Spacious Skies Ahead for Alcoa Aerospace

American Metal Market
Sixth Annual Aerospace Materials Conference
April 25, 2012
Cautionary Statement

Forward-Looking Statements
This presentation contains statements that relate to future events and expectations and as such constitute forward-looking statements. Forward-looking statements include those containing such words as “anticipates,” “estimates,” “expects,” “forecasts,” “intends,” “outlook,” “plans,” “projects,” “should,” “targets,” “will,” or other words of similar meaning. All statements that reflect Alcoa’s expectations, assumptions, or projections about the future other than statements of historical fact are forward-looking statements, including, without limitation, forecasts concerning global demand growth for aluminum, end-market conditions, and growth opportunities for aluminum in automotive, aerospace and other applications, trend projections, targeted financial results or operating performance, and statements about Alcoa’s strategies, outlook, and business and financial prospects. Forward-looking statements are subject to a number of known and unknown risks, uncertainties, and other factors and are not guarantees of future performance. Important factors that could cause actual results to differ materially from those in the forward-looking statements include: (a) material adverse changes in aluminum industry conditions, including global supply and demand conditions and fluctuations in London Metal Exchange-based prices for primary aluminum, alumina, and other products, and fluctuations in indexed-based and spot prices for alumina; (b) deterioration in global economic and financial market conditions generally; (c) unfavorable changes in the markets served by Alcoa, including automotive and commercial transportation, aerospace, building and construction, distribution, packaging, defense, and industrial gas turbine; (d) the impact of changes in foreign currency exchange rates on costs and results, particularly the Australian dollar, Brazilian real, Canadian dollar, euro, and Norwegian kroner; (e) increases in energy costs, including electricity, natural gas, and fuel oil, or the unavailability or interruption of energy supplies; (f) increases in the costs of other raw materials, including calcined petroleum coke, caustic soda, and liquid pitch; (g) Alcoa’s inability to achieve the level of revenue growth, cash generation, cost savings, improvement in profitability and margins, fiscal discipline, or strengthening of competitiveness and operations (including moving its alumina refining and aluminum smelting businesses down on the industry cost curves and increasing revenues in its Flat-Rolled Products and Engineered Products and Solutions segments) anticipated from its restructuring programs and productivity improvement, cash sustainability, and other initiatives; (h) Alcoa’s inability to realize expected benefits from newly constructed, expanded, or acquired facilities or from international joint ventures as planned and by targeted completion dates, including the joint venture in Saudi Arabia, the upstream operations in Brazil, and the investments in hydropower projects in Brazil; (i) political, economic, and regulatory risks in the countries in which Alcoa operates or sells products, including unfavorable changes in laws and governmental policies, civil unrest, or other events beyond Alcoa’s control; (j) the outcome of contingencies, including legal proceedings, government investigations, and environmental remediation; (k) the business or financial condition of key customers, suppliers, and business partners; (l) adverse changes in tax rates or benefits; (m) adverse changes in discount rates or investment returns on pension assets; and (n) the other risk factors summarized in Alcoa’s Form 10-K for the year ended December 31, 2011 and other reports filed with the Securities and Exchange Commission. Alcoa disclaims any obligation to update publicly any forward-looking statements, whether in response to new information, future events or otherwise, except as required by applicable law.
Alcoa at a Glance

- Founded in 1888
- 200+ locations
- 31 countries
- $25.0 billion 2011 revenue
- Alcoa’s lost workday injury rate is 1/10 that of the average U.S. manufacturing workplace
- Award-winning sustainability leadership
- >120 years of aluminum technical leadership

Number of Employees (2011)

<table>
<thead>
<tr>
<th>Region</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>26,000</td>
</tr>
<tr>
<td>Europe</td>
<td>17,000</td>
</tr>
<tr>
<td>Other Americas</td>
<td>11,000</td>
</tr>
<tr>
<td>Pacific</td>
<td>7,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>61,000</strong></td>
</tr>
</tbody>
</table>
More solutions by virtue of a uniquely broad engagement across the aerospace market

Unmatched **global** footprint

“First flight to now” **wisdom**

**Multi-material** expertise

**Multi-market segment** engagement

**Material agnostic** – it’s about the best solution

2011 Aero Revenues = $3.4B

- Alcoa Fastening Systems
- Alcoa Power and Propulsion (aka Alcoa “Howmet”)
- Global Rolled Products
- Forgings & Extrusions
Investing in new technologies and capabilities …an Alcoa tradition continuing

