Aerospace – Supply Chain Overview

September 20XX

TresVista
FINANCIAL SERVICES

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1. Executive Summary

Executive Summary

Sizeable Backlogs	■ Global aerospace & defense sector valued at ~$920.6 bn, and expected to grow at CAGR of 5.3% over 20XX-20XX supported by the size of existing primes / OEM backlogs, at 7+ years of Boeing and Airbus production
Increased Deliveries	■ Aerospace cycle defined by greater proportion of orders from emerging markets; planes delivered to non-OECD countries grew at a 20.0% CAGR since 20XX
Aerospace In Early Upcycle	■ Traffic to grow at a 6.0% CAGR, above 3.0% longer term GDP growth; supported by rising fuel prices, aging fleet along with growing demand from emerging markets
Pyramidal Structure	■ Industry characterized by few, high value adding players (Prime, Tier1) at the top and large number of small part manufacturers (Tier 2, Tier 3) at the bottom
Valuation	■ Increased consolidation witnessed in Tier 2 and Tier 3, with latter trading at a premium on account of higher margins
Outlook	■ Industry focused on efficiency leading to performance based contracts, outsourcing and new technologies to make aircraft more fuel efficient

2. Industry Overview

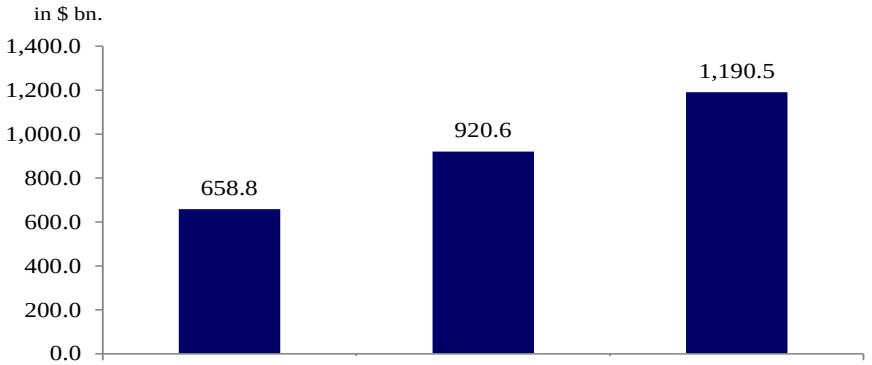
Industry Overview

Introduction

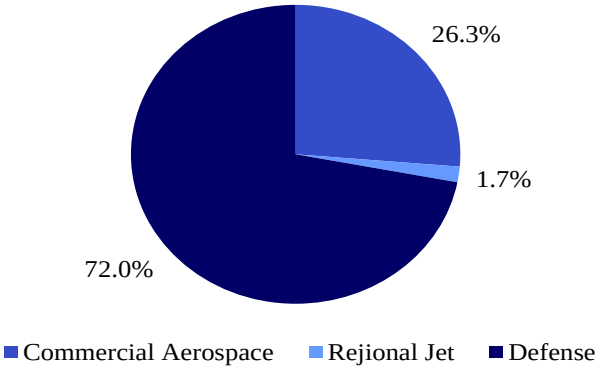
Aerospace & Defense Opportunity

- Global aerospace and defense (A&D) sector is valued at $920.6 bn and expected to grow at a CAGR of 5.3% between 20XX and 20XX
  - Defense accounts for 72.0% of total value
- Order book of ~12,705 aircrafts supports revenue growth for next several years (2)
- Global A&D market dominated by the US (59.0% market share), followed by Europe (22.0%), and Asia (19.0%)
- Boeing and EADS are the leading market players with 7.4% and 6.5% share in commercial aerospace
- A&D industry is becoming more global due to heightened competition, growing travel demands, and security requirements in emerging markets

A&D Sector — Size (1)



Industry Structure



The growth in aerospace & defense sector is expected to be led by emerging markets

(1) Data Monitor, Clearwater report.
(2) Installed base and backlog includes aircrafts from Airbus, Boeing, Embraer, and Bombardier. Backlog includes firm orders, options, Letter of Intent (LOIs) and option LOIs.

Industry Overview

Business Segments

Commercial Aerospace [1]

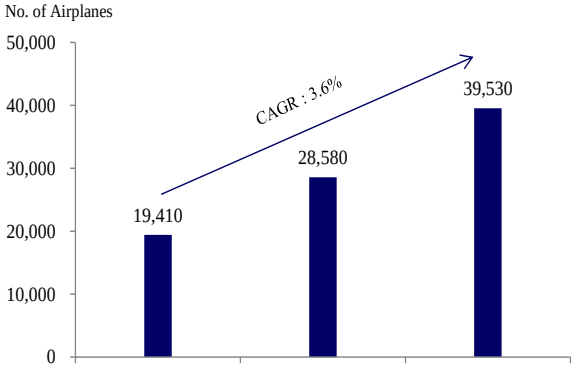
- Revenue grew by 11.0% in 20XX
- Annual production record of 1,011 deliveries by Boeing and Airbus in 20XX
  - 5.2% delivery growth in 20XX
- Major players include Airbus, and Boeing

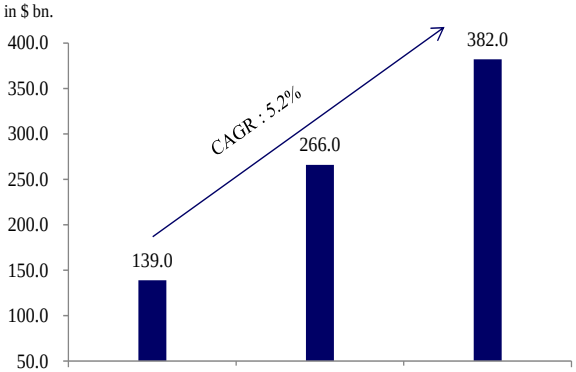
Regional Jet [2]

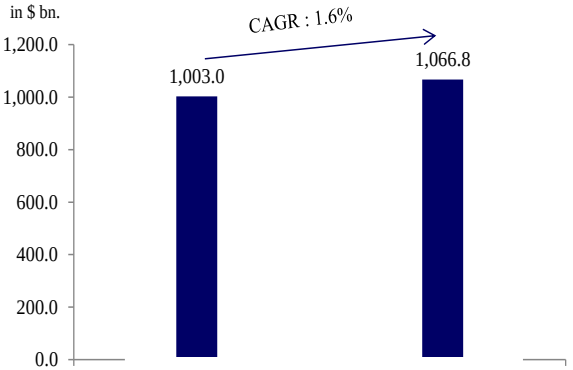
- Revenue remained flat with total billing of $15.5 bn in 20XX
- Industry backlog (20XX) of ~1,300 aircraft valued at $44.6 bn, with improved fundamentals of late
- Major players include Bombardier & Embraer

Defense [3]

- Global defense revenue decreased 3.3% in 20XX
- Defense sector in the US remained flat, with Asia and ME driving growth
- Major players include Boeing, Lockheed Martin & Northrop Grumman







Market for regional jets is expected to grow faster than commercial aerospace & defense

(1) Delloite 20XX A&D report, Boeing: Current Market Outlook (20XX-20XX).
(2) Bombardier Business Aircraft: Market forecast (20XX-20XX).
(3) moneymorning.com.au/20120417/australia-the-pacific-pawn-in-usa-versus-china.html.

