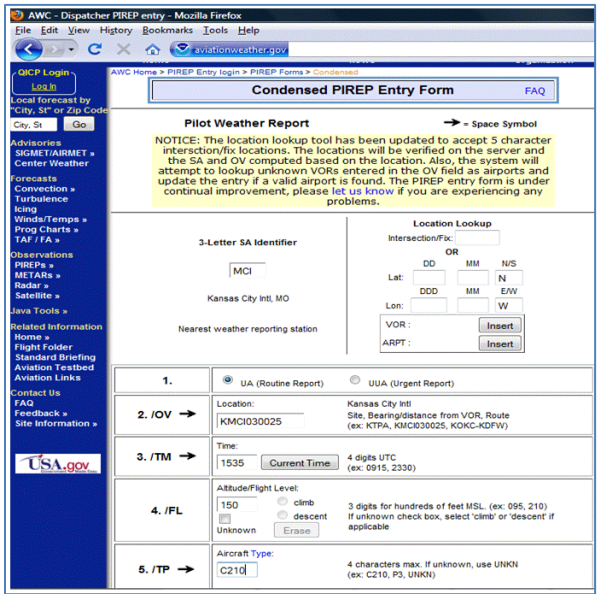

Figure 6 PIREP Submit Form

4.5 EXPERIMENTAL TAF INFORMATION BOARD

The Experimental TAF Information Board (TIB) is now available in a test and evaluation mode and is meant to help CWSU meteorologists and airline dispatchers quickly assess the weather situation in their area of responsibility. The (TIB) (Figure 7) gives users a graphical look at the ceiling and visibility conditions the TAFs are forecasting at chosen airports. To learn more about the TAF Information Board go to http://www.AviationWeather.gov/testbed/cwsu/tafboard/.

4.6 EXPERIMENTAL TRACON FORECAST PAGE

Another experimental tool released recently for test and evaluation is the TRACON Approach and Departure Gate Forecast page (Figure 8). The TRACON forecast page will complement the Collaborative Convection Forecast Product (CCFP) by providing greater detail of convective occurrence. This product is intended for users such as the FAA Command Center. To learn more about the TRACON Forecast page visit http://www.AviationWeather.gov/cwsu/.

4.7 SPACE WEATHER FOR AVIATION

Products from the NCEP Space Weather Prediction Center (SWPC) are presented on the Experimental Space Weather for Aviation Service Providers page (Figure 9). The Space Weather for Aviation pages contain information on geomagnetic storms, solar radiation storms, radio blackouts, and much more. To learn more about the Space Weather page visit http://www.AviationWeather.gov/swpc/.

5. AVIATION WEATHER TESTBED

The NOAA Aviation Weather Testbed (AWT), located at the AWC creates an opportunistic environment for the transfer of new and innovative aviation weather forecast technology into real-time operations for safe and efficient flight. Joining in partnership with government, academic, and private sector partners and stakeholders, the AWT is a formalized conduit for the effective transfer of research and technology projects to operations, through the development of rigorous testing and evaluation processes (Levit 2011). The AWT plays an integral role in CAWS by hosting Beta CAWS (bCAWS), acting as a testing platform for ADDS enhancements, and providing a proving ground for new AWRP algorithms such as the Graphical Turbulence Guidance (GTG) and the Forecast Icing Product (FIP).

6. ROLE OF CAWS IN NEXTGEN

The flexibility, reliability, and power of the QICP approved CAWS make it well-suited to play a role in the Next Generation Air Transportation System (NextGen). The Aviation Weather Testbed (AWT) is currently participating in NextGen development by serving as a data provider to the 4-D Weather Data Cube. Due to the geographic dispersion, high availability, and

