CYIENT

WHY BIG DATA AND THE INTERNET OF THINGS HOLD THE KEY TO THE FUTURE OF AEROSPACE

The advent of big data and the Internet of Thing (IoT) has transformed business and consumer sectors across the world. Facebook has over 1.4 billion subscribers generating in excess of 600 terabyte[1] of data every day. But the impact on data heavy sectors like aerospace has been even more revolutionary.

The figures already dwarf those found in the consumer space, both in terms of the volume and the impact that they're having across the industry. For example, Bombardier's CSeries jetliner carries Pratt & Whitney's Geared Turbo Fan (GTF) engine - an engine that comes with 5000 sensors and that can generate up to 10 GB of data per second. A single twin engine aircraft with an average of 12 hours flight-time can produce 844 TB of data. With an order book of over 3500 GTF engines, Pratt could potentially download zeta bytes of data, once all their engines are in the field.

These scales, combined with the level of storage and computing infrastructure required to handle such volumes, are mind blowing. It seems therefore, that the data generated by the aerospace industry alone could soon surpass the magnitude of the consumer internet.

For the GTF engine, it uses this incredibly valuable information to build artificial intelligence and predict the demands of the engine in order to adjust thrust levels. As a result, GTF engines are demonstrating a reduction in fuel consumption by 10% to 15%, alongside impressive performance improvements in engine noise and emissions.

Beyond this, big data and the IoT are having a huge impact on the industry through the advent of predictive maintenance. These developments are driving massive reductions in costly aircraft on ground time (AOG), as well as transforming the passenger experience, creating truly connected aircrafts as a result.

Predictive maintenance

IoT is having a growing influence over the maintenance side of the aerospace industry. This is important because of the resultant reduction in AOG. Every second of every minute that a plane is not in the air, it loses money; with Airbus China[2] recently estimating the daily cost of a grounded A380 Airbus to be $1,250,000. With operators under pressure to streamline their costs and increase their revenues[3], aircraft maintenance procedures play a fundamental role in reducing this.

Through sensors, IoT helps airlines collect and subsequently translate vast volumes of data into meaningful business information that can then be applied to determine the status and performance of particular systems and subsystems within an aircraft. Sensors are now being distributed throughout the aircraft, for example, monitoring key performance parameters such as fuel burn in the engine. When the flight has landed, this information can be downloaded and analysed by the ground staff, enabling appropriate action to be taken to correct any minor faults or make alterations and get the aircraft back in service as soon as possible. Five years ago, this post-flight analysis used to take an engineer up to 4 days to process data from one engine. Whereas now there are solutions available that are providing useful information within minutes of a plane landing.

Though the real-time health monitoring is limited to some of the new generation aircraft, due to bandwidth limitations, the opportunities will be endless once we have the bandwidth capabilities required to support this activity. The current bandwidth for in-flight data transfer is around 400 kbps and the next planned upgrade is up to 10 mbps. Faster speeds yet will enable increasing amounts of critical performance data to be shipped to the ground for real-time assessment.

Ground staff having access to a constant stream of information could be a reality in around five years' time, giving them continual and complete visibility of the aircraft's performance. If, for example, one of the engine vitals fails mid-air, a standby system would kick in and run all of the necessary functions to enable it to complete its journey safely. An alert would then be sent to the ground staff, who could use the real-time information to determine the cause of the failure, before engaging the necessary personnel and sourcing the components required to get the aircraft back up and running as soon as it lands. Getting all of this preparation done while the aircraft is still in flight would help the airline to vastly reduce the chance of it being placed in AOG, therefore helping it to reduce maintenance costs and also keep passengers happy.

Connecting the passenger to the aircraft

Passengers are also driving another major trend in the use of big data and IoT in aerospace. The latest smartphones, tablets and wearable devices are in the pockets of every passenger and there is an expectation to be able to use them at 39,000 feet, just as we do in our living rooms. Airlines are responding with investment in improving in-flight Wi-Fi and the development of custom-built airline apps to allow passengers to interact with the plane and inflight systems from their own device. There are multiple functionalities possible, including the ability to download movies to smartphones and tablets, adjust ambience settings, order food and drink or call for attention.

This increased engagement with the plane produces data – such as information on the movies that are being downloaded, the food that is being ordered, and when, by whom and in what quantity. With the right systems in place, airlines can ensure that they are able to extrapolate insight from this data to improve the passenger experience. This could be done through promotions on favourite food items for example, or recommendations on similar films.

Securing the future of IoT

Of course, with every innovation comes a new risk. Inflight Wi-Fi can leave planes vulnerable to hacking and the US Government Accountability Office[4] has repeatedly tried to bring this to the FAA's attention as a word of caution during its modernisation plans.

A security researcher recently claimed[5] to have taken control of a commercial airliner from his seat on the aircraft, simply through hacking the entertainment system. While there is reason to doubt the voracity of his claim, this is nonetheless a stark reminder of the challenges we have to address in this area. But the vulnerabilities are not confined to the aircraft cabin; the company systems on the ground remain at risk. This recently became a reality[6] when ten planes were grounded in Poland following a major hacking attack that jammed the carrier systems. The industry needs to come together to find new solutions and increases in regulations. Updates to security, network and data safety are crucial if there are to be further advancements in big data and IoT.

Security concerns aside, there has never been a more exciting time to be working in the aerospace industry. Soon, thousands of sensors will be embedded in each aircraft, allowing data to be streamed down to the ground in real-time. And who knows, in time, this could drive the famous black box to simply become a backup device! The potential benefits include reduced AOG from predictive maintenance as well as innovation in the passenger inflight experience, making the truly connected aircraft a very real and present possibility.

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References

[1] http://www.fin24.com/Tech/News/Facebook-to-show-highlights-from-your-past-20150325

[2] http://www.delivered.dhl.com/en/articles/2014/02/aircraft-on-ground.html

[3] http://www.strategyand.pwc.com/perspectives/2015-aviation-trends

[4] http://www.theguardian.com/technology/2015/apr/15/wi-fi-on-planes-in-flight-hacking-us-government

[5] http://www.dailymail.co.uk/news/article-3084856/Security-researcher-admits-FBI-hacked-commercial-airline-s-entertainment-took-control-plane-making-climb-fly-sideways.html

[6] http://www.cnbc.com/id/102776924

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