Leveraging data analytics for digital strategies in commercial aviation

PHM 2017 PANEL SESSION 10 DISCUSSION

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Honeywell
Honeywell: The Power of Connected

THE CONNECTED AIRCRAFT
Enabling Connected Technologies

- Flight Management Systems
- Engine Components
- Cockpit Avionics
- Mechanical Components
- Weather Radar
- Services & Applications
- Wheels & Brakes
- SATCOM Solutions
- Auxiliary Power Units
- APU

Pilots
- Real-Time Weather Information
- Flight Preview
- Fuel Efficiency Software

Passengers
- In-Flight Wi-Fi
- Smoother and Safer Flights
- Better Passenger Experience

Maintainers
- Predictive Maintenance
- Operational Efficiency Apps
- Health Usage and Monitoring

Connected Engine
Connected ECS
Connected APU
Connected Maintenance
Connected Breaks

Connected to Enhance Services
IIoT Infrastructure and Platform

Insight Delivery
- Dashboards
- Reporting
- API

Predictive Science
- Predictive Modeling
- Correlation
- Clustering

Data Science
- Data Discovery
- Data Modeling
- Data Analysis

Decision Science
- Meth & Stat
- Optimization

Analytic Platform: Algorithm & Analytic Deployment and Delivery
- Batch
- Stream
- Meth & Stat
- Analytic Life Cycle Management
- Algorithm Implementation
- Algorithm Run Time

Asset Platform
- Connect
- Provision
- Manage
- Control
- Monitor

Data Platform
- Aggregate
- Integrate
- Prepare
- Store
- Query
- Protect

Data Management
- Data Lake
- Data Unification
- MDM

Cloud Infrastructure
- Compute
- Network
- Storage

Communications
- Web API
- Mobile API
- Cloud API
- Notification API

Edge Applications
- Edge Analytics
- Alarms
- Actions
- Backup / Recovery

Device
- Hardware
- Firmware

Honeywell Internal
PHM as a Cyber Physical System: Challenges (1)

- Data availability
  - Legacy systems – dark or gray
  - Data ownership
- Data Connectivity
  - Large amount of data
  - Real-time data transfer
  - Operational and manufacturing data integration
- Data interoperability
  - System of systems
- Data Analytics
  - Imbalanced data
  - Integration of physics-based modeling with big data analytics
PHM as a Cyber Physical System: Challenges (2)

- Human user experience
  - Bring operational, performance, and maintenance data to people’s finger tips
- Configuration management
  - UUID tracking through product lifecycle
  - 3\textsuperscript{rd} party components
- Data assurance and cyber security
  - Lack of systems understanding
  - Lack of test standards
- Certification
  - Maximize benefits beyond advisory role

Technologies Need to be Transferred to Affordable Products
Trending Approaches in Industry

- Data availability
  - Smart LRUs
  - Edge devices
  - Negotiated data paths and ownership
- Data Connectivity
  - Wireless
  - Improve data transfer technologies (e.g. SATCOM)
  - Streamlined data management
- Data interoperability
  - Industry standards
  - Digital-ready components
- Data Analytics
  - Heterogeneous data fusion
  - Automated self-learning

- Human user experience
  - Data accessibility per persona
  - Virtual interface gadgets
- Configuration management
  - RFID
  - Broad implementation of IETM V
  - System connectivity
- Data assurance and cyber security
  - Industry standards
  - Systems engineering practice
- Certification
  - Case based approaches
  - Virtual certification
Digital Twin – Virtual System

Bring More Virtual Capabilities to the Real Space