International Titanium Association
Singapore 2018
Nicole LECCA
SVP Material & Parts Procurement
Chairman of the AIRBUS Material Board

Singapore
2018 February 5th
WHAT A YEAR!!!
A330 NEO First Flight Video
2017 Year of major firsts….

Congrats @FlyANA_official on your 1st #A321neo delivery, we look forward to seeing the aircraft flying in #Japan sky goo.gl/fxtQHy

Congratulations to Vietnam’s Jetstar Pacific on the delivery of its 1st aircraft ordered directly from Airbus! #A320 goo.gl/ryk4N3

PRESS RELEASE: First #A320neo assembled in Tianjin delivered to @AirAsia airbus.com/newsroom/press...

Indonesia’s 1st #A320neo has been delivered to @Citilink! Flying on domestic routes, to China and to the Middle East soon!

Congrats @HongKong Airlines on becoming 15th #A350 XWB operator. First flights to flyLAXairport starting in December goo.gl/ox86bf
2017 Year of commitments

Airbus PRESS @AirbusPRESS: 13/9/17
. @CathayPacific finalises order for 32 #A321neo aircraft airbus.com/newsroom/press...

Airbus Press Retweeted

Cebu Pacific Air @CebuPacificAir

#CEBNews: Additional seven new @Airbus A321CEO aircraft will arrive starting March 2018. Find out more here: bit.ly/pr06072017

You Retweeted
Airbus PRESS @AirbusPRESS: 20/11/17
. @SingaporeAir selects Airbus for #A380 retrofit programme goo.gl/tU71Q3

Supplier Conference 2017 @Tianjin & Market place

Celebrations for A330 Tianjin Completion & Delivery Centre inauguration
… and 2018 is already starting well!

Emirates signs agreement for up to 36 additional A380s
20-year demand for almost 35,000 new passenger and freighter aircraft

Source: Airbus GMF 2017

Number of aircraft*

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Deliveries</th>
</tr>
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<tbody>
<tr>
<td>Beginning 2017</td>
<td>20,500</td>
</tr>
<tr>
<td>2036</td>
<td>34,900</td>
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</tbody>
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- **24,807** single-aisle
  +1,277 vs GMF 2016
- **8,686** twin-aisle
  +626
- **1,406** very large
  -74
- **34,899** new
  +1,829

KEY MESSAGE: 5.3 $US Trillion market forecasted for the 20Y demand worldwide. During that period, Asia-Pacific will boost the PAX demand and double its freighter fleet.
An **Airbus** takes off or lands **every 1.4 seconds**

<table>
<thead>
<tr>
<th>Orders</th>
<th>Deliveries</th>
<th>In operations</th>
<th>Backlog</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18,191</strong></td>
<td><strong>10,926</strong></td>
<td><strong>9,950</strong></td>
<td><strong>7,265</strong></td>
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</tbody>
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31st December 2017 figures
What do customers expect….

**PASSENGERS**
- Flight “on-time”, no delay
- Attractive flight prices
- Safety and Quality
- Entertainment/Comfort
- Services

**AIRLINES and LESSORS**
- Late Configuration Freeze
- AC delivered “on-time”
- Operational reliability
- Cost/Margin per Seat
- AC performance & Safety
- Avoid unscheduled maintenance/AC grounding

**SUPPLIERS**
- Items supplied “on-time”
- Items supplied on quality
- Industrial flexibility
- Competitive prices
- Innovation
AIRBUS Sourcing footprint in China & East Asia

Overall Sourcing volume in China and East Asia at Group level:

+5% yearly growth

Top 4 countries:

<5%: average proportion of Raw material commodity footprint in Top4 Supply-Chain

>20%: average proportion of Parts & Aerostructure commodity footprint in Top4 Supply-Chain
Airbus Global Supply Chain Titanium - Infographics

+50% Forging Spend evolution from 2013 to 2020 & +180% Titanium Spend evolution from 2013 to 2020