3. Key Growth Drivers

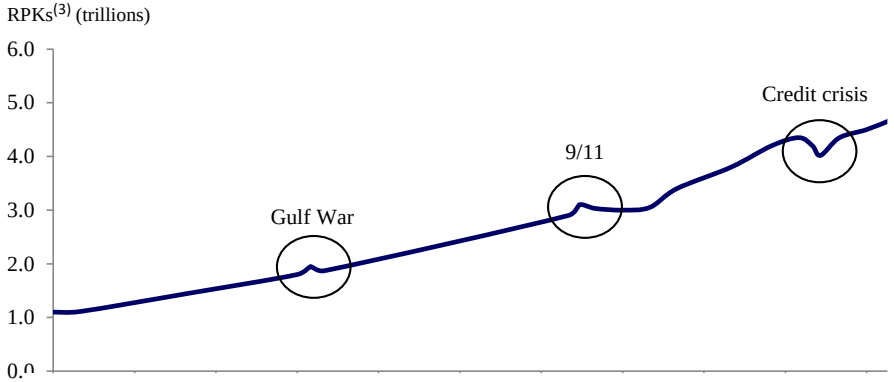
Key Growth Drivers

Commercial Aerospace

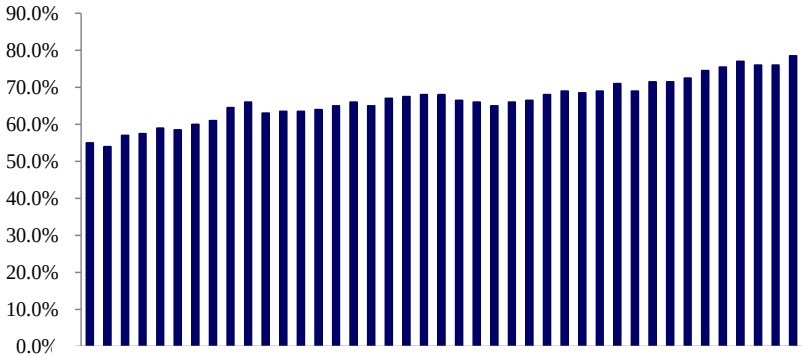
Traffic and GDP Growth

- Air traffic grew at CAGR of 5.0% since 19XX, resilient to recessions, financial crises, Gulf wars, oil shock, and 9/11 attack
- Air traffic has been growing at approximately 1.5x-2.5x the global GDP growth rate
- Global load factor for airlines are at record high level of ~79.0% and further increase in traffic will be met by fleet expansion

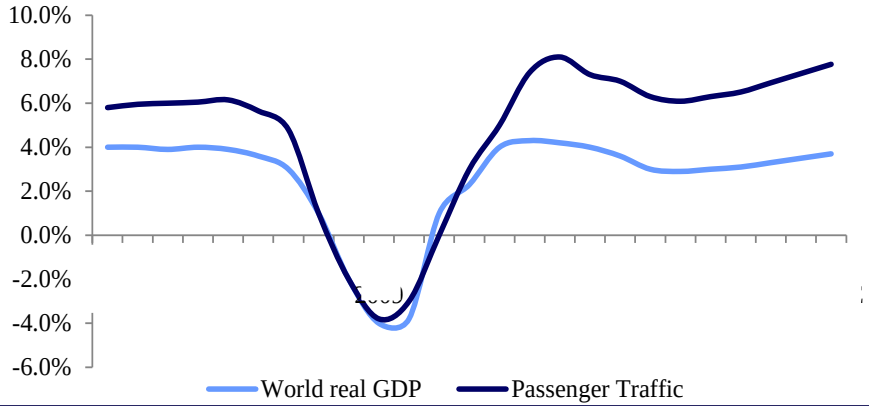
Historical Traffic Growth (1)



Global Load Factor (2)



GDP and Air Traffic (1)



Average global GDP growth of ~3% translates to traffic growth of 6.0% in the long term

(1) Airbus Global Market Forecast (20XX-20XX).
(2) Sector Primer – Bank of America Merrill Lynch dated 13 May, 20XX.
(3) RPK: Revenue Passenger Kilometers.

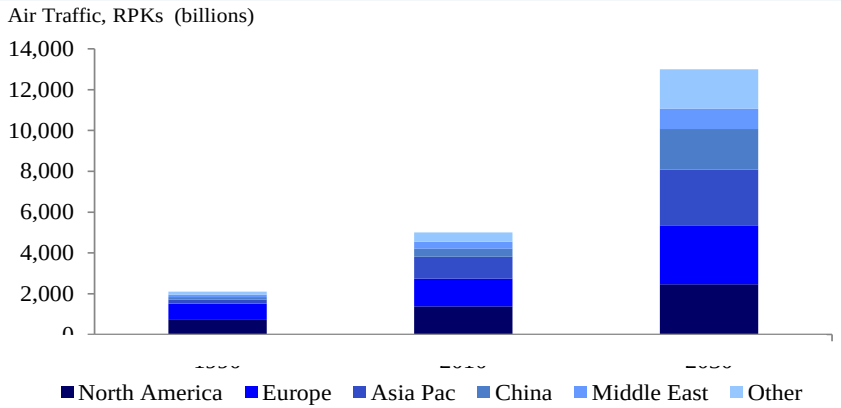
Key Growth Drivers

Commercial Aerospace

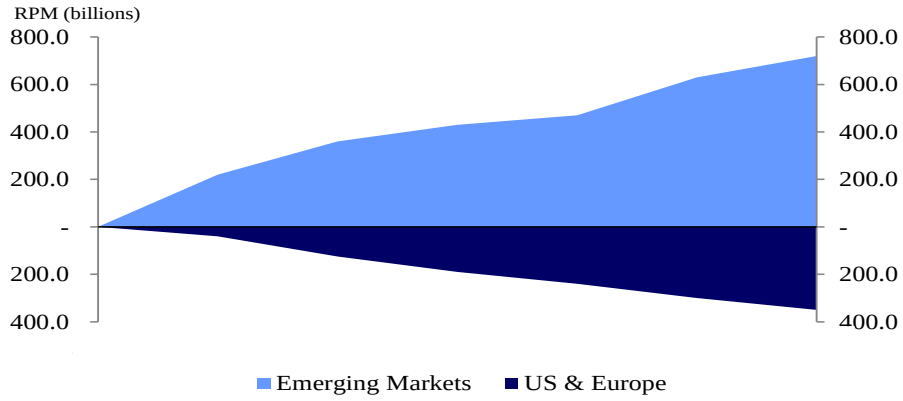
Emerging Market Drive Traffic Growth

- Air traffic growth is shifting from U.S. & Europe to Asia Pacific with China's air traffic growing at CAGR of 8.7 % in 20XX-20XX
- Growth in propensity to travel is estimated to be 4.0x in China and 3.0x in India by 20XX compared to 20XX
- Two third of the traffic growth will be generated by emerging economies by 20XX

