Aircraft Interface Device
Connecting Assets to Operations
SmartDMS (Data Management System) with aircraft interface device (AID) … unlocking your data, connectivity

**SmartDMS** (data management system)
- Aircraft health
- Full flight data
- Environment data
- Route data
- Maintenance logs

**AID** (Aircraft interface device)
- Connected flt mgmt sys
- Elec. flt bag
- Electronic logs
- Internal apps
- 3rd party apps

**Improving operations**
- Reducing pilot, maintenance workload
- Reduces operational cost and streamlines operations
- Improved safety and operations
- Predictive maintenance
- Improved asset management, availability
- Increased operational insights
Aircraft health management system ... providing aircraft interface device enablement

SmartDMS ... reducing workload

The Problem
Increasing operational complexities that that relay upon federated aircraft systems are increasing pilot and maintenance workload

The Digital Solution
Streamlining access to real-time aircraft data for crew and maintenance personnel. Maximizing the full potential of Electronic Flight Bags (EFB) enabling them to provide actionable insights, increasing operational efficiency, and assist in reducing unscheduled maintenance and disruption.

The User Experience
• Integrate with EFB’s & other aircraft functions to gain access to necessary applications to enable crew to realize operational benefits
• Seamless integration with aircraft data busses
• Supports rapid development and deployment of EFB applications built to industry standards
• Worldwide 4G and WiFi wireless communication interfaces
• Secure communications to ground solution for multiple aircraft platforms

Capabilities
• Wireless QAR (quick access recorder)
• Aircraft interface device (AID)
• Secure communications
• Aircraft health
• MOQUA

Outcomes
• Improved pilot workload
• Reduces operational cost and streamlines operations
• Improved safety and aircraft operation
Connecting assets to operations ... utilizing aircraft data to deliver seamless user experiences

Integration
- Electronic logbooks
- Electronic flight bags
- Connected FMS
- Fuel insights
- Maintenance apps
- Electronic checklists
- VR/AR aids

Forward fit or retrofit hardware

APIs

A/C Health Data
- Flight Data
- Mx Data
- Environment Data
- Route Data
- Weather data
- OOOI
- Route Data
- Weather data
- OOOI

Data Technologies
- Diagnostics
- Artificial Intelligence
- Prognostics

Domain Expertise
- Systems
- Maintenance Support

Centralized Cloud

Alerts
- Full flight data

Alert management
- Predictive Maintenance
- Fuel Efficiency / Sustainability
- Asset Management / Availability

Actionable Insights

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Augmented Checklist
Augmented electronic checklist … enhancing safety

~20% non-compliance

of business jet flight control checks prior to take-off 2013-2015
(Source: NBAA)

“An Analysis of the Effectiveness of Checklists when combined with Other Processes, Methods and Tools to Reduce Risk in High Hazard Activities” – William Y. Higgins, Daniel J. Boorman

“…4-ways that aircraft flight crews deviate from the proper use of checklists….

• At times a crew member simply does not do the checklist
• The crewmember may do the checklist but misses an item
• A crewmember responds to the call on the checklist as required but indicates it is checked or set, when in fact it is not checked or set
• The crew may start the checklist, but it is interrupted for some reason and not completed.”

– Boeing Technical Journal – 2016 paper excerpt

Gulfstream crash after rejected takeoff (NTSB report 2014)
Aircraft data assists completion of checklist ... SmartDMS provides safe, secure data between aircraft and pilot tablet.

Wireless or Wired

SmartDMS

Flight management system

Aircraft data
ARINC 429, 717, 422, etc.

~92%
of the checklist involves aircraft data

Outcomes
• Reduced pilot workload
• Enhanced safety
• Improved maintenance

Pilot tablet
Checklist or logbook application
Electronic Logbook
Enhanced electronic logbooks ... backed by industry research

Outcomes

- Reduce data entry errors
- Enhance reports with aircraft data
- Reduce mx troubleshooting
- Initiate/and enable in-air troubleshooting
- Reduce NFF events
- Reduce AOG events
- Enhance overall fleet reliability

How Electronic Technical Logbooks Enable Seamless Pilot-to-Maintenance Collaboration
By Kirk Strutt | December 30, 2019

