Japan’s Aircraft Manufacturing Clusters: Promoting Collaboration Across Border

May 8th
2019
Kensuke SAITO
Director, Aircraft Component and Material Industries Office Manufacturing Industries Bureau, METI
5,000
1st JP-made
Civil aircraft
-> setback
Licensed production > Technology acquisition
Launch JP-made planes (C-1, F-1)
F-2 Fighter
Defense budget
austerity
International Joint Development
Airframe
B767, B777
Engines
V2500, GE90
->
YS11
1964
1973
Accelerated
by B787
MRJ 2020～
Civil
Defense
Industry size:
$1.8bil >
(2015cy)
"Blank 7 years"
After WW2
Repair of US
military aircraft
Licensed production > Technology acquisition
Launch JP-made planes (C-1, F-1)
F-2 Fighter
Defense budget
austerity
3P on Defense
Equipment Transfer
-> future?
US-2
P-1
F-35
20,000
15,000
10,000
5,000
0
Manufacture/Repair
($mil.)
Japan as a Joint Development Partner

- Japan has been participating in international projects working on airframe structure and engine parts for more than 40 years.

**Participation: 15%**

- B767 (250 seats)

**Participation: 21%**

- B777 (380 seats)

**Participation: 35%**

- B787 (250 seats)

**Participation: 9%**

- B777X (400 seats)

**Participation: 23%**

- A320 (150 seats)

**Participation: 23%**

- A320neo (150 seats)

**Participation: 10.5%**

- B777X (400 seats)

- GE: GE9X

- Participation: 10.5%
International collaboration for the export finance

- Instead of USEXIM, which stops service for a while, ECAs of UK and Japan (UKEF and NEXI) have started to support of export finance of Boeing since 2017. (This additional scheme works only for the Boeing 787 with Rolls Royce engine.)
Agreement between METI and Boeing on Cooperation in Aircraft Technology

State Minister Isozaki, METI

Chief Technology Officer

Hyslop, The Boeing Company

Meeting with Boeing on cooperation in future technologies based on the agreement

- focus areas
  - electric technology, including advanced lightweight batteries and advanced motors necessary for electric propulsion systems in aircraft
  - high-rate low-cost composite production technologies
  - advances in automation to improve manufacturing productivity.

Mainichi Aviation Wire

January 15, 2019
Expanding Cooperation with Airbus

- METI and DGAC (French aviation authority) established the Japan-Airbus Ad Hoc Civil Aeronautical Industry Working Group on March, 2017.
- Technology companies from inside/outside aviation industry are discussing potential collaboration with Airbus.
- Along with expanding business with Airbus, we aim to expand business outside the aircraft structure and engine.

G to G (Japan-France)

Japanese Companies ↔ AIRBUS

Japan-Airbus Working group on March 1st, September 22
Participants over 100 companies and 150 people

Japan-Airbus supplier training program on May 22-25th (4days)
Participants over 30 companies, 50 people
• METI works to improve the business environment, and provides R&D funding to enhance international collaboration among industry, government and academia.

B2B Business Matching Opportunities

- Lighter integrated heat exchanger system
- Landing gear extension and retraction system

Policy to Enhance Competitiveness in Aircraft Systems

METI
Policy to Enhance Competitiveness in Aircraft Materials

- METI/NEDO have provided R&D assistance on “CMC” development since 2011, targeting “2019” to achieve:
  - More than 200 Mpa
  - Less than 20% decreasing of strength after 1400 °C *400hr toward better fuel efficiency and CO2 reduction.

Development of Low cost CMC by designing of exchangeable combustor liner and its coating technology

Development of High Pressure Turbine and evaluation of its coating technology for the 3rd generation of SiC matrix composite
### Battery technologies
- Panasonic, MURATA, GS Yuasa
- ROHM, MELCO, Hitachi
- Toshiba, Hitachi, Meidensha, Fuji electric
- Toray, TEIJIN, Mitsubishi Chemical

### Motor technologies

### Inverter technologies

### Lightweight composite technologies
### MRJ (Mitsubishi Regional Jet): An Example of Our Willingness to Work with International Partners

- Japan’s first jet airliner with 70-90 seat capacity, being developed by Mitsubishi Aircraft Corporation.
- The first delivery is planned for 2020 to All Nippon Airways and the flight tests are progressing in the U.S.

