Aviation Digital Data Service
Flight Path Tool
Product/Services Description Document

Part I – Mission Connection

Safe and efficient transportation systems are crucial to the US economy. At least $4 billion is lost annually due to economic inefficiencies resulting from weather-related air-traffic delays. NOAA is committed to providing information, services, and products for transportation safety and for increased commerce. NOAA works with the **Federal Aviation Administration (FAA)** and the private sector to reduce the negative impacts of weather on aviation without compromising safety.

As required by the Federal Aviation Act of 1958 and subsequent amendments, NOAA's National Weather Service cooperates with the FAA in promoting and developing new meteorological science and in fostering support of research projects through the use of private and governmental research facilities. The scope of these functions is broadened by recommendations published by the Office of the Federal Coordinator for Meteorology (1999), the Weather Joint Safety Implementation Team (2000), and the FAA Aviation Weather Mission Needs Statement (2002).

Improving the availability and accuracy of aviation weather forecasts directly supports the FAA's 2003 *ARA Performance Plan* strategy to: "Identify, develop, and conduct research to improve methods, procedures, and technologies to reduce fatal accident rates due to operational hazards." It also supports the anticipated outcomes of the Agency's "Safer Skies" initiative and delivers aviation efficiency benefits to the NAS.

NOAA supports the **Aviation Weather Technology Transition (AWTT)** process and is responsible for placing approved experimental products and services emerging from the **Aviation Weather Research Program (AWRP)** into the NOAA operational environment. The AWRP is an initiative of the FAA's Weather and Flight Service Systems Integrated Product Team. The goal of the AWRP is to increase the scientific understanding of atmospheric conditions that cause dangerous weather that, in turn, impacts aviation. The research is aimed toward producing weather observations, warnings, and forecasts that are more accurate and more accessible. AWRP funds research into aviation meteorology as it relates to problems in aviation safety or National Airspace System capacity and traffic management which may be solved or mitigated by the results of dedicated scientific studies. Various partner organizations (http://www.faa.gov/aua/awr/partners.htm) conduct or test the research.

The **Aviation Digital Data Service (ADDS)** makes available to the aviation community text, digital and graphical forecasts, analyses, and observations of aviation-related weather variables. ADDS is a joint effort of **National Center for Atmospheric Research (NCAR) Research Applications Program (RAP)**, **NOAA Forecast Systems Laboratory (FSL)**, and **NOAA National Centers for Environmental Prediction (NCEP) Aviation Weather Center (AWC).** ADDS received the Government Technology Leadership Award in 2000.

The ADDS **Flight Path Tool (FPT),** an advanced web-based technology, has been developed and applied to increase the capabilities, efficiencies, and accuracy of transportation-related

products and services. The ADDS FPT serves to promote safe, secure, efficient, and seamless movement of goods and people in the US transportation system by providing secure, reliable, and robust information from NOAA out to the aviation public.

a. Product/Service Description

The FPT allows a user to view data along a specified route of flight. The user can view important weather information on a map. Points can be entered along a route, so that the data can be viewed in a vertical cross section. Weather information that can be displayed on the FPT horizontal and vertical cross section views includes, but is not limited to:

- Wind
- Temperature
- Relative humidity
- Icing potential
- Turbulence potential
- AIRMETs and SIGMETs
- PIREPs
- TAFs
- METARs

b. Purpose and Intended Use

The FPT was developed to help users assimilate a variety of weather observations and forecast information, especially high resolution gridded data. The FPT allows the viewing of the above information on one display to maximize its effective and efficient use in flight planning.

Throughout aviation history, the effective assimilation of this information has been problematic, requiring users to understand the implication to safety in the horizontal but also in the vertical. For decades the skill of professional weather briefers from the FAA and NWS have helped pilots interpret and apply weather observation and forecast information to a specific route of flight. Lately, with the increasing ability of pilots to access directly NWS forecasts over the Internet and through federally sponsored programs such as DUATS, pilots do not have an intermediary to help interpret, integrate, and apply the various forecast products to the planned route of flight. Additionally, the availability of more detailed icing, turbulence, ceiling, and visibility information has challenged even the most experienced users.

The Flight Path Tool allows a user to plan a safer flight by integrating the new forecast products along an intended route and approximate time of flight. This allows users to visualize applicable forecast information in the vertical for the intended route of flight.

c. Audience

The Flight Path Tool is a part of the ADDS operated by the NOAA's National Weather Service, and accessed through the commercial Internet for the purpose of providing weather information to a variety of users, such as pilots, dispatchers, FAA Flight Service Station briefers, and government and private meteorologists.

d. Presentation Format

The FPT is a web-based graphical and text display that allows the user to view weather observations and forecasts in the horizontal and/or vertical (distance versus altitude) dimensions plus the ability to alter the time component.

e. Feedback

Feedback concerning the Flight Path Tool can be sent via: http://weather.gov/survey/nws-survey.php?code=AWC-FPT

Part II - Technical Description

a. Format and Science Basis

Two versions of the FPT are available: one is written as a **Java applet (FPT-1)** that is embedded within a web browser, the other is a **Java application (FPT-2)** and resides on the user's computer. Both access (via the internet) and display high resolution, four-dimensional forecast information and integrate this information with current observations. The geographic area of interest is selected by the using the zoom feature. Users are able to interrogate the dataset at desired levels and along desired line segments.