Solutions from Alcoa’s global technology network fly far beyond advanced alloys to design, manufacturing and assembly for all major aircraft wing and fuselage structures

World’s largest light metals research center
From alloys to processes to structures to fasteners – a continuing tradition of investment & innovation leadership

50K-ton Forging Press
~$100M investment restores industry leading forging capability and is now in production
2012-2014: Even if not as optimistic as the OEMs… …most are predicting a record setting 3 years of aircraft deliveries

Ready to deliver: Proven global capacity Proven supply chain reliability
A set of solutions spanning all aircraft life-cycle phases

As You Conceive & Design
- Structural design
- Alloy development
- Dedicated designers

As You Build
- Lower mfg and assembly costs
- Reduced program risk

As You Prototype & Test
- Rapid prototyping
- Trusted and credible technical experts

As You Retire It
- Recyclable

As You Maintain It
- Corrosion resistant
- Meet emerging inspection interval requirements

As You Fly It
- Lightweight
- Low operating cost
- Aerodynamic

A Value Proposition that works for Airframers… and their customers
Aerospace Plastic Weight – When doesn’t choosing a lighter material result in a lighter airplane part?

1. CFRP starts off with a 45% density advantage for an identically-sized chunk of raw material.

2. 25% of that advantage is lost because CFRP is “orthotropic” – it needs to be applied in multiple layers to carry an equal load.

3. 10% of the remaining advantage is lost due to the addition of other materials and components to provide “multi-functionality” needed in aircraft.

4. The last 10% is lost to the addition of other materials for strength and the inability to taper CFRP to the same extent as aluminum.

No amount of “learning” or “scale” can alter what are the natural physical properties of the material itself.

CFRP
- 45% advantage - plastic

Aluminum
- 20% advantage - plastic

Titanium
- 0% Advantage GONE!

To deal with things like lightning, electrical grounding, etc.

Copper mesh
- 10% advantage - plastic

Fasteners
- 10% advantage - plastic

Bus bar

Titanium is 60% denser than aluminum.

Tapering in metal can be done more efficiently for cut-outs.
With every component a contest of materials, Alcoa is changing the “conventional wisdom”.

Boeing 787 & Airbus A350XWB decisions based on best info available…

…but consider recent Al fuselage (CSeries) & Al wing (MRJ) decisions

…and even more recent decisions for new ultra-efficient single & twin aisles

…what’s best for the next aircraft?

“…Alcoa’s 3rd-generation lightweight aluminium lithium (Al-Li) is a viable option…”

“…makes sense in significantly trimming weight…”

Aspire, February 2012
Composites Shortage Snags Hawker Beechcraft

by CHAD TRAUTVETTER

March 13, 2012, 4:00 PM

Hawker Beechcraft announced yesterday that it “is implementing a supply chain and final-assembly Premier IA and Hawker 4000 line to synchronize its production line with availability of composite material from a key supplier.” While Hawker Beechcraft would not confirm the identity of the supplier, industry sources told AIN that the problem stems from epoxy resin supplier Cytec. At press time, Cytec had not responded to AIN’s inquiry.

Hawker Beechcraft implementing supply chain furlough

Hawker Beechcraft is implementing a furlough of its supply chain and final assembly Premier IA/Hawker 4000 line in Wichita in order to synchronize its production line with availability of composite material from a key supplier.

Increases in production of commercial and military programmes have placed higher demand on composite material suppliers. It is a matter of composite material availability and Hawker Beechcraft synchronizing its production accordingly.

This will be done on a rolling basis over the next 30-60 days and likely last between 30-45 days for the affected employees.

The company will continue moving aircraft through its upgrade and enhancement programme, as well as completing and delivering aircraft out of its Little Rock facility.
Large aircraft currently being developed have a composite share of over 50% – No further increase is expected at first.