<table>
<thead>
<tr>
<th>Component Category</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jet Engine</td>
<td>Pratt &amp; Whitney</td>
</tr>
<tr>
<td>Auxiliary Power Unit</td>
<td>Pratt &amp; Whitney Canada</td>
</tr>
<tr>
<td>Avionics</td>
<td>Rockwell Collins</td>
</tr>
<tr>
<td>Hydraulic System</td>
<td>Parker Aerospace</td>
</tr>
<tr>
<td>Air Conditioning, APU</td>
<td>Hamilton Sundstrand</td>
</tr>
<tr>
<td>Pylon</td>
<td>Spirit Aero Systems</td>
</tr>
<tr>
<td>Seats</td>
<td>Zodiac</td>
</tr>
<tr>
<td>Interior</td>
<td>HEATH TECNA</td>
</tr>
<tr>
<td>Slat, Flap, Belly Fairing</td>
<td>AIDC</td>
</tr>
<tr>
<td>Windshield</td>
<td>PPG Industries</td>
</tr>
<tr>
<td>High Pressure Duct</td>
<td>Daher Aerospace</td>
</tr>
<tr>
<td>Cockpit Panel</td>
<td>KORRY Electronics</td>
</tr>
</tbody>
</table>

(The picture was taken at the Paris Air Show in 2017)

- Category: Regional Jet (70-92 seats)
- Range: 3,770km
- Performance:
  - High Efficiency  
    (GTF Engine, Aerodynamic Design)
  - Environmentally friendly
  - Comfortable Cabin
Japanese SMEs are forming clusters to enter the aircraft manufacturing. There are about 40 clusters all over Japan.
Aircraft Manufacturing Clusters in Japan

Ex) “Matsusaka Cluster”

- 10 SMEs forms an association under one roof for efficient aircraft parts production.
Testing facilities for Aircraft Parts and Component

Temperature / Altitude / Humidity Icing Test Chamber

- Reproduce atmospheric pressure, temperature and humidity from the ground to the sky, and evaluate the safety and reliability of equipment.
- It evaluates not causing an explosion in the explosive gas around by the operation of the equipment and the generation of heat.
- In 2019, the combustion/fire resistance test facility will be available.

Explosion Proof Test Chamber

- Temperature / Altitude / Humidity Icing Test Chamber
- It reproduces the atmospheric pressure, temperature, and humidity from the ground to the sky, and evaluates the safety and reliability of the equipment.
- It prevents explosions in the explosive gases around by the operation of the equipment and the generation of heat.
- In 2019, the combustion/fire resistance test facility will be available.

Main specifications

- Pressure Range: 101.3 kPa to 10.7 kPa (atmospheric pressure) (equivalent to 52,000 ft altitude)
- Temperature Range: -70 °C to 100 °C (atmospheric pressure), -60 °C to 100 °C (10.7 kPa to atmospheric pressure)
- Humidity Range: 20% RH to 95% RH
- In the Test Chamber: W 1,500 mm, H 1,500 mm, D 4,000 mm
- Test Chamber Outer dimension: W 3,380 mm, H 2,835 mm, D 5,100 mm
- Resistance to skydropping, specimen slide with colloid

Main specifications

- Pressure Range: from 101.3 kPa to 4 kPa
- Pressure drawdown time: from 101.3 kPa to 4 kPa within 15 minutes
- Temperature Range: from 10 °C to 260 °C
- Heating-up-period: from 20 °C to 150 °C within 90 minutes
- Use fuel: N-Hexane
- Main chamber size: diameter 1.5m, depth 2.0m
- Sub chamber size: diameter 0.25m, depth 0.25m
- Interior-lighting, High Speed camera
- Manipulator use possible
- Program operation, The fixed value operation
- Manual operation's being possible
The Nationwide Network of Aircraft Manufacturing Clusters (NAMAC) was established in 2017 for inter-cluster/SME cooperation and to appeal for foreign companies.

