The MRO LAB Initiatives – Key for Innovations

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How to inspire innovation within AFI KLM Engineering & Maintenance?

- AFI KLM E&M: 80 years of combined experience, each gained as airline shops managing large fleets from Air France, KLM but also 200 third party customers

- Fully “airline/MRO minded” with strong company cultures

- How to inspire innovations within 2 large companies and their affiliates?
AFI KLM E&M, a multi-product MRO with nose-to-tail adaptive solutions

GLOBAL No.2 IN ITS MARKET

14,000 EMPLOYEES

€ 4,012 BILLION TOTAL REVENUES

39% CUSTOMER TURNOVER

2,000+ AIRCRAFT IN COMPONENT SUPPORT

>400 ENGINE SHOP VISITS PER YEAR

AFI KLM E&M MRO Solutions

Engine

Aerostructure

Components

Airframe

Cabin Modifications

Additional Services

Total Care

2015 & 2016 MRO OF THE YEAR
Aviation Week
Best Component MRO
Aircraft Technology E&M
Over 200 Customers Around The World

North America
Air Canada
Air transat
ALC
American Airlines
Atlas Air
Centurion Air Cargo
Cargojet
Delta Airlines
GE Aviation
Honeywell
ILFC
Miami Air
Omni Air
Kelowna
National Airlines
Southern Air
Sunwing Airlines
The Boeing Company
Universal Asset Management
United Airlines
Willis
World Airways

South America
Aerolíneas Argentinas
Aeromexico
Avianca
Conviasa
GOL
LATAM
Satena
Surinam Airways

Europe
Aercap
Agean Airlines
AirBridgeCargo
Air Almaty
Air Astana
Air Atlanta Icelandic
Air Corsica
Air Europa
Air France
Air Mediterranee
Airbus
Aitalia
Aurora
Cargolux
Cargolux Cargo Air
CityJet
Corsairfly
Dniproavia
Dutch Army
El Al
Europe Airpost
Evelop
Finnair
Flybe
Freebird
French Air Force
Gainjet
Gazpromavia
Globus
Hifly
HOP!
Icelandair

Europe
Jetair Fly
KLM Royal Dutch Airlines
KLM Cityhopper
LOT
Lufthansa
Martinair
Masterjet
Monarch
Nordstar Airlines
Nordwind Airlines
Orenair
Pegasus
Privilege Style
SES
Snecoma
SR Technics
TAP
Thales
Titan Airways
TNT Airways
Turkish Airlines
Transavia
ULS Airlines Cargo
Virgin Atlantic
XL Airways
Wamos

Middle East
Almasria Universal
Alpha Star Aviation
Gulf Air
Egyptair
Emirates
Etihad
Kuwait Airways
Libyan Airlines
Oran Air
Petra Airlines
Presidential Flight
Qatar Airways
Qatar Amiri Flight
Royal Jordanian
Salt Airways
Saudia
Yemenia

Africa
Air Algerie
Air Arabia
Air Austral
Air Madagascar
Air Mauritius
Air Seychelles
Air Zimbabwe
Air Afrique Airways
AKFED
Afrikair
Atlas Blue
Comair
Libyan Airlines
Kenya Airways
Nouvelair
Royal Air Maroc
South African Airways
Syphax Airlines
TAAG
Tunisair

Asia
Air Asia X
Air Calin
Air China
Air China Cargo
Air New Zealand
Air Tahiti Nui
Asiana
China Airlines
China Cargo Airlines
China Eastern
China Southern
Druckair
Fiji Airways
Garuda
Indigo

Asia
Jet Airways
Korean Air
Myanmar Airways
Nokair
Pakistan International Airlines
Philippines Airlines
Qantas
Royal Brunei
Shenzhen Airlines
Sichuan Airlines
Sri Lankan
Thai Airways
Turkmenistan Airlines
Vietnam Airlines
Xiamen Airlines
And more important with a Strong Development on New Platforms and New Engines