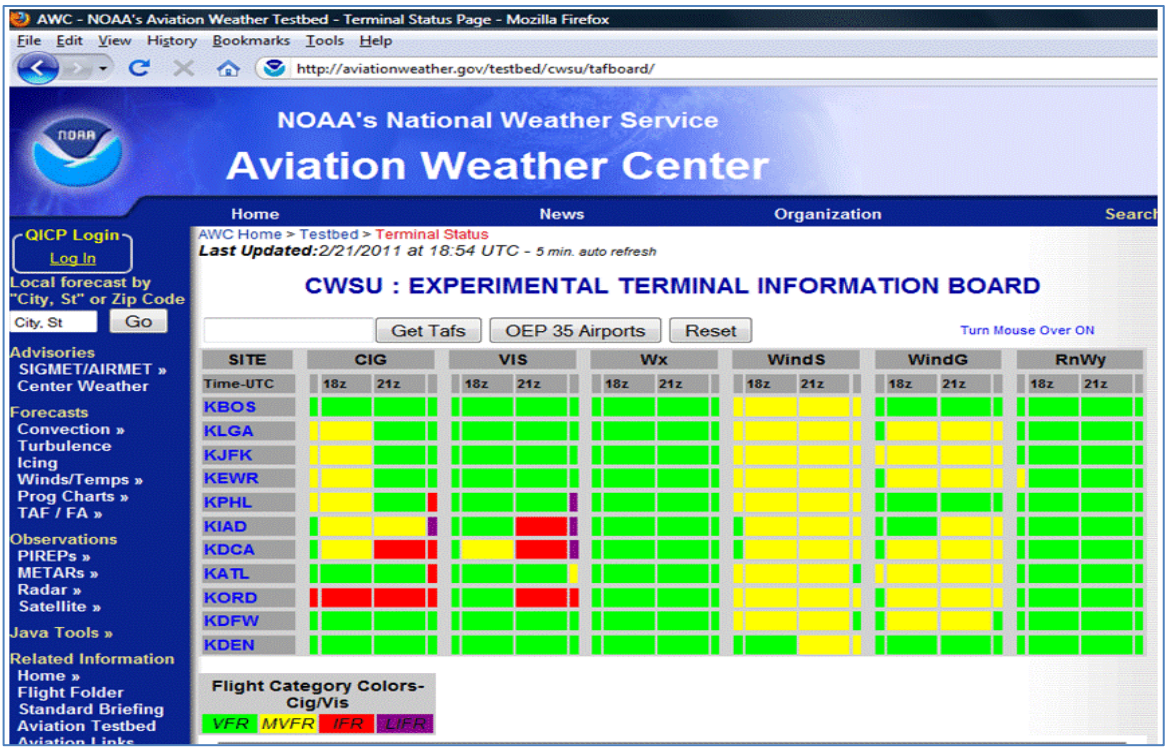

Figure 7 TAF Information Board

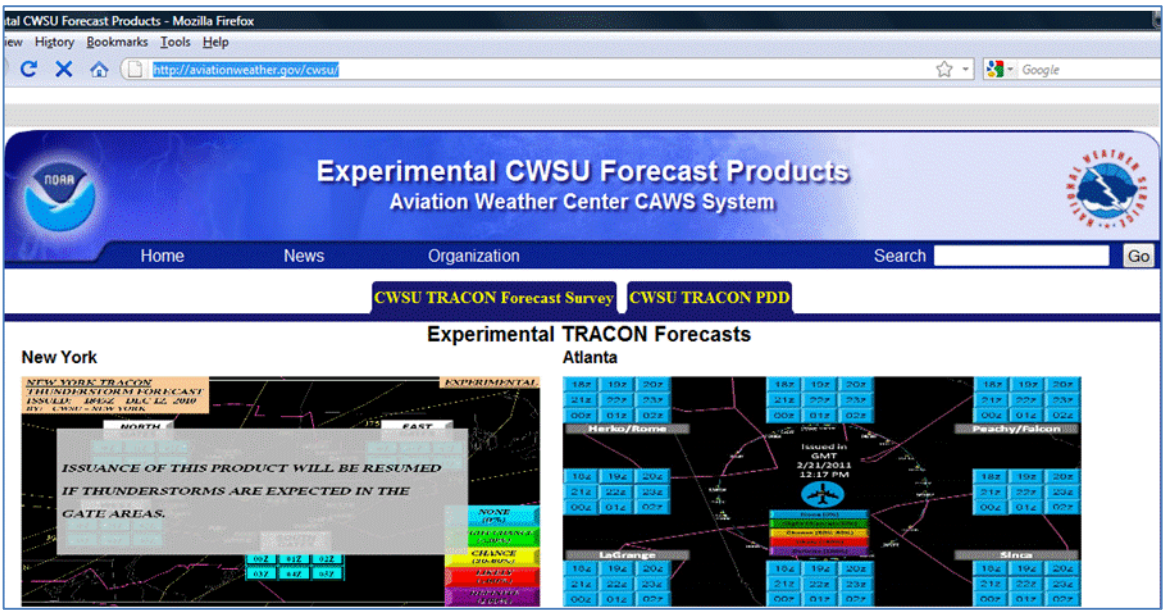

Figure 8 TRACON Forecast Page

access to data, the CAWS web farms make excellent candidates to host NextGen 4-D Weather Data Cube servers. The high bandwidth, load balanced web front end also make CAWS an attractive candidate