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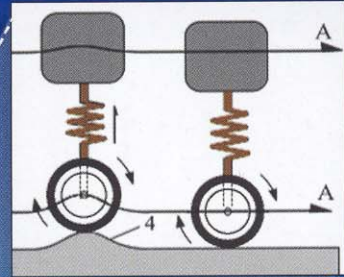
MARCH 2011



AEROSPACE[®]

MANUFACTURING and DESIGN

Safe
Landings



Mazak Optonics'
Servo Focus
Laser Head



Stama America's
MC 726/MT-2C
Machining Center



Schunk's VERO-S
Quick-Change
Pallet System



Moving
Beyond the

**BLACK
BOX**

Should any monitored system, part, or flight characteristic vary from assigned norms, this small box will send a real time, encrypted alert via satellite to a ground station, then, immediately to the airline's operations center for assessment and, if necessary, action.



Edited by **Matthew Grasson**, Associate Editor

Star Navigation Systems Group Ltd., Toronto, Ontario, Canada, focuses on providing aerospace solutions – in both hardware and software platforms – that assist aviation operators worldwide. The development of the real time monitoring system is based on its patented In-Flight Safety Monitoring System technology. It is the first system in the world that features in-flight data monitoring and diagnostics, with real-time secure connections between the aircraft and ground.

After eight years in development, the commercialization of the STAR-ISMS comes at a critical moment in aviation history. After the June, 2009 loss of AF-447 in the mid Atlantic – with 228 passengers and crew – the inability of both the French and U.S. Navies to locate the Flight Data Recorder, sent authorities worldwide into a search for a way to avoid such a situation from reoccurring.

Although some information was received during the latter stages of the flight through the Aircraft Communications Addressing and Reporting System (ACARS), the information received gave limited hints of potential problems, and the amount of detail transmitted was insufficient to confirm the probable cause or causes of the accident.

STAR-ISMS was conceived in 2002 by Viraf Kapadia, chairman and CEO of Star Navigation Systems Group Ltd. Kapadia felt that there existed a real need

to be able to both monitor, and analyze, the functioning of the myriad of systems aboard an aircraft, while that aircraft was in flight, and, if necessary, send information concerning potential problems to the ground, all in real time. The system reads data from the aircraft avionics buses (ARINC 717/573 and ARINC 429) and monitors aircraft parameters provided by a variety of avionics.

STAR-ISMS has been tested and certified for airworthiness by world transport authorities, including the United States Federal Aviation Authority (FAA) and Transport Canada. Star Navigation Systems Group is actively developing new applications for in-flight medical monitoring, environmental monitoring, and ground-based systems.

THE STAR-ISMS

STAR-ISMS is an on-board monitoring system that provides a virtual window into an aircraft. It is a proven, cost-effective system that automatically and securely transmits flight data and incident alerts in real-time. It continuously monitors selected avionics systems on the aircraft during flight, instantly analyzing the data, and transmitting desired data and incident alerts via satellite to the operator.

Flight Data is stored on a solid state storage inside the Star Server Unit (SSU) – the centerpiece of the STAR-ISMS hardware on board the aircraft. The sys-

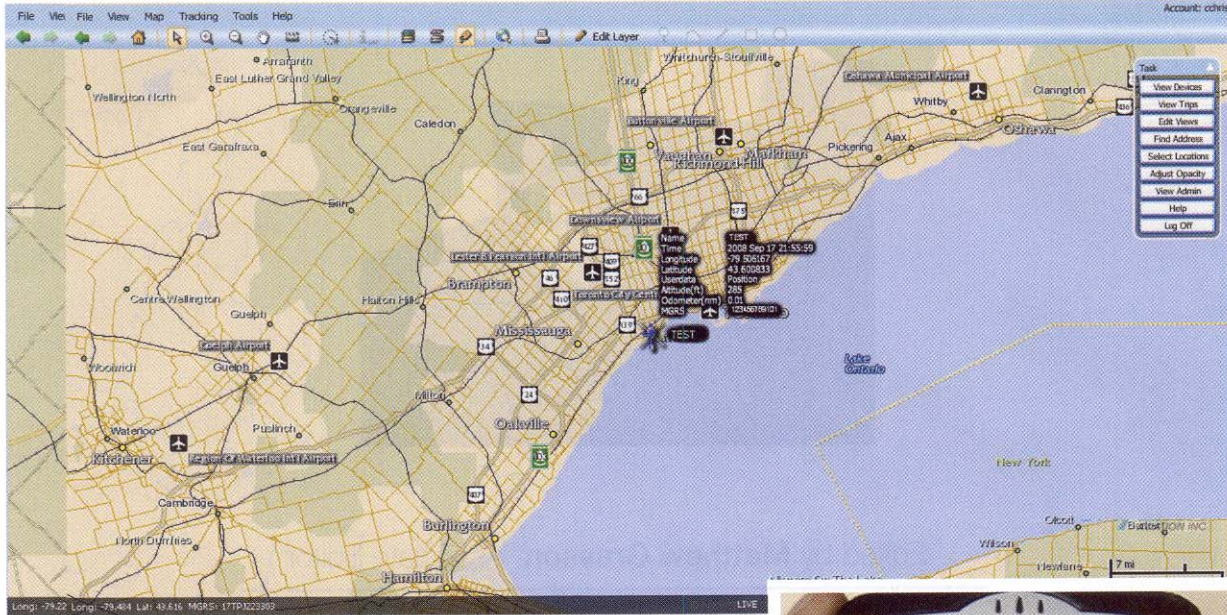
tem analyzes the data in real-time and sends alerts about abnormal parameters and events to the ground along with selected data. The STAR-ISMS uses satellite communication when in the air and WLAN (IEEE 802.11) when on the ground. While time-critical information is sent right away; other information is stored on board and transmitted at lower cost from the ground.