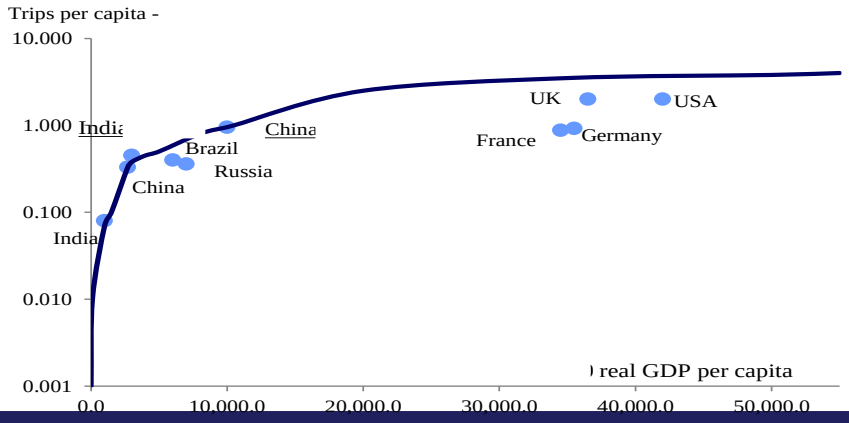
Changing Dynamics of Air Travel (1)



Global Traffic Growth (2)



Trips per capita in 20XX (1)



China is estimated to exceed U.S. in air traffic by 20XX

(1) Airbus Global Market Forecast (20XX-20XX).
(2) Broker Report.

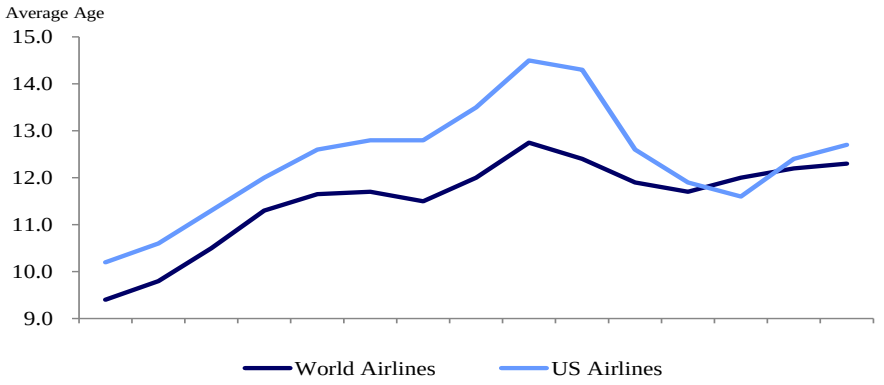
Key Growth Drivers

Commercial Aerospace

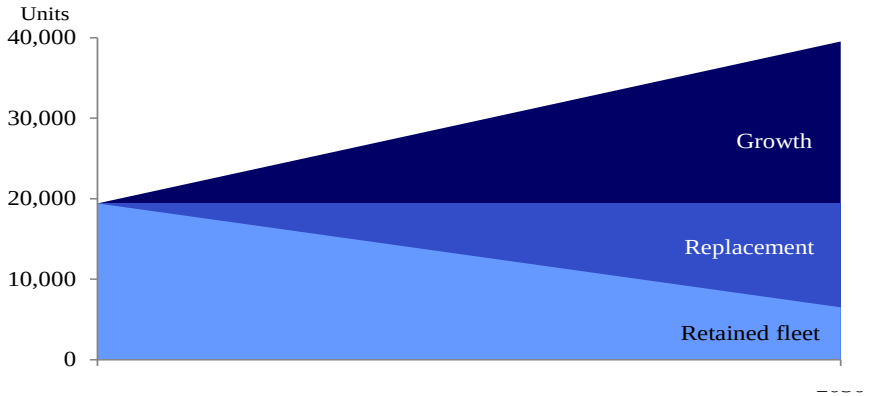
Replacement Demand

- Average age of world airline fleet is at 12.3 years
- Increase in fuel prices leads to airlines replacing their existing fleet with newer more fuel-efficient airplanes to save on fuel-costs
- Replacement demand is expected to be 40.0% of the future demand between 20XX-20XX

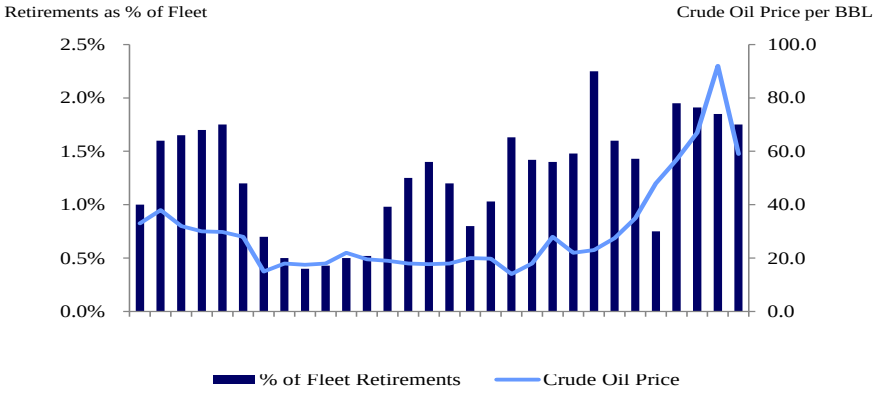
Age of airline fleet (1)



Global Traffic Growth



Fuel Price vs. Retirement of Fleet (2)



Increasing fuel prices to drive replacement demand in the range of ~40.0% going forward

(1) *Aerospace Industry Update report dated July 20XX, Goldman Sachs.*
(2) *Airbus Global Market Forecast (20XX-20XX).*

