The Use of AI and Big Data Analytics

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1. Shifting from “Repair” to “Prevent”

2. Four Stages of Data Analytics

3. Data Analytics and Aircraft Maintenance

4. Prescriptive Analytics and AI

5. Collaboration between AI and Airline personnel
Shift from “repair” to “prevent”

To shift from “repair” to “prevent”, we set the ultimate target of safety and satisfaction that we provide to our customers

“Zero Zero 100”

- Irregular Operations, IFSD Zero
- Flight Defect Zero
- On-time Departure 100 %
• Predictive maintenance by Data Analytics is advancing rapidly. Technician’s experience and situation awareness play key roles to monitor the conditions of aircrafts physically.
• Also, incorporation of Service Bulletin and execution of maintenance program are important
Toward 0-0-100

In parallel with maximizing the effect of modification and maintenance program, JAL will strive for predictive maintenance toward “0-0-100”.

- Predictive Maint.
  - Situation Awareness
  - Data Analytics

- Maintenance Program (Insp. Ope Test. RPLC, etc.)

- Hazard Removal by Modification, etc.

Airline A
Airline B
Japan Airlines
Four Stages of Data Analytics

- **Descriptive Analytics**: What happened?
- **Diagnostic Analytics**: Why did it happen?
- **Predictive Analytics**: What will happen?
- **Prescriptive Analytics**: What should we do?

**Big Data Analytics (QAR/CPL)**

- **Crew Alerting System**
- **Aircraft Condition Monitoring System**

**Challenge Level**

**Potential of Effect**

**Autonomous? Maintenance Optimizer?**

**Onboard Maint. Computer**

- **QAR**: Quick Access Recorder
- **CPL**: Continuous Parameter Logging

**AI?**
However, technicians are still essential for accomplishing and confirming actual maintenance actions.

Furthermore, some may be automated decision support.
Collaboration of AI and Maintenance Personnel

Expectation for AI and Prescriptive Analytics

1. Bring the maintenance level up without depending on each person’s expertise and skill.
2. Decrease the human error in decision.
3. Accelerate the process for decision making.

Even AI can propose the desirable solution, it is necessary to monitor and approve the proposal since the allowance for any error in the aircraft maintenance is minimal.

- AI needs to propose the solution in a manner that maintenance personnel can determine whether the proposal is appropriate or not.
- Also, maintenance personnel are required to keep/improve the knowledge and skill for evaluating the proposal by AI.

Toward the ultimate goal of “0-0-100”,
Building a “Proud and Confident” maintenance team with the collaboration of AI is the key
Thank you
Example of Big Data analytics (ERJ ENG oil TEMP sensor)

- E-170/190 (20 airplanes)
- Used data for one year
  - 68,000 flights
  - 62,000 flight HRs
  - 12 parameters/sec
  - 15.4 GB data size

Using standard deviation, normal range was defined.

If the data deviates from the normal range, degradation of the oil TEMP sensor is suspected.

Difference of Engine oil TEMP (L and R)

Replaced oil TEMP sensor