Material mix development as a share of total weight of aircraft structure [%]

<table>
<thead>
<tr>
<th>Boeing</th>
<th>Airbus</th>
<th>Bombardier</th>
<th>UAC</th>
<th>Comac</th>
</tr>
</thead>
<tbody>
<tr>
<td>B737</td>
<td>A300/310</td>
<td>A300/340</td>
<td>A380</td>
<td>LCA 2020</td>
</tr>
<tr>
<td>79</td>
<td>15</td>
<td>15</td>
<td>74</td>
<td>C919</td>
</tr>
<tr>
<td>80</td>
<td>66</td>
<td>66</td>
<td>61</td>
<td>5-10</td>
</tr>
<tr>
<td>70</td>
<td>61</td>
<td>52</td>
<td>30</td>
<td>15-20</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>52</td>
<td>38</td>
<td>5-10</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
<td>20</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>2011</td>
<td>20</td>
<td></td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Impact:
- Up to B787 and A350, significant increase in composite share ("CFRP hype")
- Updates of current single-aisle aircrafts (A320neo and B737max) are planned without a significant increase in the proportion of CFRP compared to A320 & B737
- Material mix (metal vs. carbon fuselage) of new ("post-neo") single-aisle generation aircraft not yet defined, but clear preference for metal

"Composite percentage remains frozen at today’s level – the new A30X will have a metal fuselage"
- Head of Procurement at Airbus

Source: Teal, expert interviews, Russia & CIS Military Newswire, Roland Berger
Responding to demand for aluminum-lithium solutions: a global, three pronged investment plan

New casting complex (USA)
- Unique design
- Adds 20kT capacity
- Eliminates pinch points
- 4Q2014

Casting expansion (UK)
- 4Q2012

Casting expansion (USA)
- 30% increase
- 4Q2012

“… well understood technology … requires little to no modification in the (airframer) production process …”
Aspire, February 2012
Alcoa products expand the performance envelope

**High Perf Structural Plate**
- Ftu, L (S or A)
- Fty, L (S or A)
- Klc, L-T (S)
- Fbry, e/D=1.5 L (S or A)
- SCC-ST threshold (min)

Comparison at 2-3in thickness
- 7050-T7651
- 7449-T7651
- C85T-T7651

**Upper Wing**
- Ftu, L (S or A)
- Kapp, L-T (Typ)
- Fty, L (S or A)

Comparison at 1.0-1.5in thickness
- 7150-T6151
- 7449-T7951
- 7255-T7751

**Lower Wing**
- Fty, L (S or A)
- Kapp, L-T (Typ)

Comparison at 4-5in thickness
- 2024-T351
- 2027-T351
- 2624-T39

**High Perf Structural Plate**
- Ftu, L (A)
- Fty, L (A)
- Klc, L-T (S)
- Fbry, e/D=1.5 L (A)
- SCC-ST threshold (min)

Comparison at 4-5in thickness
- 7050-T7451
- 7140-T7451
- 7085-T7451

**Density**
- -2%
- 0%
- 1%
- 1.1%
- 1.2%

**Upper Wing**
- Fty, L (S or A)

**Lower Wing**
- Fty, L (S)

**Upper Wing**
- Kapp, L-T (Typ)

**Lower Wing**
- Kapp, L-T (Typ)

*Alcoa products expand the performance envelope*

*www.alcoa.com/aerospace*
Its not just about “industry leading new products” anymore

Our approach as shifted from material properties to meeting aircraft mission needs – through in-depth customer collaborations focused on design drivers across aircraft applications…

<table>
<thead>
<tr>
<th>Period</th>
<th>Approach</th>
</tr>
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<tbody>
<tr>
<td>1920s to 1950s</td>
<td>“If a little alloying addition is good, a lot is better till something bad happens”</td>
</tr>
<tr>
<td>1950s to 1960s</td>
<td>Applied understanding of microstructure/property/process relationships in concert with phase diagram considerations. Use performance parameter extrapolations to establish reasonable property expectations.eu.</td>
</tr>
<tr>
<td>1980s to today</td>
<td>Accelerated development process combining state-of-the-art knowledge with computer aided alloy design. Use flowfield and chemistry based models. Use metamodels to reduce complexity for design and manufacturing.</td>
</tr>
</tbody>
</table>
Alcoa creates & integrates technology beyond Al-Li to enable Next Gen enhanced structures.
Alcoa’s focus on the best solution coupled with our customer intimacy and market reach make us “material agnostic” – and a partner that can be counted on

No technology gaps or pinch points
- Aluminum investments in alloy development continuing to meet the needs of Next Gen aircraft
- Design, structural and assembly innovations maturing for aircraft EIS > 2015

No capacity constraints
- Current capacity supports projected build rates
- Al-Li capacity investments will meet future requirements
- Al-Li products fit current airframer supply chains – no extraordinary investments required as with alternative materials

Alcoa’s advanced metallic technologies provide high-performance, low-weight, low-cost, and low-risk solutions for Next Gen aircraft – with growing industry expert endorsement
Thanks and Questions

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