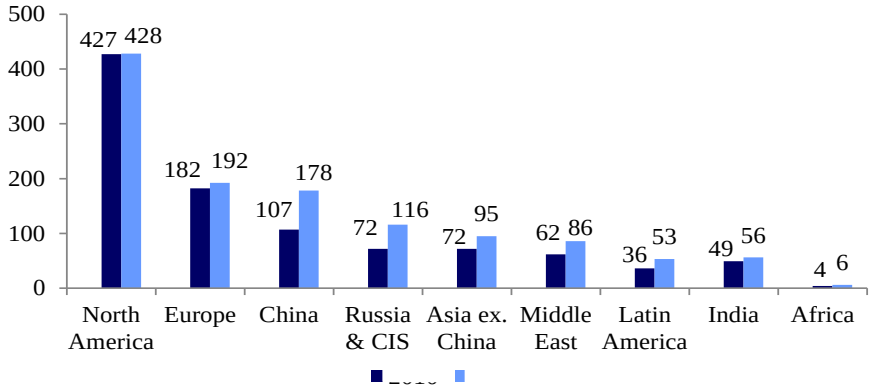
Key Growth Drivers

Regional Jet

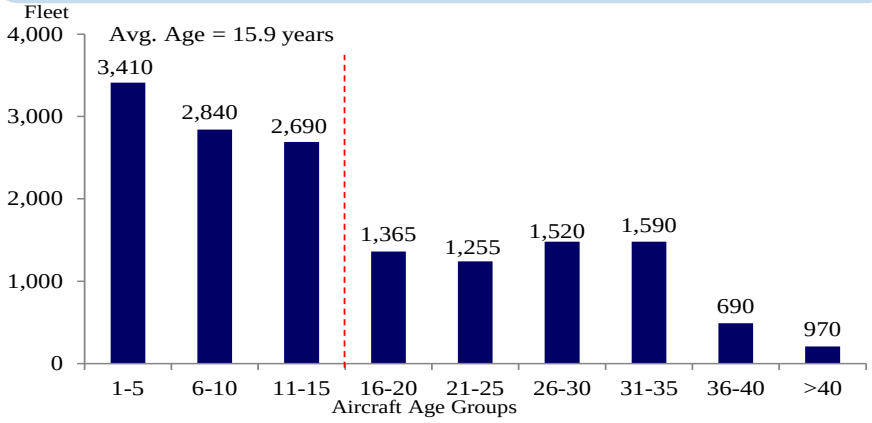
Key Growth Drivers

- Affluence Leading to Business Jet Growth
  - The number of billionaires reached a record high of 1,231 in 20XX with China showing a y-o-y growth of 66.0%
- Aging Fleet
  - With 24.1% of the fleet above 25 years, there is increased expectation of replacement in the next decade

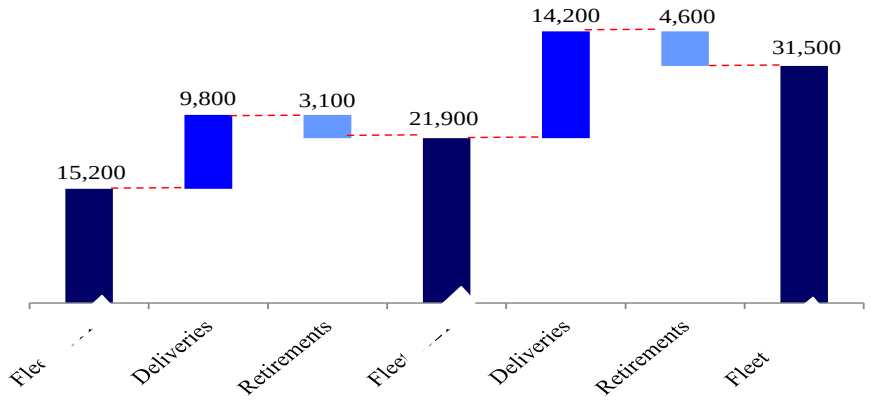
Number of Billionaires (1)



Business Jet Fleet Age (20XX) (1)



Business Jet Fleet Forecast (1)



Economic recovery, increased wealth creation & jet utilization will drive the growth for business jets

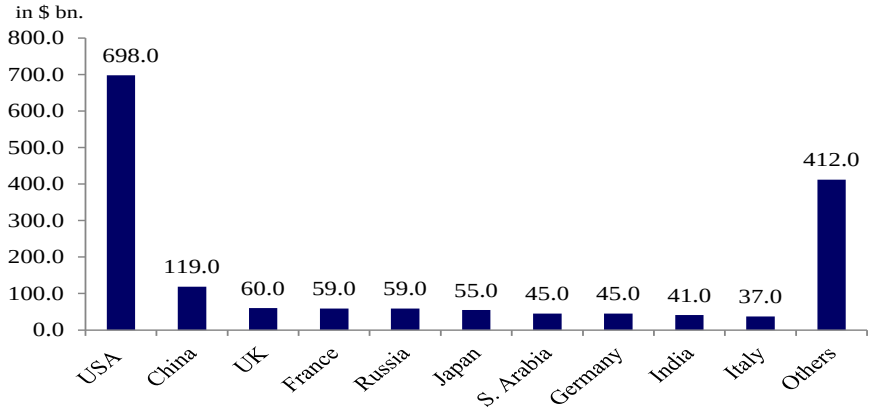
(1) Bombardier Market Forecast (20XX-20XX).

Key Growth Drivers
Defense

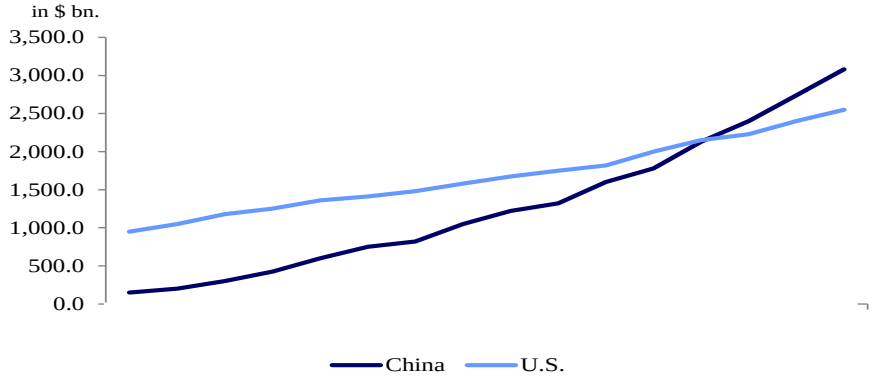
Key Drivers[1]

- US Defense Budget
  - U.S. & other developed countries remain the key driver despite of the defense budget reduction on account of growing fiscal deficit
- China's Increasing Budget
  - Increase in China's military expansion, along with its neighbors have resulted in increased exports for the U.S. defense industry

