Introduction

This newsletter briefly introduces AirSense Digital Information Services for Enhanced Aircraft and Airspace Situational Awareness.

AirSense is the result of a year-long study of the requirements of aviation industry stakeholders for improving situational awareness and developed as part of the Airbus Digital Surveillance Eco-System by sourcing data from multiple surveillance data providers and employing the rich experience of aviation data scientists within Airbus.

The core value of AirSense comes from its approach in leveraging on multiple surveillance data sources to deduce the best possible set of surveillance information, upon which advanced analytics can be applied for generating valuable intelligence and reports for improving the overall situational awareness and operations.

Data and Analytics based on continuous and global surveillance capability combined with a unique data quality framework are the key aspects of AirSense.

This newsletter also solicits interests from aviation users and service-partners to experiment with AirSense Digital Solution and its portfolio of services, including the opportunities for service demonstrations, trials tailored to target use-scenarios and also for potential “value co-creation” opportunities.
Why is global and continuous flight tracking needed?

Following the unfortunate accident of MH370, there is an increased drive within, and external to, the aviation industry, for the overall improvement of airspace surveillance and continuous flight-tracking in the context of safety of flights. This has fruitfully led to the Global Aeronautical Distress Safety System (GADSS) initiative and its current progress of implementation, under the leadership of ICAO. One of the key enablers for GADSS is the ability of the ground operators to track aircraft position and movement, continuously and globally.

Global and continuous flight tracking requirement is not only driven by the flight-safety objectives; the demands on air traffic management and the need for enhanced situational awareness are also driving factors for global and continuous surveillance. Cost pressures and environmental imperatives also seek means to improve route-efficiency and airspace utilization.

In particular, there has been a growing interest in improving the efficiency of oceanic air traffic situation. Oceanic flights consume nearly 26% of total fuel consumptions in the world while also contributing to 49% of international cargo revenue and 20% of passenger revenue\(^1\).

As the ground based surveillance systems cannot cover the oceanic (and also remote and mountainous regions), the air traffic management over these regions mitigated the surveillance coverage gaps with procedure-based controls.

As a result, the procedure-controlled airspaces use more than necessary separation margins and so offer ample optimization potentials when continuous and global situational awareness is available.

The full benefits can be unleashed, when unique, rich data is fused, processed and analysed. This is where AirSense comes to aid.

Operationally, enhanced airspace utilization in terms of increased traffic density and capacity is an important goal for the aviation industry.

For example, the traffic density over the North Atlantic airspace (NAT), which is deemed as the most congested oceanic airspace, is steadily increasing.

Better situational awareness of the en-route airspace and improved traffic-flow management therein would bring greater benefits to the traffic flow management in the terminal area.

Even within the land-based routes, knowing the aircraft movements in adjacent or remote airspaces in real time enhances the traffic management within the own airspace.

Airlines and the Aircraft operators always seek the most efficient routes for achieving better fuel efficiency, on-time performance and reduced carbon-footprint. Pilots are increasingly opting for route flexibility where necessary, and an efficient way of implementing route-changes to the filed flight-plans.

Thanks to global navigation satellite systems (GNSS), aircrafts fitted with GNSS equipment are capable of detecting their positions much more precisely than the ground control; thanks to Automatic Dependant Surveillance-Broadcast (ADS-B) that allows aircrafts with ADS-B OUT to be tracked in real time anywhere in the world and also simultaneously providing for the situational awareness to other aircrafts in the vicinity and fitted with ADS-B IN.

Studies and operational use have proven the accuracy and reliability of ADS-B information to be better than that of secondary radar based system.

\(^1\) Bureau of Transportation Statistics, Aviation Data Library (www.bts.gov)

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New Approach Needed

A key question to aviation users is how to best utilize the surveillance information, given the plethora of diverse ground-based surveillance data providers covering most of the land mass, with Aireon providing space-based surveillance data globally, including oceanic airspace.

AirSense has taken such an approach to facilitate access to global multi-source integrated surveillance data and analytics, for becoming an integral part of the digital surveillance eco-system for the aviation users.

What is AirSense?

