Key Trends Shaping the Aerospace Supply Chain

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Four Megatrends Will Reshape the Aerospace Supply Chain

1. Supply Chain Globalization
2. Rise of China
3. New Program Execution
4. Tier 4 Consolidation

The Aerospace Supply Chain

Source: ICF SH&E analysis
Investments in Manufacturing Facilities Have Been Increasing Since the Late 1990’s

Major Manufacturing Investments*

1990 – 2010

* Includes joint ventures and organic investments for over 160 OEMs and service providers; excludes acquisitions

Source: ICF SH&E
Mexico and China Received a Significant Number of Investments in Manufacturing Facilities

Major Manufacturing Investments*
1990 – 2010

* Includes joint ventures and organic investments for over 160 OEMs and service providers; excludes acquisitions

Source: ICF SH&E Analysis
AEROSPACE SUPPLY CHAIN TRENDS

Aerospace Manufacturing Globalization is Shifting Raw Materials Consumption Patterns

Raw Material Mills concentrated in North America and Europe…

…and Production is shifting South

Mills and distribution channels must adapt to emerging clusters

Source: ICF SH&E
OEMs Are Using Chinese Manufacturing for Low Tech and High Volume Production…

China’s growing economy will significantly increase global demand for engine components – mainly from Western engine OEM’s

Western engine OEM’s will increase use of Chinese low cost manufacturing

China is rapidly developing an indigenous aerospace industry

Source: ICF SH&E Analysis
AEROSPACE SUPPLY CHAIN TRENDS

...And Chinese Raw Material Suppliers Are Increasing Their Presence

- China Southwest Aluminum signed agreement with Airbus and EADS in May 2011
- Airbus will increase its efficiency as the aluminum needed by partners in China will be sourced directly from China instead of being shipped from Western suppliers.”

- In September 2011 started building a $300 million rolling venture in Zhenjiang, China
- Signed a five-year agreement with Airbus at 2011 Paris Air Show
- Plans to begin Al plate deliveries in 2013

- China’s largest titanium producer has been approved by leading aerospace OEMs including Airbus, Boeing, Bombardier, Goodrich, SNECMA, Rolls-Royce
- In 2009, Baoti achieved titanium production of 17,000t
AEROSPACE SUPPLY CHAIN TRENDS

Raw Material Consolidation and Vertical Integration is Reshaping the Supply Chain

The Aerospace Supply Chain

- Leading raw material suppliers are repositioning via vertical integration and consolidation
- The upshot: increases bargaining power vs. customers
AEROSPACE SUPPLY CHAIN TRENDS

Three Blockbuster Deals in 2011 Are Harbingers of Continued Tier 4 Consolidation and Vertical Integration

- ATI acquired Ladish in May 2011 for $883M
  - ATI is now able to offer customers advanced forging, casting and machining assets for titanium alloys, nickel-based superalloys and specialty alloys

- PCC acquired Primus International in June 2011 for $900M
  - Deal significantly expands PCC’s machining and final assembly capabilities
  - PCC is integrating upstream (raw materials) and downstream (machining)

- In June 2011 Carpenter Technology announced the intention to buy Latrobe in $558M deal (deal pending)
  - Brings together two leading aerospace specialty alloy suppliers

Source: Secondary Research
On Time Execution of New Aircraft Programs Will Shape Future Raw Material Demand

Projected 2016 Aerospace Raw Material Demand

- The impact of B787 and A380 delays are a reminder of the importance of new program execution to raw material demand.
- Five new programs are projected to comprise 30% of raw material demand by 2016.

Source: ICF SH&E Analysis
There Will Be a Fundamental Shift from Legacy Aircraft to Next Generation Aircraft, Occurring Mid-Decade

Air Transport Production Market
2011-2021, Narrowbody Vs. Widebody

**Why the fall in production rates?**

- High fuel prices (30%) mean that airlines will defer orders for legacy aircraft
- Aggregate production rates will fall in the transition – this is also the experience of past re-enginings of the B737 in the mid-1980s and late 1990s

Source: ICF SH&E
If Scheduled Production Rate Increases Occur There Could Be Several Possible Supply Chain “Pinch Points”

- Aluminum mill capacity
- Large press aluminum extrusions
- Rutile
- Titanium machining
- HIP facilities
- Heat treat facilities

Source: ICF SH&E analysis