for secure, web-based visualization of the 4-D Weather Data Cube. To learn more about NextGen visit the Joint Planning and Development Office (JPDO) web site at http://www.jpdo.gov.

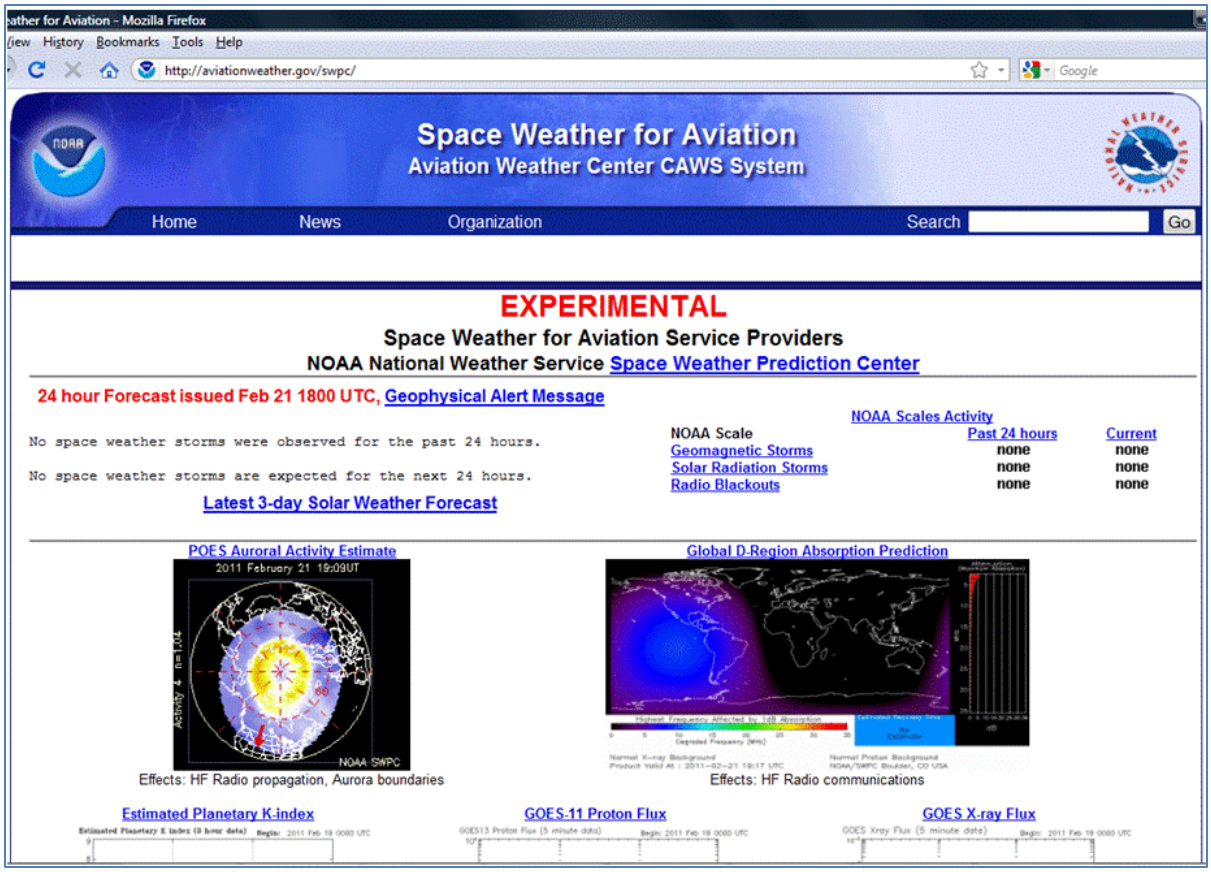

Figure 9 Space Weather for Aviation Page

7. REFERENCES

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