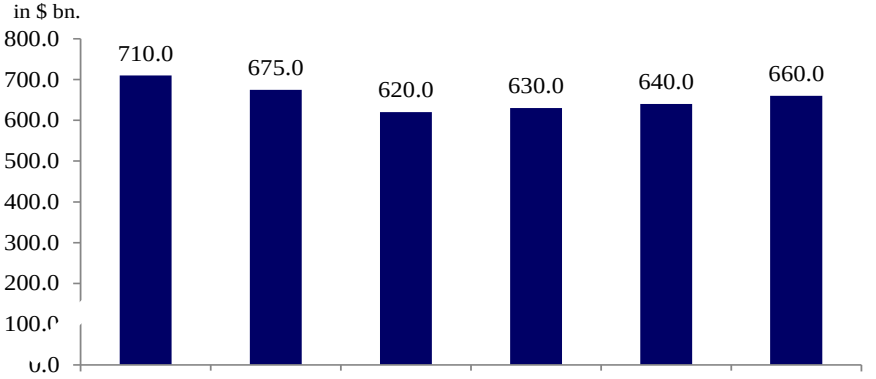
Military Expenditure by Country (20XX) [1]



China vs. U.S. Defense Budget [2]



Projected U.S. Military Expenditure [3]



China's rapid military expansion, along with others in Asia, is likely to drive growth

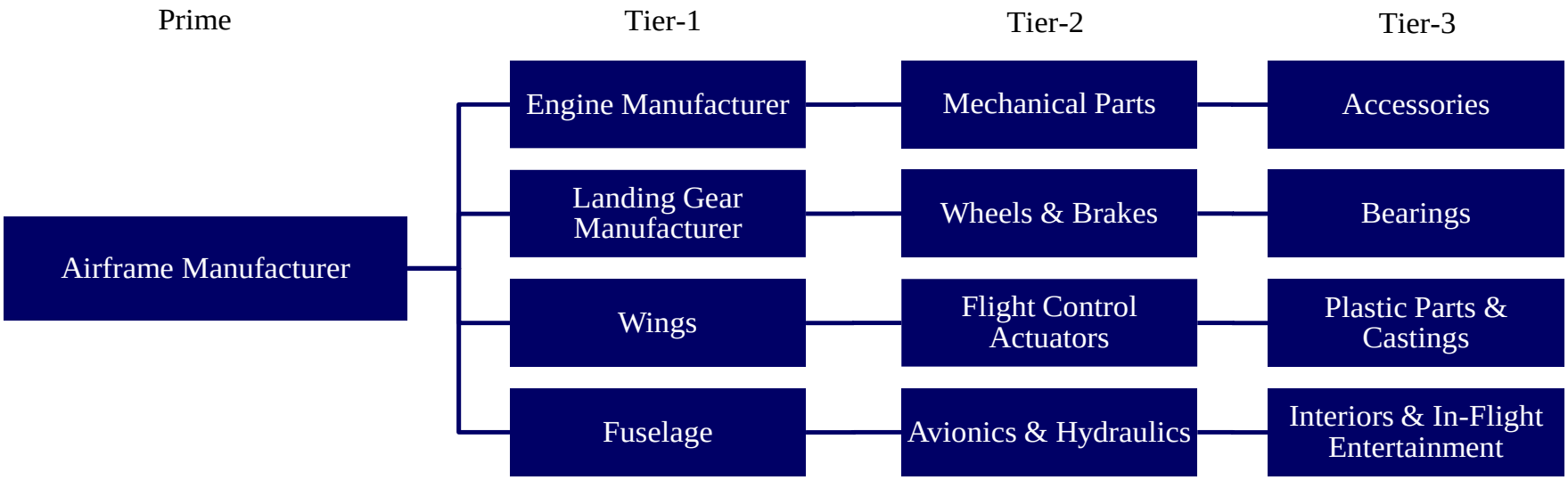
(1) *Stockholm International Peace Research Institute (SIPRI).*
(2) *nextbigfuture.com/20XX/XX/china-economic-forecast-to-20XX-and.html.*
(3) *A&D 20XX review – PWC.*

4. Business Dynamics

Business Dynamics

Industry Supply Chain

Overview



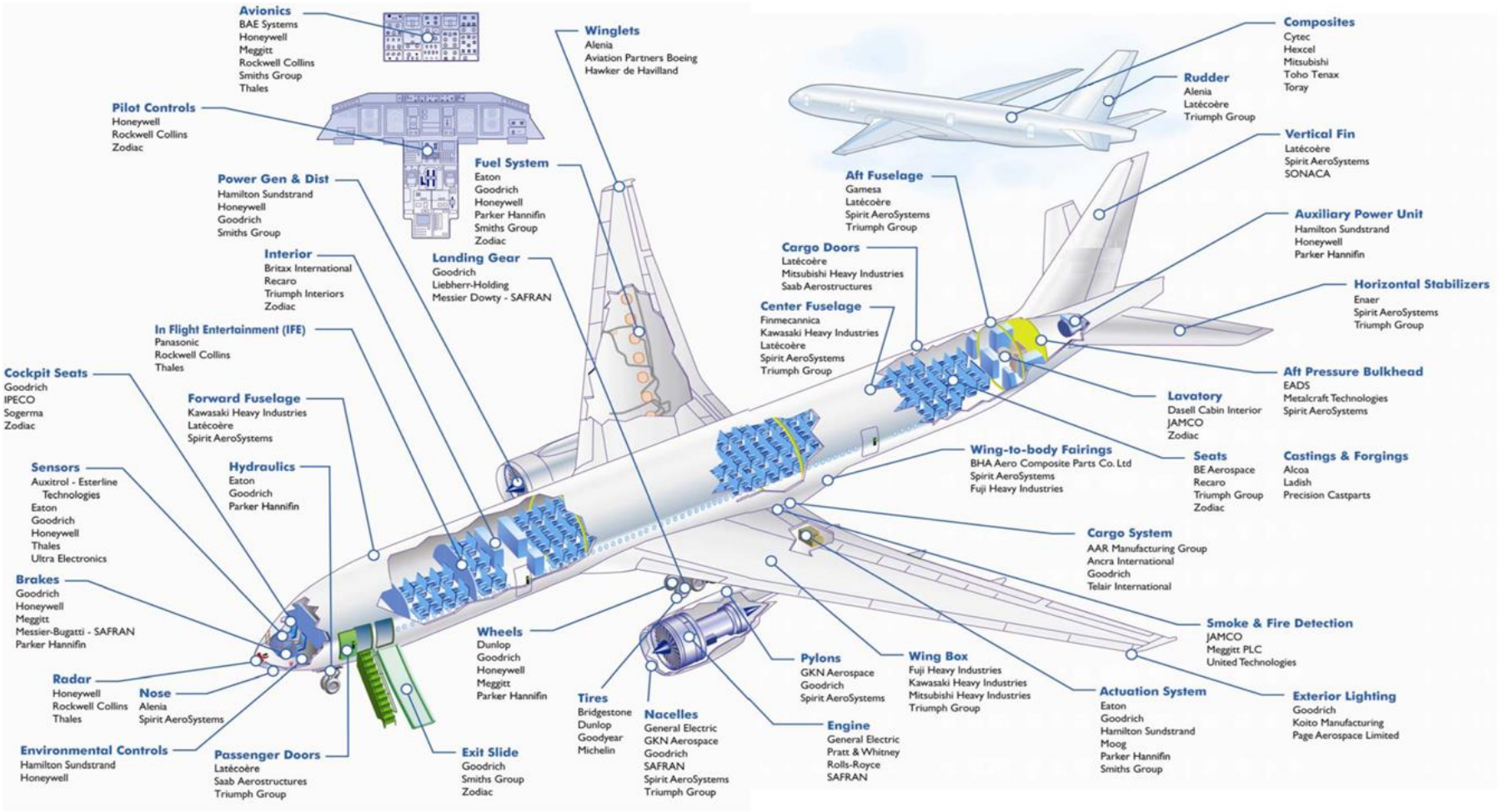
- **Primes** - Control design, manufacturing and assembly function, the most critical component of value chain
- **Tier 1** - Support Primes by providing them with equipments and systems like engines, Wings, Fuselage
- **Tier 2** - Manufacture and develop parts as per the specifications provided by primes and Tier 1 suppliers
- **Tier 3** - Responsible for supplying basic products, components and other non-core value added services

