

Flight Tracking and Satcom

AIRCRAFT TRACKING SYSTEMS, ONCE FOUND MOSTLY IN AERIAL FIREFIGHTING OPERATIONS, ARE INCREASINGLY BEING INSTALLED ON COMMERCIAL AND BUSINESS AIRCRAFT.

BY DARYL MACINTOSH



Dispatchers can now view an aircraft's near real-time flight path, position, speed and altitude, overlaid onto a detailed map page such as Google Earth.
Jason Pineau Photo

INTRODUCTION

Do the key people in your organization know the exact position of each aircraft, where it has been, how long it has flown and its mission status details? Do they have direct access to flight crews via text and/or voice communication? The technology that enables this type of organizational situational awareness has steadily progressed over the past decade to the point where it is now reliable, cost effective, feature-rich and mainstream. Dispatchers and/or other authorized people with Internet access can now view an aircraft's near real-time flight path, position, speed and altitude overlaid onto a detailed map page such as Google Earth.

Many firefighting aircraft operators became early adopters of satellite-based tracking systems several years ago, when various government forestry contracts began to mandate their use. The fire control centres needed a reliable automated flight following (AFF) system to better manage the aircraft under their control. The companies that operated these firefighting aircraft saw immediate benefits as well. They found they could improve the accuracy and efficiency of their invoicing, monitor aircraft hours, monitor crew duty times and improve aircraft utilization with tactical repositioning.

We are now seeing a wider variety of aircraft operators equipping their entire fleets with these systems. Many clients who hire aircraft have become accustomed to receiving detailed flight data and they may now expect this capability from all operators. Owners of unequipped aircraft may find themselves at a competitive disadvantage.

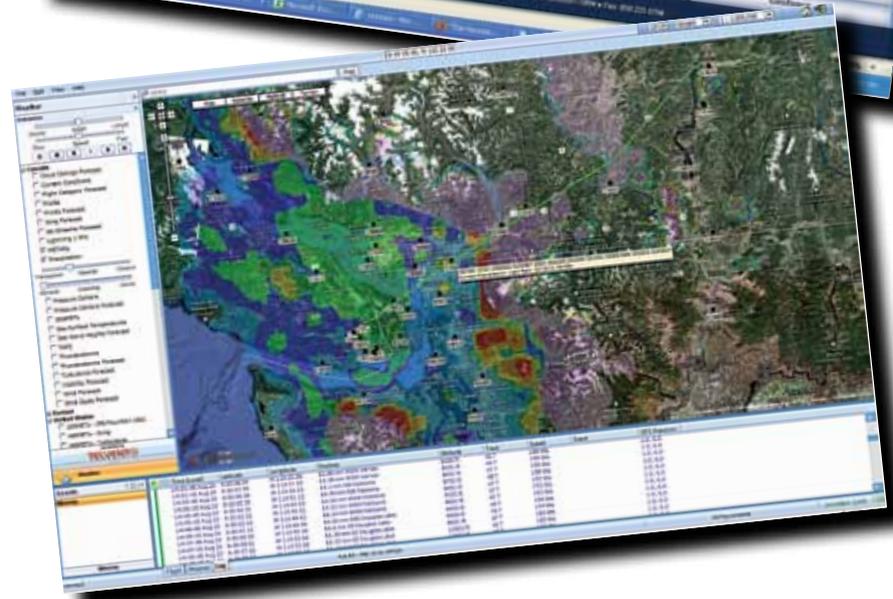
TECHNOLOGY OVERVIEW

Aircraft tracking systems utilize two separate satellite networks to perform their function. The global positioning system (GPS) network of 24 satellites orbiting about 12,000 miles above the Earth is used to determine the aircraft's position, including altitude, speed and track. This information is then periodically transmitted to ground stations via the Iridium satellite network, which is a constellation of 66 satellites in a low-Earth orbit (about 780 km above the ground), providing worldwide voice and data services to a variety of users. A dual-element antenna (GPS and Iridium) is installed on a top surface of the aircraft to enable line-of-sight connection to these satellites. Most current systems are optionally capable of voice communication via the Iridium network. This communication capability can be configured for use with a dedicated handset or interfaced into the ship's audio system, similar to an aircraft radio. A control-display panel is typically installed in the cockpit and/or cabin to provide the user interface for text messaging and telephone dialing.

TYPICAL FEATURES AND CAPABILITIES

The features and capabilities are not exactly the same from each manufacturer, and also vary between their products. Typical features are listed below, but buyers should verify exact capabilities before committing to a specific system.