- AIRBUS A350
- BOEING 787
- AIRBUS A320Neo
- BOEING 737MAX
- GEnx
MRO Market is growing in every segment but…

Evolution forecast between 2015 and 2025

MRO Market by Segment

- **Airframe**
  - 2015: $24.7bn
  - 2025: $35.3bn
  - Growth: +43% in 10 years
  - Additional: +$10.6bn

- **Engine**
  - 2015: $25.5bn
  - 2025: $39.2bn
  - Growth: +58% in 10 years
  - Additional: +$13.7bn

- **Component**
  - 2015: $14.1bn
  - 2025: $21.5bn
  - Growth: +52% in 10 years
  - Additional: +$7.4bn
The competition is fierce…

**MRO providers by revenues and product scope**

- **Airline shops (larger circle includes internal revenue)**
- **Independent players**
- **OEMs and OAMs**: revenues as both suppliers of parts and providers of MRO services
And that is why we have to innovate!

« If you always do what you always did, you will always get what you always got »

- Albert Einstein

Innovation is for everyone!
Values & Tools for an Innovation Culture

Identity, values and company culture

Innovation center, labs, incubators

Common values, recognized, shared, behaviour

Training, awareness of values and knowledge to promote

Events, Innovation days, dedicated communication, challenges...

Symbolic acts, supports, recognition

Simple and transparent procedures

« Try, Fall, Try again, Succeed »
The MRO Lab uses different tools to help us innovate

**Participative Innovations**
- Creative rooms
- Hangar X and FabLab to help prototyping

**Innovation Ecosystem**
- Industrial partners
- Universities / research centers
- The MRO Lab Singapore
- Start-ups

**Think Big - Start Small - Act Fast**
With prototyping & experimentation

**Strategic topics**

- Hangar & repair shop of the future with human at the centre of the organization
- Digital and Mobile Applications
- Big Data & Predictive Maintenance
- Customer Experience
- Automatization Artificial Intelligence Collaborative Robots
- New technologies
  - 3D printing / IOT*
  - Geolocalisation
  - Augmented reality

*IOT: Internet Of Things"
Connected aircraft as an eco-system: Surrounded by customer / employee centric innovations
787 Virtual Reality Training is saving one week access on the aircraft
787 Virtual Reality Training for engine run-up using HTC Vive
PROGNOS for Aircraft
Predictive feature

5QA1 (Feed pump in NOGO position) showed impending failure signal

Swap of positions: pump about to fail in a non-critical position, for study, and a healthy one in critical position

3 weeks after, pump failed in Shanghai (GO IF)

Predict supply chain demand → 2 days of A380 grounding avoided!
Our Predictive Maintenance Solutions using Big Data: Prognos

PROGNOS for Aircraft
Curative feature: quick fixing for sporadic failures

Failures appear on ECAM without any detailed information (e.g. transfer pump issue)
Mechanics follow the troubleshooting manual steps

With Prognos, sub-system is directly targeted (e.g. pressure switch)
Mechanics go directly to the effective AMM task

➔ Up to 3 weeks in case of sporadic failures
➔ Unnecessarily pulled components

PROGNOS: failures are fixed within TAT
Decrease irrelevant supply chain demand / decrease NFF rate
Mobility is key for our technicians: for example in the cabin maintenance.

To establish a diagnostic, the technician needs *in situ* one information:
- Exhaustive
- Ergonomic
- In real time

And it is a real challenge to meet these challenges using the current tablets.
And we have a smart solution for cabin maintenance
The MRO Lab – Let’s experiment Maintenance with Hololens
The MRO Lab - Adaptive Innovations
Its all about People!
Main Challenges and Take away

- Have the **right Innovation Culture**: Innovation is not only about technology
- Mixing **Maker teams** with complementary knowledge
- Test and experimentation: **Learning by doing**
- Involve the end user => we have to be more **user centric**
- **Symmetric digital approach**: Customer centricity ↔ Employee centricity
- Involve all the stakeholders (authorities, customers, manufacturers…) to have the real benefits of this new paradigm with predictive maintenance using data
- And It is all about **people**