

Aircraft Tracking: What is currently available?

Andrew Burton, 31 Dec 2014

With the third major commercial airline crash of 2014 where the aircraft could not be located for 48 hours or more, there is a growing discussion around the issue of real-time flight following of aircraft. There is a lot of conjecture from armchair experts about what could be done, and what is currently available, and why it isn't being widely used. Apex Flight Operations and its predecessors have been involved in aircraft tracking since 2003, and we are uniquely positioned as both a hardware manufacturer and a flight tracking data accumulator to shed some light on what is currently available in the market.

Firstly, there are three major types of aircraft tracking: traditional radar-based, ADS-B/ACARS and dedicated flight following – the majority of recent discussion around aircraft tracking has omitted this last type. There are also several new systems or planned improvements to existing systems that may bring increased oversight in the future.

- **Traditional Radar-Based Tracking**

This has been the predominant means of tracking aircraft in real time globally until the advent of ADS-B, and remains the only means of flight following in areas with no or limited ADS-B coverage. It has major shortfalls in that tracking is only available when the aircraft is in range of the radar – the rest of the time the aircraft is estimated to be at a certain location based on expected speed on a planned flight path. It is now generally accepted that a better alternative needs to be urgently found.

- **ADS-B/ACARS Tracking**

ADS-B transponder tracking is a vast improvement over the limitations of radar-based tracking, but requires considerable infrastructure outlay to provide coverage. It is also generally limited to coverage of continental flights, with intra-oceanic flights remaining untracked for large parts of the flight path. Major concerns and issues around the capacity, security and integrity of ADS-B data remain largely unresolved. Coverage is also a major issue for aircraft flying below FL200 in the majority of ADS-B airspace, limiting it for widespread global use. Similar concerns around the use of ACARS data, particularly capacity have led industry experts to look for alternatives or enhancements to meet the challenges.

- **Dedicated Flight Tracking**

Tracking of aircraft with dedicated tracking equipment has been around since the late 1990s when Thrane&Thrane introduced AeroC units using the Inmarsat network. Since then, tracking data has been developed by a number of manufacturers, with Inmarsat and Iridium the predominant data carriers. Varying levels of sophistication have driven the cost of these systems; some can carry a huge amount of flight data, but cost over \$100k, whilst others carry simple positional information and cost less than \$2k – all have the ability, however, to pinpoint the aircraft's position to within a mile or two at any given time.

- **Future Systems**

Proposed systems such as Aireon and others may well improve the tracking of aircraft globally, but with expected implementation dates predicted from 2017 onwards, there is still far too big a timeframe for regulators and airlines to sit back and wait, and no guarantee that they are a silver bullet for the problem.

What Is Available?

Focusing on the third option, many people would be surprised to know that thousands of aircraft worldwide are already being tracked daily by dedicated tracking systems – since 2007 the United Nations has mandated and implemented aircraft tracking on all humanitarian and peacekeeping flights, as has the International Committee of the Red Cross/Crescent. Safety conscious general aviation pilots, charter operators and regional airlines have been implementing systems for years, but there has been significant resistance to the adoption of these systems by commercial airlines, and even from the airline pilots themselves. The reasons provided include “they don’t lose aircraft”, cost, implementation and security. Let’s have a look at these reasons:

“We Don’t Lose Aircraft”

This was a comment received after a presentation by the author to a safety committee of a consortium of major airlines in 2008 – since then the losses of AF447, MH370, AH5017 and now QZ8501 have proven them tragically wrong. Many other aircraft have remained missing for hours, days and weeks.

Cost

This is the most frequent reason cited for why tracking systems are not being adopted – it is true that some solutions are uneconomically expensive (over \$100k before installation), but the vast majority cost only a couple of thousand dollars in capital expenditure. Secondly, the data costs are given as a prohibitive factor, and again, this used to be true years ago. The latest tracking systems, using new satellite communication channels from Inmarsat and Iridium, however, provide positional information for a few cents per report (3.5¢ for the Falcon 360+ tracking system). Even in terms of small aircraft operational costs, the price of these systems is not valid as an argument any more.