Titanium Footprint:

- Asia & Russia (mainly Raw Mat)
- North America (balanced Raw Mat & Forging)
- Western Europe (mainly Ti Forgings)

Input weight of Titanium on A350 is 18 TIMES HIGHER than on A330ceo *

KEY MESSAGE: Titanium demand trend is driven by both new Pylon architecture and the growing adoption of CFRP in Aircraft manufacturing ➔ Every working day, AIRBUS supply-chain consumes >50T titanium
Material & Parts strategic objectives – **Industrial Excellence**

**Target 100% OTD & No Quality escape**

- failure is not an option at current & future rates

**Enablement and Vertical Integration**

- rationalize logistics flows & develop regional / complementary actors

**De-risking of critical items on SA and A350**

- create business opportunities for new entrants or new manufacturing routes (including in Asia)

**KEY MESSAGE:** Local for local and de-risking policy are generating opportunities for actors in Asia who are able to comply with AIRBUS Quality & Supply-Chain standards
Industrial flexibility – why do we need it?

Mills A

Mills B

Mills C

12 to 24 months FORECAST

12 months ORDER

3 months HORIZON

2 weeks CALL-UP

Airbus FAL

Airbus pre-FAL

Or

RSP (integration)

Configuration Definition Freeze

Detail Parts & Aerostruct Tier

Figurative

Build rate change#1

MOD

ToW (awarded business)

Convergence corridor

Demand fluctuation

Make to Buy

Build rate change#2
Material & Parts strategic objectives – **Sustainable competitiveness**

**Sourcing strategy at Group level**
- Bundling the needs and leverage opportunities

**Raw material optimization**
- Volumes, Buy to Fly & Vertical Integration

**Trade between capable technologies**
- Value creation on cost, weight, time to market, customer value, …

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KEY MESSAGE: Competitiveness is key and overall cost structure optimization must be considered
(recent introductions of CFRP as replacement of the initial Titanium solutions)
Material & Parts strategic objectives – Foster Innovation

Promoting joint innovation
➡ Develop Cooperation & Research Agreements in a win-win & risk sharing approach

Digitalization
➡ Pilot cases “paperless” and reduction of testing and incoming inspections

From subtractive to additive
➡ Change of paradigm, offering opportunities on the whole process

KEY MESSAGE: All newcomers to the AIRBUS supply-chain will be required to enroll in the industry digitalization breakthrough
Titanium Additive Manufacturing perspectives

- Inconel powder bed pre-serial parts used for A320neo flight test campaign since 2013
- 1st powder bed serial parts qualified on Ti and Inconel in 2017
- 10+ serial qualifications on-going
- Collaborative development of High Deposition Rate for Ti
- # of designers trained to AM opportunities 200+

**Airbus Roadmap:**

**Step 0**
- R&D

**Step 1**
- Iso-design / part Qualification / Static loaded

**Step 2**
- Optimize design/ family Qualification/ Fatigue loaded

**Step 3**
- New concept / Process Qualification / Class 1

**Powder Bed:**
- Titanium parts
  - Enabler: Powder sourcing
- Inconel parts

**High Deposition Rate:**
- Titanium parts
  - Enabler: Wire sourcing

**KEY MESSAGE:** Pro-active contribution from all players in the Titanium industry (Material / Machines /Process)
Conclusion

SHORT & MEDIUM TERM

➢ Programmes ramp up & sourcing strategy is creating growth opportunities for the Asian Titanium actors…

➢ …and this requires our partners to comply with AIRBUS standards:
  ➢ Further improving use of raw material with optimized By to Fly
  ➢ Reaching a sustainable industrial excellence 100% on time, 0% defects
  ➢ Adapting operating model to cope with continuous innovation and digital era
  ➢ Improve lead time and agility to cope with build rate evolution

LONG TERM

➢ Competitiveness, flexibility and innovation will be the differentiation criteria to be part of the 2020+ AIRBUS supply-base
Thank you