BCA Supplier Management
International Titanium Association
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Agenda

- Business Environment
- Market Outlook
- BCA Titanium Usage
- Titanium Opportunities
- Supply Chain Efficiencies
- Partnering for Success 2.0
- Securing the Future
Business Environment

- Volatile economic and geopolitical landscape
- Oil price volatility
- Attractive, resilient and diversified commercial market; cycle speculation
- Supply-demand balance
- Intensifying competitive pressures – across all markets
- Dynamic supply chain at all levels – capacity, industrial base
- More for less – customer and productivity focus critical
Substantial, balanced backlog validates Boeing’s product strategy

Backlog by value ($B)

- Backlog = 5,795 aircraft
- Value = $432 billion
Global market performance since 2010

Global economic growth rate below average

Passenger market resilient, growing

Airlines managing better than ever before

NOTE: Annual growth rates (%) and cumulative profit ($B)

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Strong market fundamentals
Some at record levels

**Demand**
- Passenger traffic growth +6.7% in 2015
- Load factors >80% globally

**Fleet**
- Utilization stable, all-time highs
- Parked fleet steady at 3% of in-production

**Value**
- Stable values and lease rates
- $33 billion in airline profits in 2015
### Boeing expectations vs. reality

<table>
<thead>
<tr>
<th>Category</th>
<th>2015 Expectation</th>
<th>2015 Reality</th>
<th>2016 Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth</td>
<td>2.8%</td>
<td>2.4%</td>
<td>2.7%</td>
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<tr>
<td>Trade growth</td>
<td>4.6%</td>
<td>1.4%</td>
<td>3-4%</td>
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<tr>
<td>Passenger traffic growth</td>
<td>6%</td>
<td>7%</td>
<td>6%</td>
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<tr>
<td>Cargo traffic growth</td>
<td>5%</td>
<td>2%</td>
<td>3-4%</td>
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<tr>
<td>Oil prices</td>
<td>$80+/bbl</td>
<td>$52/bbl</td>
<td>$40-50/bbl</td>
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<tr>
<td>Airline profits</td>
<td>$25B</td>
<td>$33B</td>
<td>$36B</td>
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## Competition is intensifying

<table>
<thead>
<tr>
<th>Boeing</th>
<th>Emerging</th>
<th>Airbus</th>
<th>2-class seating</th>
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<tbody>
<tr>
<td>600</td>
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<td>A380</td>
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<td>737 MAX 9</td>
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<td>737 MAX 7</td>
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Green text denotes study airplanes

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20-year forecast: Airlines will need 39,620 new airplanes valued at $5.9 trillion

Airplane deliveries: 39,620

- Regional jets: 2,380 (6%)
- Single-aisle: 28,140 (71%)
- Small wide-body: 5,100 (13%)
- Medium wide-body: 3,470 (9%)
- Large wide-body: 530 (1%)

Market value: $5,930B

- Regional jets: $110B (2%)
- Single-aisle: $3,000B (51%)
- Small wide-body: $1,350B (21%)
- Medium wide-body: $1,250B (23%)
- Large wide-body: $220B (4%)
- World Total: $5,930B

NOTE: market share may not equal 100% due to rounding
Today’s marketplace: Highly competitive

Aggressive competition
- Traditional competitors
- Emerging competitors

Customers want “more for less”
- Affordable and mission-capable
- Integrated services for mixed fleets
- Low operating cost
- In-service reliability
- Standardization, first-time quality
- Environmentally progressive
BCA Titanium Usage
(787-8 example)

Titanium Application

- Landing gear and adjacent structure
- Movable surfaces support structure
- Engine Mounting structure
- Engine and APU areas
- Hydraulic, ducting and tubing
- Fasteners

Titanium is metal of choice for aerospace

- Lightweight characteristics
- Corrosion resistant
- Withstand high temperatures
- Compatible with composites

Past
Capacity, availability and price limited the usage of titanium in the past

Current / Future
Cost/price of titanium is limiting the additional use on airplanes

Cost/price of titanium is limiting the additional use on airplanes
Titanium Opportunities

New Airplanes
• 777X increase in forgings due to composite wing
• 737MAX limited increase in sheet
• Any potential new platform

Near Net Shape / Process Improvement
• Ti – Forgings/extrusions
• NNS -Water jet shapes/Cut to size
• Increase Scrap Revert Collection
• Manufacturing process improvement

New technologies
• Powder
• Additive Manufacturing
• Linear friction welding
Supply Chain Efficiencies

**RMAS**
- Improve Forecasting
- Inventory Optimization
- Supply Chain Mapping
- Advanced Reporting and Metric

**Aggregation Strategies (exploring)**
- Steel and Hard Metals
- Titanium Extrusions
- Composites

**Vertical integration value**
- Control Input Risks
- Reduce Internal Cost/Fee/Overhead
- Shorter Lead-time
Partnering for Success 2.0

1st Time Quality
- Quality parts
- Production readiness

Design Cost Out / Lean+
- Design changes
- Productivity improvements

Supply Chain Architecture
- Strategic sourcing
- Value creation / innovation

Competition / Commercial Rebalancing / Volume
- Balance risk & reward
- Statement of work adjustment

Affordability focus areas
Securing the Future

Investment to enable change
Create sustainable competitive advantage

Integrate cost down initiatives
Drive productivity and affordability

Development of new technology to achieve cost down
Collaboration and sharing innovative ideas

Future business opportunities are tied to success
THANK YOU!