Fragmented industry with multiple layers in the supply chain

Business Dynamics

Industry Supply Chain

Various Components In Play Across The Industry (1)



(1) Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.

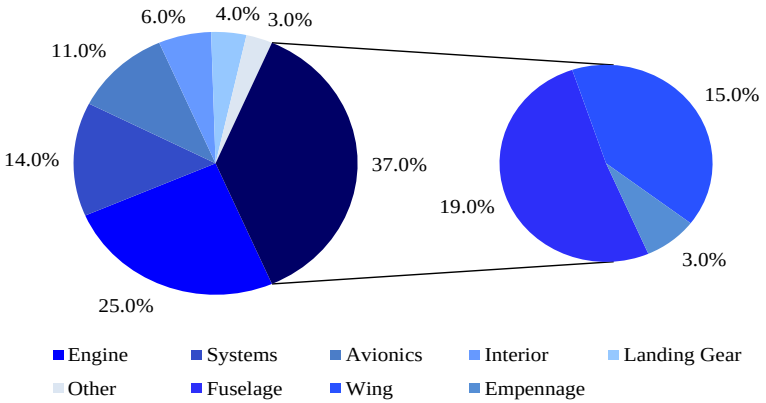
Business Dynamics

Supply Chain Components

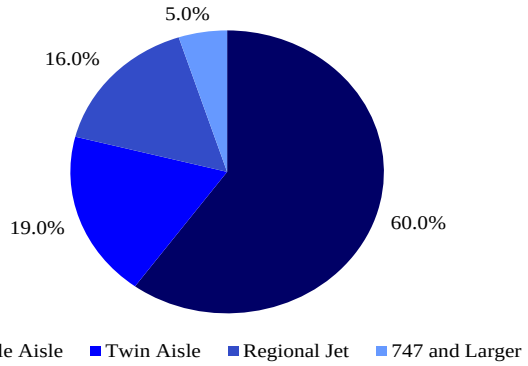
Airframe Primes [1]

- Assemble large aircraft and are also involved in manufacturing of fuselage (body), wings and empennage (tail) representing 35.0-40.0% of the total manufacturing cost
- Outsources 60.0-65.0% of the plane value resulting in the proliferation of aerospace component industry
- Most critical component of the value chain characterized by stiff entry barriers due to high cost and technological requirements
- An aircraft takes 8-15 months to build, therefore aircraft primes locks most of its cost through long-term contracts with the suppliers
- Aircrafts are classified as Single-Engine, Twin-Engine, Very Large Aircraft (VLA); further they can be classified by range & seating capacity
- Competitive players include Boeing, Airbus, Bombardier & Embraer

Cost structure of a Commercial Airliner [1]



Current Civil Fleet by Aircraft Type [1]



Long term contracts with supplier bode well for Airframe primes

(1) Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.

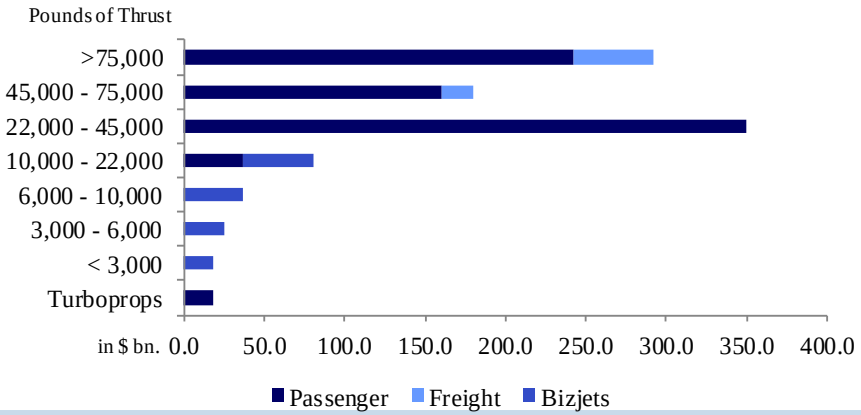
Business Dynamics

Supply Chain Components

Tier 1 - Aircraft Engine Primes (1)

- Global engine demand is estimated at 149k; to be delivered from 20XX-20XX, worth ~$975.0 bn
- Accounts for approximately 25.0% of the cost of a commercial airliner
- Engines are rated by the amount of thrust they can deliver and the future engines are expected to generate thrust of more than 22K pounds
- JV's/Alliances have increased to capitalize on the demand from emerging market and to leverage common platform
- The major aero engine suppliers include General Electric, Pratt & Whitney and Rolls-Royce

Engine delivery value (20XX-20XX) (2)



Aircraft Engine Manufacturers

Alliances	Companies	% Stake
The Engine Alliance	GE Aviation	50.0%
	Pratt & Whitney	50.0%
CFM	GE Aviation	50.0%
	Snecma Moteurs	50.0%
International Aero Engines	Rolls-Royce	32.5%
	Pratt & Whitney	32.5%
	Japanese Aero Engines Corporation	23.0%
	MTU Aero Engines	12.0%
PowerJet	NPO Saturn JSC	50.0%
	Snecma Moteurs	50.0%

Engine manufacturers form JVs to capture the opportunities from emerging markets

(1) Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.
(2) Market Outlook – Rolls Royce.