- Transmission of position, time, track, speed, altitude and other flight status data
- Display of near real-time aircraft flight path overlaid on a map
- Display historic flight paths overlaid on a map
- Ability to send and receive narrow band text messages
- Ability to store prewritten text messages and transmit as required
- Ability to transmit event-triggered alerts
- Ability to control access logins for clients, employees and others
- Ability to generate reports which include takeoff, landing and distance flown
- Ability to control the frequency of automated position reports (control of data use cost)
- Basic telemetry – ability to interface with aircraft systems and transmit data
- Emergency mode – transmit a Mayday message
- Optional voice communication capability



Aircraft tracking systems use the GPS network of satellites as well as the Iridium group of satellites in a low-Earth orbit. Several companies operating in this niche market are Canadian.

Another key capability that we hope you never need to use is the ability to pinpoint the last known position of a missing aircraft. This information could accelerate a search and rescue operation and possibly save lives.

PRODUCTS AND PLAYERS

The manufacturers of these products are working hard to differentiate themselves in a somewhat crowded market. For example, their product offerings vary from bare bones AFF hardware to meet minimum forestry requirements, to full-featured turnkey solutions with voice, enhanced data capabilities and custom software. Systems continue to evolve with improvements to hardware, user interfaces and data capability.

The manufacturers, listed alphabetically below, build Iridium-based tracking and communication products specifically designed for aircraft installation. The list does not include manufacturers of the portable devices used by some aircraft operators. It is interesting to note how many of the key players in this niche market are Canadian.

Before choosing a system for your aircraft or fleet, the following questions should be considered:

- Will the system meet all of your current needs?
- Does the system have growth capability to add features in the future?



Installing an aircraft tracking system with an applicable STC approval for the client's type of aircraft will help to keep installation costs down. Images courtesy of Latitude and Sky Trac

- Will the airborne user interface meet the needs of your flight crews?
- Will the Internet user interface meet the needs of your dispatchers and clients?
- Is the hardware well-built and to a quality standard suitable for your aircraft?
- Is the manufacturer committed to remaining in this competitive market?
- Does the manufacturer have an authorized dealer/installer in your area?
- Is the system STC-approved for installation into your aircraft type(s)?
- Does the product have a good reputation with other users?

SYSTEM INSTALLATION

The installation of these systems is not an overly difficult undertaking for a qualified avionics facility, but it shouldn't be attempted by someone without appropriate experience. The installation challenges and subsequent costs vary by product and aircraft type. Installation of a system which comes with high quality hardware, accurate technical documentation and an applicable STC approval will go reasonably well, especially if the dealer/installer is familiar with the aircraft type.

Some equipment manufacturers have made significant investments in obtaining STC installation approvals for a wide variety of aircraft. These STC approvals help to keep the installation cost down and minimize associated project risks. If an STC is not available for your aircraft type, the installer will have a much larger job in planning the installation, generating the supporting drawings and documents, and working with a design approval representative (DAR) as necessary to obtain Transport Canada approval. Systems can often be installed into smaller, unpressurized aircraft without STC approval, but the installer then has additional responsibilities to ensure that all applicable airworthiness requirements are met.

INSTALLATION CONSIDERATIONS

The system installer will need to consider the following questions during the planning stage and may need the aircraft owner's feedback in order to make the right decisions.

- Who will need access to satellite communications (satcom) in flight? Is capability for simultaneous satellite telephone calls and crew VHF radio communication required? Do passengers need to make private calls? Some aircraft may require a completely new audio system to meet an operator's unique requirements.
- Is there a suitable location available in the cockpit to mount the selected control/display unit? If not, can other systems be relocated to make room?
- How will the system detect aircraft lift off? Will it be interfaced to a weight on wheels switch, a helicopter collective switch, or will it use ground speed?
- Where will the antenna be mounted? Is there a suitable location with a clear view of the sky?
- Where will the transceiver be mounted? Is a sturdy shelf available or must it be constructed?
- How far will the antenna be from the transceiver? If they are not reasonably close together, special (expensive) low-loss coaxial cable will be required.
- Does the aircraft interior need to be completely removed for installation access? Perhaps the installation can be scheduled with other major inspection work.

FINAL THOUGHTS

I believe that the adoption rate for this and/or similar technology is accelerating and that most commercial aircraft and many business aircraft will be equipped with satellite tracking technology by the end of this decade. In the next issue, we will discuss broadband connectivity, Wi-Fi, email and Internet access. 

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