AirSense represents a portfolio of digital surveillance intelligence information services, based on multi-source integrated surveillance data and advanced analytics, for the aviation related agencies, operators and enterprise customers.

AirSense today aggregates terrestrial surveillance data streams from FlightRadar24 (and others under evaluation) and space based surveillance data streams from Aireon.

AirSense also extends its scope by optionally fusing supplementary data including aircraft data, on-board weather radar data and ground data. Multi-source ingested data are enriched for quality and information content.

AirSense Analytics Services entails a growing portfolio of micro applications enabling analytics to run on demand either as a Web service embedded within customer system or on call by user applications via AirSense API or in the AirSense Dashboards.

How about

- A neutral data-repository that could ingest surveillance data from various sources, produces fused and quality-enriched surveillance data sets, accessible over the secure cloud for exchanges in various common formats used by IT applications and web services, thereby needing no infrastructure investment by the user?

- Enhancing the surveillance data and analytics by incorporating relevant supplementary data? Weather including airborne weather radar information, aircraft data are just examples that can boost the situational awareness and operations.

- Hosting and running advanced algorithms on the data-repository, generating inferential intelligence and reports, regularly ‘as and when’ needed?
AirSense Service Portfolio

AirSense provides global, real-time aircraft surveillance data and advanced aviation analytics for performance monitoring, situational awareness, prediction and optimization supporting more effective, timelier and more collaborative decision.

Data Quality Framework at the heart of AirSense Services

AirSense Data Quality Framework enables the identification and measurement of major data quality issues, standardizes information on data quality and improved level of confidence for the generated analytics for the users, which in turn leads to continuous improvements for user operations.

**CONSISTENCY** conflict or contradictions free in data

**TIMELINESS** information arrival and processing times known

**UNIQUENESS** no duplicates

Trust what you see for better decision making

It employs a number of quality detectives or algorithms specialized in looking for specific quality issues. Feedback from the data user further refines the quality detectives. Target benchmarks (Quality KPI) are used to measure data quality.

Cleaning of Data items, isolating of problem sources and remedial actions management all form part of the quality framework.

**AirSense Data Quality Framework provides**

*continuous* improvements and *committed* data quality.

**STEPS OF DATA QUALITY FRAMEWORK**

I. Model AirSense Ingress & Egress Data
II. Define key attributes for data quality
III. Evaluate existing data quality levels
IV. Decide data quality priorities
V. Implement remedies
VI. Iterate for revision as required
VII. Declare delivered data quality performance
AirSense Data Services

AirSense provides the best-possible situational awareness through proprietary algorithms for multi-sensor fusion, data cleaning, and enrichment.

Data providers use various data formats and transmission mechanisms. AirSense provides a unified data format following latest common industry standards. Each type of aircraft position data (radar, ADS-B) has unique characteristics.

Our fusion algorithm uses these types in a complementary way to provide a best-estimate of the true position of each aircraft. Inherently, all aircraft position data has uncertainty. Our data cleaning flags sensor noise and explicitly provides metrics for data uncertainty in order to build in trust in each aircraft position report.

We enrich the available aircraft tracking data with proprietary models to give additional information about the state of the aircraft and meta information about the flight.

Try it out

Are you interested in assessing the value of AirSense data services for your use-scenarios?

Would you like to fuse your ground data (e.g. radar tracks) with AirSense for joint validation of data quality?

Contact AirSense Team

DATA OFFER

<table>
<thead>
<tr>
<th>TRACKING</th>
<th>Global real-time tracking of aircraft or fleet</th>
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<tr>
<td>SURVEILLANCE</td>
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<tr>
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<td>Real-time flight related events</td>
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<tr>
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AirSense Data Services are provided live, periodic or historic through secure APIs for seamless customer integration.

AirSense can facilitate customer-owned tracking data sources such as radar and ADS-B in order to complement our global data feed.

Many stakeholders already possess aircraft tracking capabilities. These data are extremely valuable and must be utilized to provide the best possible tracking service.

AirSense data ecosystem allows to integrate any aircraft position data feed.