Except for bug fixes, the FPT-1 code base is considered frozen. Additional features available in the FPT-2 will not be implemented in FPT-1. The FPT-1 will be removed from ADDS at some point in the future when it is deemed users have had ample opportunity to transition to the FPT-2.

b. Availability

The currently operational FPT-1 is a part of the operational ADDS operated by NOAA's National Weather Service at the AWC. The FPT is accessed through the commercial Internet at: http://adds.aviationweather.gov/flight_path/ .

The experimental FPT-2 is now available at http://weather.aero/jade/ . This version is under development and new feature and fixes to bugs are being deployed on a regular basis.

The development of the ADDS FPT-2 is the responsibility of the Aviation Forecast Product Development Team of the FAA Aviation Weather Research Program. When outages occur, the FPT-2 will be returned to service on a best effort basis.

c. Additional Information

A new version of the Flight Path Tool (FPT- 2) is now available. The following describes the design concepts and advantages to the new version.

1. Design Overview

The FPT application (FPT-2) was designed to make it easy to create web-deployed applications that display real-time, geo-reference aviation weather information. FPT-2

has several advantages over the DataCanvas framework used as the foundation of the current ADDS applets (FTP-1):

• To resolve numerous bugs related to inconsistencies in different web browsers, applications will be deployed instead of applets.
• Data views are 'pluggable' in FPT-2, meaning that the way data is drawn on the screen is independent from the format in which the data is stored and delivered. For example, FPT-2 will provide several ways to render METAR symbols, and it will be easy to change which symbol set is used for a particular application.
• FPT-2 is not tied to a particular data format, which removes the necessity to coerce data into a particular structure before displaying it. Any data format can be displayed if code is written to locate, retrieve, and render the data. The FPT-2 approach is very scalable in that code for unused data formats does not need to be included in an application.

2. FPT-2 Applications

FPT-2 is written entirely in java. Any applications developed with the framework can be deployed with Java Web Start, a free product from Sun Microsystems which allows users to run applications either by clicking on a link in web page or by starting them up from the desktop. More information on and download of the the Java Web Start product can be found at http://java.sun.com/products/javawebstart/ . These applications have several advantages over applets:

• Applications are run against a sanctioned version of the Java Virtual Machine (JVM), reducing bugs due to custom JVM implementations in web browsers.
• Startup time is dramatically reduced since the FPT-2 applications only need to be downloaded once. Subsequent use of the applications happens from the local disk. New versions of applications are downloaded automatically by Web Start.
• The utility of the FPT is enhanced by allowing users to save their configuration preferences, allowing them to start the application later in a configuration appropriate for how they use the tool.

Feature	**FTP-1**	**FTP-2**
Stand-alone application with these features: - No code, map, or configuration file download on startup - No dependence on web browser Java Virtual Machine		X
Resizable map		X
Configurable pre-defined flight paths		X
Cross section (flight path history)		X
Save User Preferences / XML Configurable (e.g. layers, zoom , color scales)		X
Pluggable Rendering / Different Views of Same Data (e.g. different METAR symbols)		-
Applications Small, Easy to Write, Maintainable (400 lines vs. 3500 lines)		-
Animation Sweeping		X
Animation Backwards		X
Animation Over Any Set (Vertical Levels, Variables, etc.)		-
Semi-Transparent Data Layers		X
Color-Coded Topography		X

Configurable Time Range and Intervals		X
Graphical Indication of Displayed Data (“Blue Dots”)		X
Dockable Tool Bar Controls		X
Displays Most Common ADDS Data Formats	X	X
Zoom	X	X
Cross Sections (Flight Paths)	X	X
Contour View of Gridded Data	X	X
Progressive Disclosure on Point Data Sets (e.g. METARs)	X	X
Displays TAFs, SIGMETs, AIRMETs, VORs	X	X
Pan Current View (Overview Dialog)	X	X
Legends	X	X
User-Definable Color Scales		X
View Different Domains		-
Change Order of Layers with Drag-and-Drop		X
New Data Formats (NetCDF, SPDB, Satellite, Radar)		-
Map Projection On Screen Can Be Different From Data Projection		-
Contours on Cross Section (Flight Path) Dialog		X
Animation Configuration (Range, Delay, Dwell, Skip Frame)		X
Name and Categorize Color Scales From Within GUI		-
Column Viewer (Pseudo Soundings) for Gridded Data		-
SkewT Plots		-
Display Pressure / Altitude / Sigma Levels		-
Wind Barbs on Cross Section (Flight Path) View		X
Wind Vectors as an Option (Rather than Barbs)		-
Meteograms and Other Time-series Plots		-
Display GIS Layers		-
Derived Data Layers and Functions Calculated From Other Data Layers		-
Label Font / Size / Color Configurable by User		X
Graphical Status Indicator		X
Contour Configuration (Min, Max, Interval, Labels)		X
Unit Conversion / Display Configuration		-
Text / Notes Data Layer (For User Annotation)		X
Load / Display Fronts Information		-
Pluggable Action Listeners (Custom Clients Can Listen To Application Events)		X
User Interface to Edit Time Configuration		X
Ease of Building Other Applications		-
Gridded Data Decimation on Small-Scale Views		-

