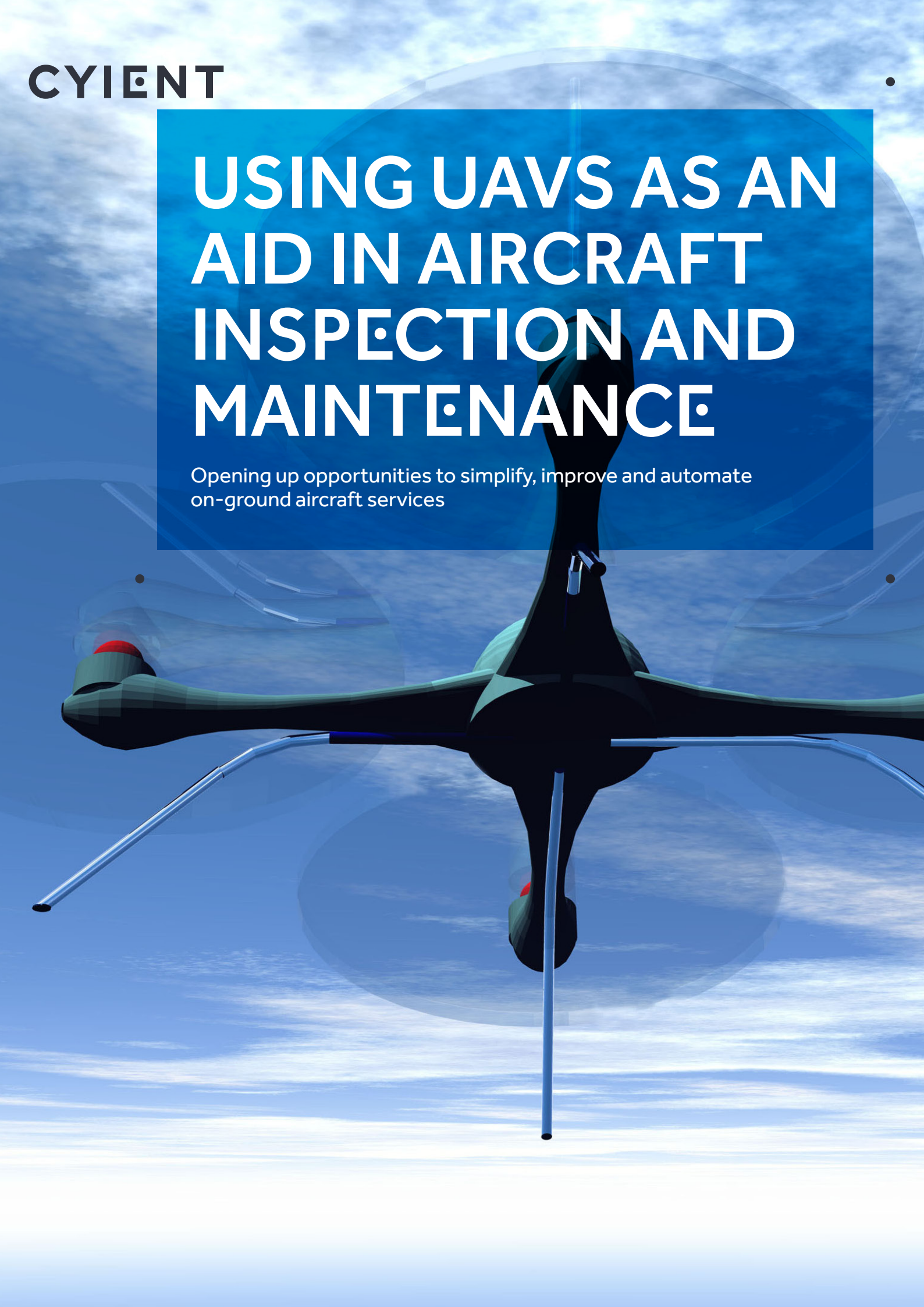
CYIENT

USING UAVS AS AN AID IN AIRCRAFT INSPECTION AND MAINTENANCE

Opening up opportunities to simplify, improve and automate on-ground aircraft services



The global commercial aircraft fleet is set to increase to 49,940 aircraft by 2035[1] with passenger numbers expected to reach 7.2billion based on a 3.7% CAGR[2]. It is not difficult to understand the growing passenger load factor and rising aircraft maintenance requirements of the future and act proactively.

In this regard, more and more disruptive technologies are under test, and there is cautious and stable adaptation within the industry that requires a rethinking of existing processes with a view to replacing them with new ones. The use of Unmanned Aerial Vehicle (UAV) as inspection and maintenance aid is one of them.

Significance of UAVs in Maintenance

UAVs as operational and maintenance support in a digitized setup opens new possibilities for aircraft operators where minimum time on ground is highly desirable from operational efficiency and Revenue Passenger Kilometer (RPK) standpoint.

In commercial air operations, most of the inspections are either done manually or utilizing hand-held probes which make the inspection tedious, exhaustive and labor intensive, plus maintenance and inspection reporting are mainly still paper-based and time-consuming. The landscape is however changing, and Cyient is at the forefront of this evolution.

Integrated Decision Support System

Our team utilizes automatic unmanned aerial vehicle systems to improve and automate the inspection and maintenance process. This is done by leveraging a Computer Aided Design (CAD) model of the inspected aircraft as an input deciding an appropriate flight path and guiding the controlling software of the UAV.

The CAD model in synchronization with the on-ground computer tracks the UAV as it flies around the aircraft structure passing through the marked waypoints. At all times during the inspection process, the UAV follows the waypoint navigation system and ensures that no harm is caused either to the aircraft structure or the human maintenance personnel.