EXAMPLES OF FLIGHT-RELATED EVENTS

1. Surface Pre-Take off
   - Taxi out start
2. Take Off
   - Take off start
   - Lift off
   - Climb out start
   - Step climb start
   - Step climb end
3. En Route
   - Entry controlled Airspace
   - Exit Controlled Airspace
4. Landing
   a. Holding start
   b. Holding end
   c. Touch down
5. Surface Post-landing
   a. RWY exit
6. Additional
   a. Go around start
   b. Go around end
   c. Separation violence
7. ..................
AirSense Analytics Services

AirSense Analytics Services provide a portfolio of intelligence and reports based on the AirSense Data.

Live Monitoring

Live Analytics provide an insight into what is happening now. From the real-time map of flight track to airspace surveillance to delivering of operational alarms and notifications, event detection, current airspace throughput, current aircraft count, Aircraft-to-aircraft separation monitor, live delays etc. in support live flight mission operations.

LIVE ANALYTICS

- Operations event detection
- Monitor current airspace throughput
- Monitor flight / aircraft states (at gate / taxiing / queueing / runway)
- Current aircraft count
- Aircraft-to-aircraft separation monitor
- Live delays

Historic Analytics provide an insight into what has happened in the past. This includes benchmarks and comparison with global historic data, Disruptions (go-around, etc.) analysis impact and precursors, Airspace Efficiency, Average separation, Flight hours per airspace user, Bottleneck identification etc. in support of operational performance analysis and improvements.

HISTORIC ANALYTICS EXAMPLE

- Benchmark and comparison with global historic data
- Disruptions (go-around, etc.) analysis impact and precursors
- Airspace Efficiency
- Average separation
- Flight hours per airspace user
- Bottleneck identification

Performance Reporting

Predictive and Prescriptive Analytics provide an insight into what could happen in the future. This includes for example Predicted time of arrival, Predicted Gate, Predict runway / taxiway / gate bottlenecks, Predict trajectories, Next arrivals in airspace, Congestion prediction etc. in support of traffic flow management and airspace planning.

PREDICTIVE ANALYTICS

- Predict gate / runway arrival times
- Predict runway / taxiway / gate bottlenecks
- Predict trajectories
- Next arrivals in airspace
- Congestion prediction
AirSense Partner Program

AirSense launched a partner program which allows Application Partners to embed seamlessly AirSense Services. It also offers Analytics Partners to run analytics on top of AirSense global data set.

AirSense Application Partner

With Partner applications, we offer to embed AirSense Data and Analytics to enhance your product offering. With Partner Analytics, we provide a service to develop and distribute analytics.

AirSense is inviting partners to contribute to a growing-ecosystem of derived analytics for the greater aviation market.

Let’s grow together to offer a rich analytics portfolio. Customers consume analytics results developed by Analytics Partner directly from the AirSense Analytics Catalogue.

AirSense Analytics Partner

Analytics Partner can use the AirSense environment to develop analytics to power products and services.

Analytics Partner can utilize the data and processing capabilities available in AirSense. The global aircraft position data available in AirSense is a rich repository for many applications.

As cloud-based service, analytics are available from any internet-connected device and enable scalable application.

Get in touch for more information about our AirSense Partner Program
Conclusion

AirSense Pilot Trial

AirSense is open to access from Q2 2019, initially for service demonstrations and customer trials with the aim of proven portfolio of services ready for market consumption from Q3 2019.

Prospective users are welcome to take advantage of AirSense offer for service demonstrations including access to AirSense Data and Analytics Services subscriptions.

Where necessary, AirSense pilot trials and service validation can be tailored to the context of specified Use-Scenarios so that the value of AirSense is evaluated to real-use objectives.

AirSense Value Co-Creation

AirSense welcomes actors from the aviation domain as well as value-added application developers and service-providers to explore value-co-creation opportunities.

The aim is to generate value from the AirSense data, analytics products and platform capabilities and also extend the AirSense service-partnerships.

AirSense will provide necessary support including access to AirSense data, platform and Services and in the efforts for realizing the shared goals under the AirSense value-co-creation agreements.

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