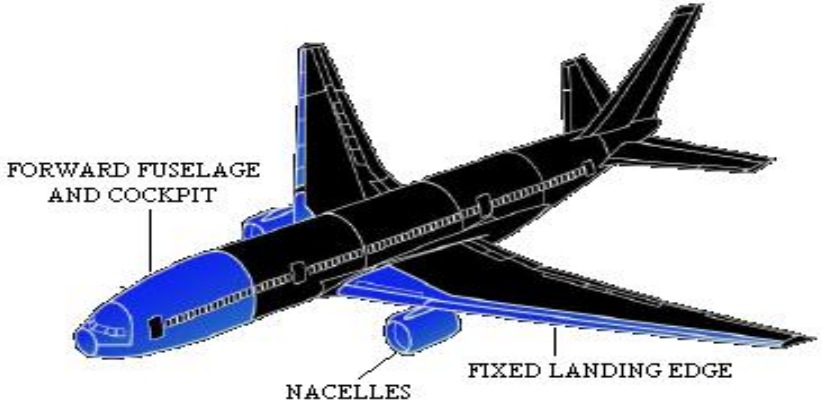
Business Dynamics

Supply Chain Components

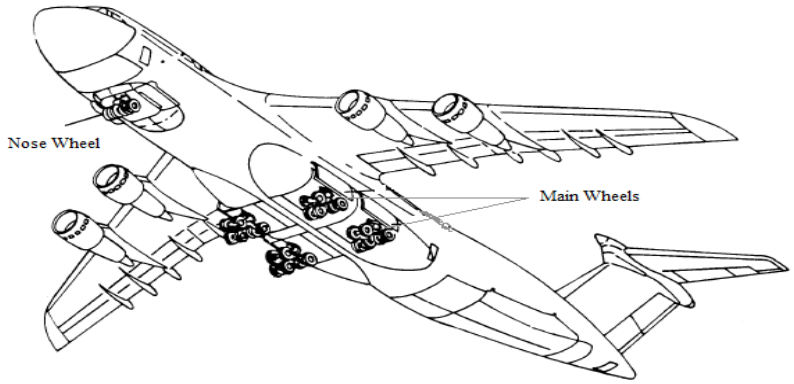
Tier 1 - Aerostructures, Nacelles and Gears

- Aerostructures are used to provide stability and aero-dynamicity, includes all or part of the fuselage, wings and flight control surfaces
- Spirit is the largest aerostructure manufacturer with ~16.0% market share of $40.0 bn
- Nacelle is an aerodynamic structure around engine, containing nozzle and thrust reverser
- Independent nacelle suppliers include Goodrich, Spirit, Aircelle and GKN
- Landing gear constitutes 4.0% of the plane value with the market dominated by Safran and Goodrich
- Large jet aircraft have one nose gear to allow the aircraft to maneuver while on the ground; with two wheel set at the back to absorb shock while landing

Aerostructures and Nacelles (1)



Landing Gear(1)



Aerostructures are built to have high strength to weight ratio, with low drag

(1) *Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.*

Business Dynamics

Supply Chain Components

Tier 2 - Tires and Brakes (1)

- Aircraft tires are filled with nitrogen as they expand/contract less at extreme temperatures
- Single-aisle aircraft use steel disc brakes, while larger, twin-aisle aircraft use carbon brakes as they have more stopping power
- Major manufacturers include Goodrich, Messier Dowty, Honeywell and K&F

Tier 2 - Avionics (Aviation Electronics)

- Includes radios, navigation equipment, sensors, processors, and electronic displays
- Avionics are different from electronics as they operate under extreme temperatures
- Avionics has moved towards integrated system or “glass cockpit”, which displays wide range of operating data on a single main screen

Tier 2 - Hydraulic System (1)

- Hydraulic servo-valves are used to manipulate primary and secondary flight control, landing gear, and steering system
- It is also used to provide additional power
- Recently the hydraulic systems are being replaced by digital system as they are:
  - Much lighter than hydraulic system, hence fuel efficient
  - Less susceptible to mechanic failure
  - Requires less physical maintenance
  - Can relay positioning feedback information to pilot
- Airbus pioneered the use of digital control and uses this system on all of its aircraft models, except for the A300 and A310

Hydraulic systems are replaced by more precise electrical systems

(1) Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.

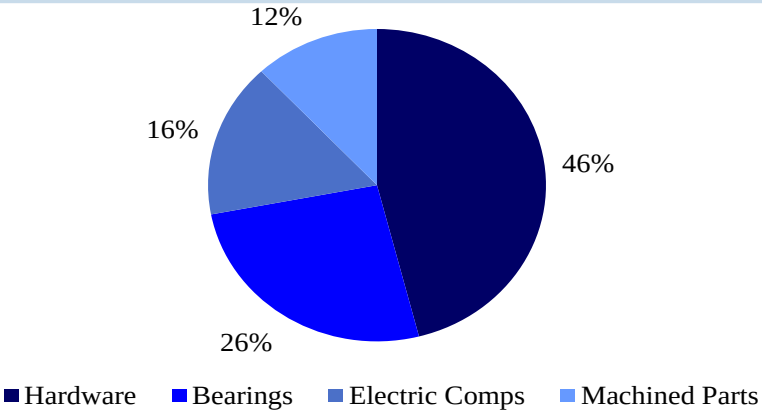
Business Dynamics

Supply Chain Components

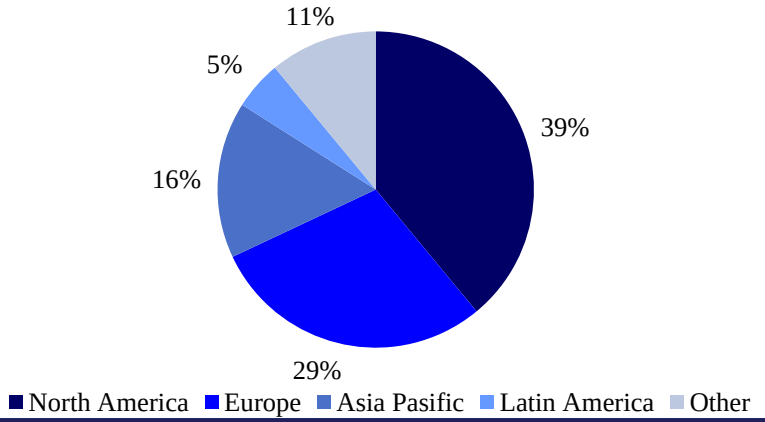
Tier 3 - Industry Characteristics (1)

- Includes hardware, bearing, electrical component and machined part
- Total addressable market of $6.5 bn with 69.0% sold to OEMs/subcontractors and the remaining to airlines and aftermarket MRO
- North America and Europe constitutes ~68.0% of the market
- Sales channel weighted towards distribution (~64.0%)
- Distribution market relatively consolidated (especially hardware) with the top four companies constituting ~50.0% of the market
- Commercial Aerospace controls 56.0% of the market with the remaining contributed by defense
- Key Players – B/E Aerospace, Wesco, Precision Castparts

Product Mix (2)



Geographic Segmentation (2)