The NAMAC website lists the information of each cluster and its member companies, indicating their certificates and machines.

The NAMAC website can be accessed at [https://namac.jp/en/](https://namac.jp/en/).
Japan National Aerospace Non-Destructive Testing Board (JNANDTB-Japan) was established in 2017 to certify NDT professionals of NAS 410.

- Approved two Formal Training facilities

1st Examination
December, 2019
Major Aircraft companies in Asia

- China
- India
- Malaysia
- Republik Indonesia
- Kingdom of Thailand
- Republic of the Philippines
- Republic of Singapore

Manufacturing base:
Established in the last 5 years or under construction.
Japanese companies in ASEAN

• Japanese aircraft companies have also started working with ASEAN countries.

• There are many Japanese SMEs they have already manufacturing bases in ASEAN for other sectors, there are huge potential to expand the cooperation in the aerospace sector as well.

IAC Manufacturing (Malaysia) Sdn.Bhd.
Manufacturing aircraft component and surface treatment

Asahi Aero Malaysia Sdn.Bhd.
Surface treatment and other processing of aircraft parts.

Wada Aircraft Technology
Design aircraft parts and jigs and tools.

SINGAPORE
JAMCO PTE LTD.
Maintenance of aircraft and aircraft equipment

Malaysia
Nabtesco Aerospace Singapore Pte. Ltd
Repair of aircraft equipment, etc.

JamcoPhilippines, inc.
Composite material for aircraft interior components, Panel processing, etc.

Nikkiso Vietnam, Inc.
Engine parts and wing parts

Mitsubishi Heavy Industries, Ltd.
Wing parts and fuselage parts

Aero-Design & Manufacturing Service (Vietnam) Co.,LTD
Jigs, Tools, and program design

Vietnam

Singapore

Philippines

JAMCO Aero Design & Engineering PteLtd.
Design for repairing aircraft interior items, etc.

Asahi Aero Malaysia Sdn Bhd

METI
The Asian civil aviation market is expected to expand significantly. On November, 2018, "ASIA AIRCRAFT SUPPLY CHAIN FORUM" was held to discuss potential of the aircraft supply chain in Asia.

Commercial Market Outlook (2017-2036)
World fleet 41,030

Boeing

Collins Aerospace

Safran

Japanese suppliers provide high added value.

We would like to cooperate with cutting-edge materials, manufacturing methods, and technologies in fields such as Electrification and integration.

Japanese suppliers provide high added value.

We would like to add more to our supply chain if they have potential.

Japanese suppliers provide high added value.

We would like to add more to our supply chain if they have potential.

Japanese suppliers provide high added value.

We would like to add more to our supply chain if they have potential.

Japanese suppliers provide high added value.
• In Asia-Pacific region, the MRO market is expected to grow 50% over the next 10 years.
The first Okinawa-based MRO started its operation this January 2019.

Okinawa is closer to the center of the major Asian airline network.

Source: Okinawa Pref, website

Capacity of the hanger
- For 3 narrow-body aircraft and a wide-body aircraft with painting capability.

Completion Ceremony (Nov, 2018)

Source: Okinawa Pref, website
Major MRO operations in Asia

Hong Kong
China/Xiamen
Shenzhen
Philippines
Singapore
Beijing
China/Zhuhai
Malaysia/Selangor
(JV between Lufthansa and MTU)
Thailand/Bangkok
Japan/Aichi
Japan/near Tokyo
Japan/Okinawa
Taiwan/Taipei
Thailand/Chonburi
IHI

- Has a variety of repair experiences on the many jet engine components (V2500, CF34-8, 10 and GEnx).
- Set up a new Commercial Aero Engine maintenance base near Tokyo and this base is planned to commence operation by the end of 2019.
- Providing airline operators worldwide with MRO services for PW4000 and V2500 engines.
- Released that to join MRO services for PW1100G-JM.

Source: IHI Press Release, website