Implementation

Installing any avionics on an aircraft can become quite costly, and is widely varied based on the type of aircraft, the requirements of the avionics installation, and even the country’s local aviation certification and engineering requirements. Many modern tracking systems, however, circumvent these issues by being portable unit that require no installation further than fastening the unit down.

Security

Whilst ADS-B communication can be picked up by a simple receiver unit obtainable through the Internet, and can also be “spoofed” to provide false position reports for aircraft, dedicated tracking systems have secure and encrypted communication channels. Inmarsat’s IDP service, for example, provides a guaranteed delivery of transmission, and the data cannot be decrypted by non-authorized parties.

A Compelling Solution

Dedicated tracking solutions provide a lot more than just positional information; recognizing that aircraft operators require some real daily value from the systems (outside of where the aircraft is currently located), most service providers have additional functionality available that includes:

- Instant “Mayday” button for the Aircrew, with increased reporting rate
- Real-time automatic “OOOI” (**O**ut of the gate, **O**ff the ground, **O**n the ground, and **I**nto the gate) times
- Real-time ETAs
- Automatic flight monitoring, with Alert escalation on the loss of signal for early incident detection

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- Flight phase monitoring, with alert escalation for rate-of-ascent or –descent exceedances
 - Bi-directional communication, including email
 - Intra-fleet aircrew communication
 - Restricted airspace monitoring and real-time warning
 - Back-office integration of flight data into maintenance, crew management and billing systems

This additional functionality provides a short-term return on investment for the aircraft operator, and provides invaluable additional information to flight operations managers and airline analysts.

The Golden Hour

After an aircraft accident, rescuers talk about a “golden hour” during which injured passengers can be saved. Whilst it appears that it was unfortunately unlikely that anyone could have survived QZ8501, the fact that it took over 48 hours (even when being tracked by both radar-based and ADS-B tracking) to pinpoint the aircraft highlights the need to identify distress situations early, and have accurate and reliable positional information available immediately to search and rescue. In incidents where our tracking systems have been onboard accident aircraft, we have identified the situation before ATS has been aware the aircraft is missing, and have guided search and rescue efforts to the location within minutes, before natural elements like oceanic currents can disperse debris too far from the crash location.

Making Tracking “Tamper Proof”

Aviation regulators worldwide have given no specific attention to these systems until now, and have approved installation and use under the same conditions as general avionics systems. Systems are classified as “non-essential devices” in terms of the aircrew’s emergency procedures, and must therefore be able to be disabled in the event of an emergency; they are typically connected to a standard circuit breaker in the cockpit which can be disconnected at any time. Regulators are now working on providing a framework under which tracking systems can be separately certified, allowing them to be configured in a tamper-proof manner, but this is strongly resisted by the airlines, as well as airline pilots associations.

Summary

As a technology-based industry, the satellite tracking of aircraft has evolved quickly, certainly quicker than the airline industry and regulators have been able to cope with. Costs have dropped to a fraction of what they were 5 years ago, and the increased bandwidth availability has seen systems introduced with far more additional functionality, bringing increased safety oversight, and invaluable feedback on the performance of the aircraft during operation. Contracts for aircraft charter are now routinely including requirements for aircraft tracking, and even weekend pilots are implementing tracking solutions for their safety. It is only the commercial airline industry that seems to be dragging their feet – perhaps with the flying public becoming more concerned about real-time aircraft tracking they will have to review this attitude in the near future. There is no question that if AF447, MH370, AH5017 and QZ8501 had a dedicated tracking system on board, search and rescue would have located them within minutes.

Andrew Burton is CEO of Apex Flight Operations, and has managed aircraft tracking companies since 2003. For more information, please contact andrew@apexflightops.com. Apex Flight Operations is based in Sydney, Australia, and manufactures dedicated tracking solutions for the aviation industry. It also consolidates data from 17 different tracking service providers into its IndigoTrack software package, and tracks over 2,000 aircraft on a daily basis.

† For more information on the Falcon 360 Tracking system, visit our website at www.apexflightops.com. To view Apex Flight Operations’ submission to ICAO’s Aircraft Tracking Task Force investigation, click [here](#)