X : Available Feature - : Planned Future Feature

Figure 1: Horizontal View

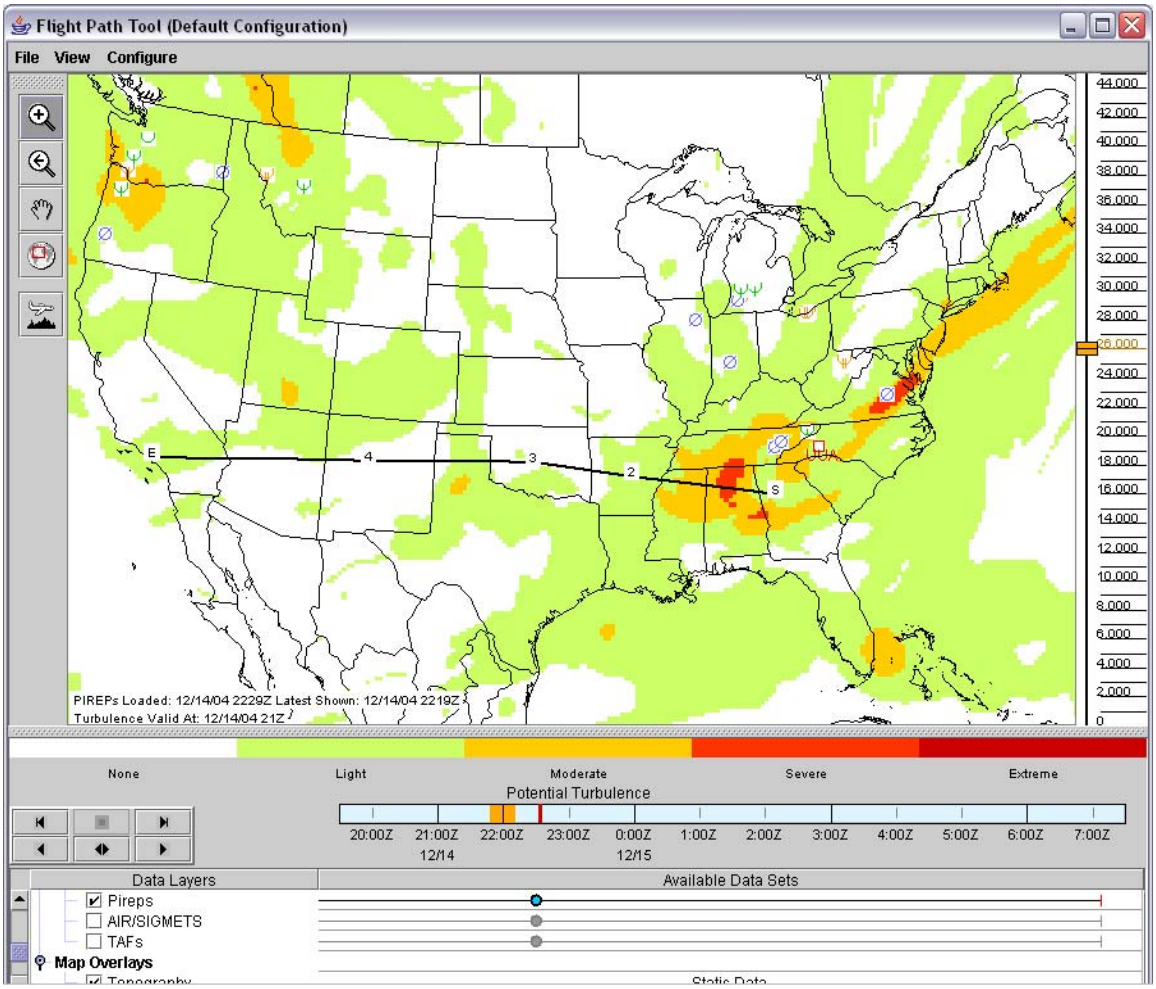

Figure 2: Vertical Cross Section View