Case Study: Electronic Technical Logbook at Swiss International Airlines
Author: Marcus Di Laurenzio, Technical Project Engineer, SWISS International Airlines, and Udo Stapf, CEO, CrossConsense
Connected Flight Management
Connected flight management ... delivering operational efficiencies

**Safety**
- Less manual entries
- Enhanced manual cross checks
- Increased accuracy

**Efficiency**
- Cloud analytics
- Faster preflight
- Wind optimization
- Fuel management
- Route time/fuel savings

**Enhanced capabilities**
- Trajectory overlay with traffic, weather, charts
- Real-time performance
- Aircraft health
# Connected Flight Management Use Cases

<table>
<thead>
<tr>
<th>Use case scenario</th>
<th>Unconnected</th>
<th>Connected</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop up thunderstorm causing immediate reroute need</td>
<td>Ask ATC via VHF to find a new altitude, route, or manual vectors for reroute</td>
<td>EFB app has real-time weather and advises optimal route to avoid turbulence</td>
<td>Quicker action avoids turbulence, optimizes fuel savings</td>
</tr>
<tr>
<td>Much stronger jet stream tail wind is reported 2,000 feet above current cruise altitude</td>
<td>Request altitude change with ATC, risk of never getting cleared for another altitude change</td>
<td>Request clearance for all lateral and vertical optimizations simultaneously</td>
<td>Fuel savings, faster enroute times capitalized on more often by pilots than manual entry methods</td>
</tr>
<tr>
<td>Tight turnaround time and AOC datalink is down/unavailable</td>
<td>Manually enter and crosscheck entire preflight and route, may take up to 10+ minutes, prone to human (entry) errors</td>
<td>Transfer entire filed flight plan and preflight entries with a click of a button</td>
<td>Less chance for safety mishap, less dependence on AOC/ACARS availability, reduce ACARS costs</td>
</tr>
<tr>
<td>Trajectory data gathering and sharing</td>
<td>Unable to access/share data other than from the cockpit</td>
<td>Can safely meet airspace constraints and enable airspace network optimization</td>
<td>Network benefits such as preferred time slots, ease congestion, especially at major hubs</td>
</tr>
</tbody>
</table>
AID Architecture
Aircraft interface device (AID) ... proven interface between aircraft data and non-traditional aircraft systems

Standardized ARINC 834 protocol for lower cost application development

Supports wired or wireless connectivity to EFB

Supports 1-way or 2-way communications with Aircraft Systems

Enables greater airline integration with
• Live aircraft data
• Aircraft systems (e.g. FMS)

Reduce Pilot workload

Enhance Safety

Fosters collaboration
SmartDMS
GE Integrated Vehicle Health Management (IVHM) System

Connect
- Aircraft Communications Management Unit
- Ethernet
- SATCOM
- Cellular
- SmartDMS
- WiFi
- • At-aircraft data viewing
  • Data loading

Manage
- Ground Services Network
- Deploy
- FOQA EMS FlightPulse Analytics

Understand
- Configuration tools
- Continuous Improvement
- FOQA Engines FlightPulse Suppliers MRO
SmartDMS Product

Key characteristics

- Size: 2.48" x 5.91" x 8.26"
- Weight: 2.33lbs Max wt.
- Power: 28Vdc power input; 2.45A Max; 1.01A Nominal
- Interfaces:
  - 1 - 10/100/1000 Ethernet
  - 6 - 10/100 Ethernet
  - 8 - A-429 Receive
  - 1 - A-717 Receive
  - 1 - 4G Cat6 Cellular
  - 1 - 802.11N CWLU
  - 3 - RS422 (1) Tx (2) Rx
  - 1 - ASCB-C
  - 15 - OG Discrete Inputs
  - 3 - OG discrete Outputs

- DAL D Certified SW
- Security Certification per aircraft platform
- Configuration Toolset
- Real-time in air alerting/Data Query
- At aircraft live data viewing
- AID interface capable
- Ground Services data & fleet management

Ground Services

- Connect to aircraft anytime anywhere
- Interact with aircraft (e.g. remotely query for data)
- Data visualization and flow status
- Platform to deploy analytics and integrate further with operations (e.g. maintenance systems)

SmartWIFI Module

- WIFI Modem
- Fielded Product
- Established Pedigree

SmartCM Module

- Cellular Module
- Fielded Product
- Established Pedigree

SmartHMU Module

- Primary Module