This highly stable and controlled flight of the UAV in the proximity of the aircraft structure is best suited for sensor-based data acquisition and surface scanning.

The on-ground computer remotely receives the real-time data from the UAV, processes it and offers decision support as per the selected aircraft check. The decision support system outlined in the proposal creates electronic Transit Check task cards, and digital pilot debrief reports using eXtensible Markup Language (XML) schema. These cards and reports together with the electronic knowledge base file helps the Aircraft Maintenance Engineer (AME) and the Pilot in the decision making without going around the aircraft.

The knowledge base files primarily capture the information from multiple digital sources, validate them based on the UAV's data and generate real-time recommendations. Thus, providing an integrated decision support system. The various information sources include:

- Sensor data transmitted from the UAV
- Technical manual decision trees
- Engineering data
- Failure Mode, Effects, and Criticality Analysis (FMECA) data
- Reliability and Maintainability (R&M) data
- Reliability Centered Maintenance (RCM) data
- Historical data
- Fleet maintenance experience

Reporting and Rectification

The electronic Pilot Debrief Report (PDR) maintains a history of all the previous issues and the responses entered during the PDR sessions. This report also provides a list of components that are suspected to have caused the failure symptom, and provide appropriate follow-up instructions, such as creating the work order, or suggesting replacement of the part.

An interface between the PDR and a maintenance management system will store the pilot debrief sessions for subsequent use by the maintenance personnel.

Integration with the Structural Health Monitoring Devices

Deployment and integration of UAV along with the Structural Health Monitoring (SHM) based sensor data brings enormous value on one consolidated platform. Each structural element selected for monitoring primarily has a permanently installed sensor network which is controlled by the SHM hardware. The SHM hardware connects to the Central Maintenance Computer (CMC) or the UAV ground station, and controls the SHM system operation. The sensor data provides a precise indication of the functionality of the individual structural element which by the use of installed commercial or custom software applications provide accurate defect indication, localization, and estimation of the Remaining Useful Life (RUL).

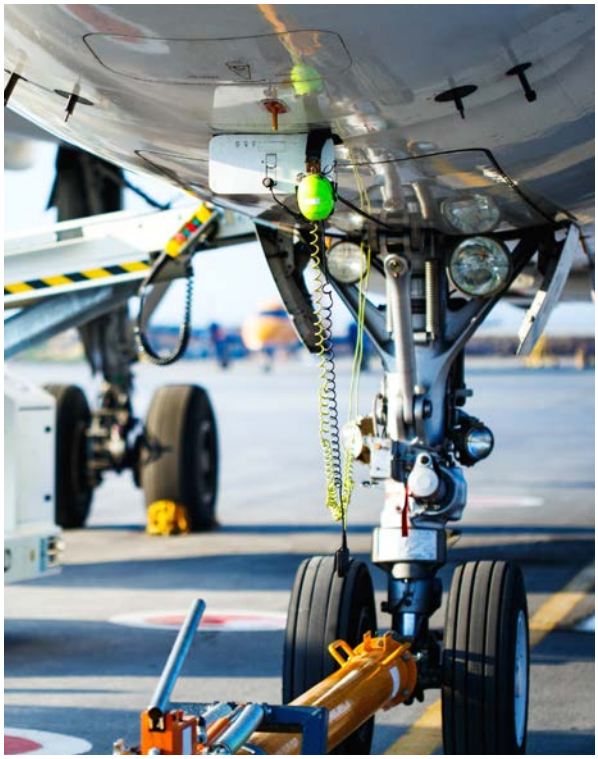
Summary

The interest in UAV and drone technology has been increasing in the recent years with its adoption in various applications from reconnaissance and security through environmental and geospatial surveys to asset monitoring. Cyient's UAV application in the aftermarket space is just the next development and one that could become commonplace in the near future.

References

[1] https://www.flightglobal.com/products/fleets-forecast/

[2] http://www.iata.org/pressroom/pr/Pages/2016-10-18-02.aspx.



About Cyient

Cyient (Estd: 1991, NSE: CYIENT) provides engineering, manufacturing, geospatial, network and operations management services to global industry leaders. We leverage the power of digital technology and advanced analytics capabilities, along with domain knowledge and technical expertise, to solve complex business problems. As a Design, Build and Maintain partner, we take solution ownership across the value chain to help our clients focus on their core, innovate, and stay ahead of the curve.

Relationships lie at the heart of how we work. With nearly 14,000 employees in 21 countries, we partner with clients to operate as part of their extended team, in ways that best suit their organization's culture and requirements. Our industry focus spans aerospace and defense, medical, telecommunications, rail transportation, semiconductor, utilities, industrial, energy and natural resources.

For more information, please visit www.cyient.com.

Contact Us

NAM Headquarters
Cyient, Inc.
99 East River Drive
5th Floor
East Hartford, CT 06108
USA
T: +1 860 528 5430
F: +1 860 528 5873

EMEA Headquarters
Cyient Europe Ltd.
High Holborn House
52-54 High Holborn
London WC1V 6RL
UK
T: +44 20 7404 0640
F: +44 20 7404 0664

APAC Headquarters
Cyient Limited
Level 1, 350 Collins Street
Melbourne, Victoria, 3000
Australia
T: +61 3 8605 4815
F: +61 3 8601 1180

Global Headquarters
Cyient Limited
Plot No. 11
Software Units Layout
Infocity, Madhapur
Hyderabad - 500081
India
T: +91 40 6764 1000
F: +91 40 2311 0352

cyient.com
connect@cyient.com

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