The system gives airline ground personnel the ability to monitor trends, predict possible failures, schedule repairs, and assist the flight crew to take preventative action as required. It acts as an early warning system, detecting the earliest signs of potential problems. As a result, airlines can reduce aircraft downtime and flight delays due to unscheduled maintenance, increase compliance to standard operating procedures, and gain efficiencies from the many reports and data feeds available.

CAPABILITIES

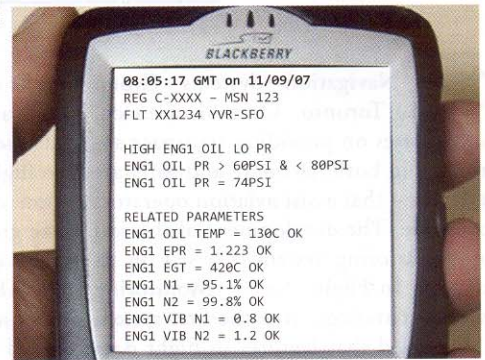
In addition to acquiring flight and aircraft data from the aircraft avionics buses, the system analyzes the data on the aircraft in real-time.

“Contrary to ground-based systems, STAR-ISMS do not require the data to be downloaded from the aircraft before it is analyzed” Kapadia says. “This avoids the high cost of large data transfers through satellite or ACARS while the aircraft is in flight. It also eliminates time delays



TOP: The web-based tracking position report of STAR-ISMS can be interfaced with third party tracking and/or plotting software, such as Google Earth.

RIGHT: An illustrated sample of what a real-time alert, sent from the aircraft, would display to those on the ground.



in reporting characteristic for systems that store the data on the aircraft and only transmit it once the aircraft is on the ground and within reach of a ground based communication network such as WLAN (IEEE 802.11).”

The systems on-board data analysis capabilities range from simple bound checking – aircraft pitch within -15° and +25°, to multi-parameter combination checking – aircraft speed less than 250kts below FL 100 – to complex equations with multiple parameters. A set of the most common analyses are pre-defined in STAR-ISMS. Airlines can specify additional analysis to be performed independently for each aircraft or aircraft type.

Once on-board analysis identifies an abnormal parameter or combination of parameters, it generates and transmits an alert. The ground station receives the alert, then transmits it to the airline and/or ground personnel (e.g. PDA) via e-mail, subject to local network capabilities. This enables the airline’s maintenance department to know the status of the aircraft before it arrives and gives it the opportunity to prepare tools, parts, and resources. As a result, costly flight delays and aircraft downtimes are reduced.

At the end of each flight, the system creates a set of reports for various departments within the airline. These reports are available as both formatted reports and as raw data feeds. Formatted reports in PDF format are sent by e-mail and are also available through STAR-ISMS’s secure Customer Internet Portal. Raw data feeds are transmitted to the airline’s systems through e-mail or file transfer protocol (FTP).

A comprehensive pre-defined report set covers the most common and most relevant parameters that are required for awareness, transparency, and decision support, by various departments:

- Flight Operations
- Flight Safety
- System Operations Control
- Maintenance
- Engineering
- Engine Condition Monitoring
- Finance/Administration
- Payroll

ENGINE CONDITION MONITORING

STAR-ISMS fully automates data acquisition and transmission for engine condition monitoring (ECM). All relevant engine parameters are read at various

stages of the flight and can be set up to automatically upload into the airline’s or engine manufacturer’s ECM database via IP internet communication either through satellite communication – when in the air – or through WLAN (IEEE 802.11) when – on the ground. Airlines can specify the set of parameters transmitted, the number of samples recorded during a flight, and the flight phase and/or time at which the samples are recorded. With automated ECM, the airline can collect engine data more frequently and with greater accuracy while reducing pilot workload.

REAL-TIME FLIGHT TRACKING

STAR-ISMS offers real-time flight tracking via satellite communication. The system submits position reports at a user-specified rate (default – every 2 min; max rate – every 30 sec). The parameters are typically set by transmitting the longitude, latitude, altitude, flight number,

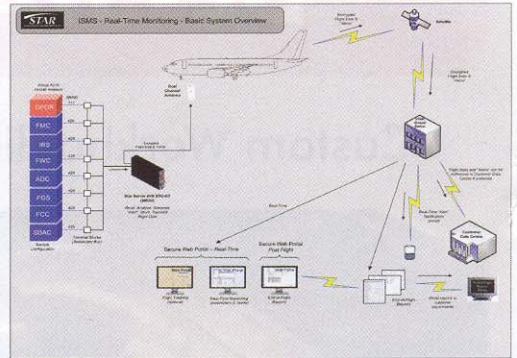
and ground speed for tracking .

Tracking messages are received and processed either by the Star Data Center or by the airline. The tracking data is available through STAR-ISMS's Customer Internet Portal both as position reports, as well as plotted on an interactive map.

CERTIFICATION

The STAR-ISMS system is currently certified via Supplemental Type Certificate (STC) by Transport Canada for the following aircrafts:

- Airbus A340-311-312-313
- Airbus A310-300



The schematic of the STAR-ISMS system is a quick overview of all it has to offer airlines.

- Boeing 727-277
- Boeing 737-7CT
- Boeing 737-76N, 737-7CT, 737-832, 737-8Q8

Aircraft are typically certified using a two-stage certification process. First, an Installation STC is applied for to obtain approval for installation of the equipment on the aircraft. The Installation STC is typically issued within a few weeks. Once the Installation STC is provided and the equipment is installed, Transport Canada requires operational certification testing which will need to be scheduled and usually takes from one day to a week. When operational certification testing is satisfactorily completed, Transport Canada will issue an Operational STC – typically within several weeks.

The United States Federal Aviation Authority (FAA) or the European Aviation Safety Agency (EASA) usually issues certification of equipment like STAR-ISMS based on the Transport Canada STC. Such certification can take from a few weeks to several months.

INSTALLATION

The hardware installed on the aircraft depends on which version is installed. The SSU that houses the Plus system on board the aircraft is installed in the avionics bay. It has standard avionics dimensions and requires space for two modular concept units (MCUs). In addition, a data transceiver unit is usually installed in the avionics bay, requiring space of approximately one MCU. The SSU and transceiver weights are 12 lb and 4 lb, respectively. Installing the SSU, data transceiver and cable harness typically takes between 20 and 40 man

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hours – depending on the aircraft – and can usually be completed within one or two night shifts.

Current black box technology is extremely limited. They are capable of about 300 parameters. In the event of a crash, the black boxes can be recovered and sent – still sealed – to the National Transportation Safety Board (NTSB) for analysis. This is completely reactionary and good only if the box is found and not damaged.

Star Navigation system is capable of reading up to 18,000 parameters and streaming live data on demand. The system knows exactly where your aircraft is at all times, exactly what is happening on your aircraft as it happens; it is literally a virtual window into the aircraft.

“I would like to say that safety and security are the main goals, but I would



WEB CONNECT

To view an interview with Viraf Kapadia, chairman and CEO, Star Navigation Systems Group Ltd., go to hudescommunications.com/2010/05/04/star-navigation-systems-group-inc-tv-interview/

rather say, STAR-ISMS increases safety, security, and efficiency; helps save on maintenance costs while providing better maintenance and flight awareness; improves operational control; and offers better maintenance analysis and more timely early warning analysis. All of this reduces downtime; historical trend analysis; optimizes fuel management; and improves financial control. That is something every CEO, CFO, and COO would want,” Kapadia states. “ROI is in months, with continuous substantial savings thereafter. Imagine the affects it would have on the carbon footprint, for every kilogram of fuel saved we can save approximately 3.2kG of CO². Now consider the savings when the Carbon Tax comes into effect.”

Governing bodies have been calling for better monitoring systems. Star Navigation has recognized that need more than 10 years ago, spending that time perfecting technology that is beyond any other technology.

The R&D stage is never over, with continued advancements sure to be occurring. A recent technology partnership with a major European conglomerate, has been a tremendous accomplishment for Star Navigation Systems, as they look forward to having their product on all aircraft. **A**

The STAR-ISMS system is currently certified via Supplemental Type Certificate (STC) by Transport Canada and the FAA in the United States of America.

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