Large and fragmented addressable market

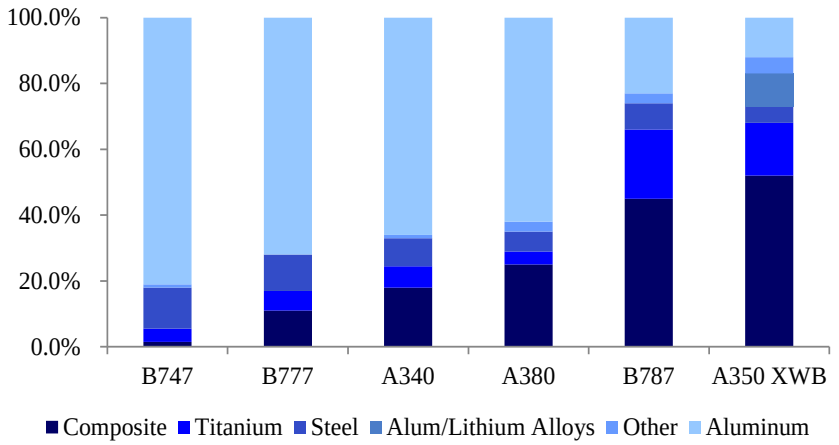
(1) Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.
(2) Wesco Aircraft Initiating Coverage by Citigroup.

Business Dynamics

Supply Chain Components

Materials

- Aluminum and aluminum alloys are the principal structural material used in aircraft as they have good strength-to-weight and stiffness characteristics, provides good corrosion resistance and is relatively inexpensive
- Titanium is 60.0% heavier and 10.0x costlier than aluminum but is twice as strong and has higher melting point, hence used in structures surrounding hot areas



Composites - Niche Focus (1)

- Unlike aluminum, composites are ~25.0% lighter with higher strength-to-weight ratio and can be made available in complex shapes associated with modern aircraft
- Estimated demand for composite engine structures to grow at CAGR of 7.0%, reaching a high of 1,324.5 MT in 20XX; representing market value of ~$800.0 mn
- Relative to traditional materials, composites are expensive; costs expected to decline significantly through the automation of manufacturing processes going forward
- Major players comprise of Hexcel, Amoco, Toray & Toho

Usage of composite is increasing significantly over traditional materials like aluminum & steel

(1) *Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch.*

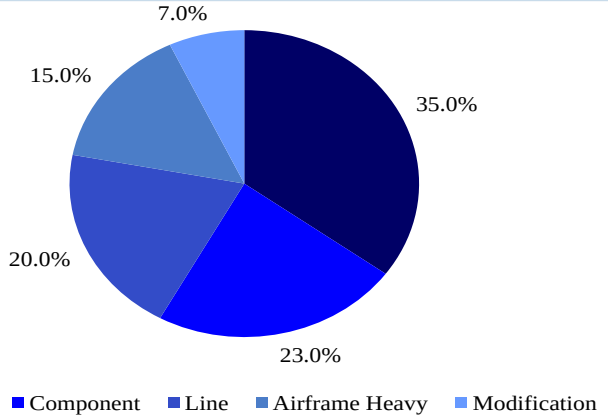
Business Dynamics

Supply Chain Components

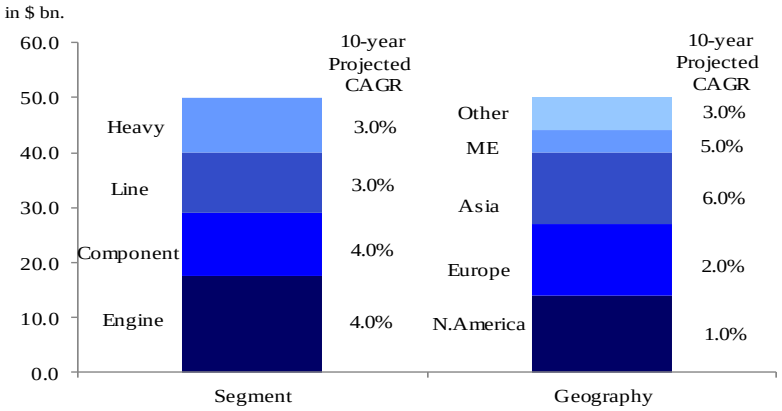
MRO (1)(2)

- Global MRO market valued at $45.7 bn (20XX) consists primarily of airframe maintenance, engine and component work as well as line maintenance
  - Global MRO industry is expected to reach $50.0 bn by 2015, implying a 20XX-20XX CAGR of 3.5%
- Key revenue from MRO is derived from engine maintenance (43%), followed by heavy maintenance visits and modifications (21%)
- Emerging markets to dominate MRO sector with India and China growing at ~9.5% over 20XX-20XX
- Major players include Triumph Group, Helico, and AAR

Breakout of MRO market (1)



Market Overview (2)



North American market to experience 1.0% growth against a global CAGR of ~4.0%

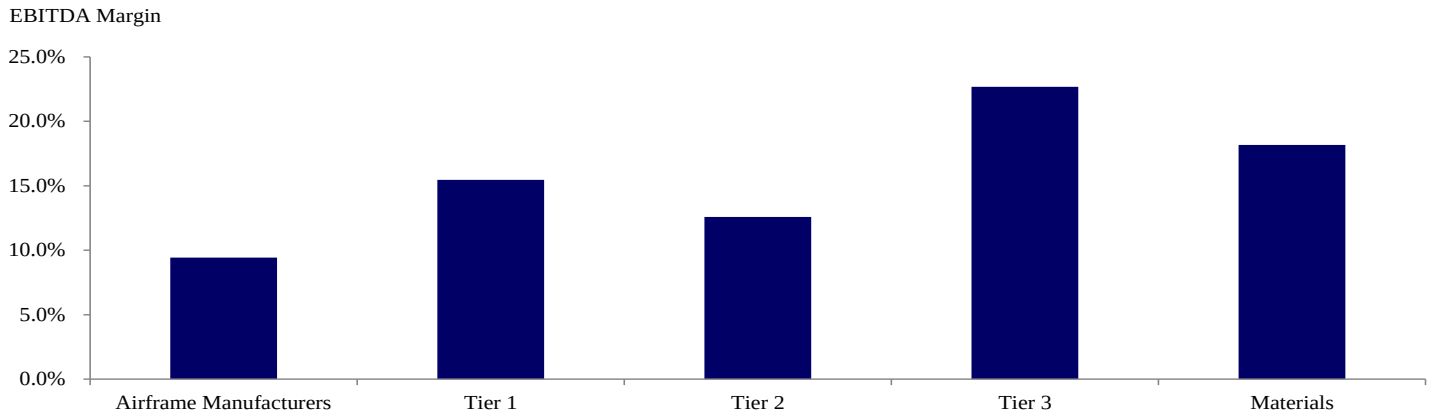
(1) *Commercial Aerospace: Industry Overview by Bank of America Merrill Lynch; Aerospace Global Report 20XX.*
(2) *Commercial Services Report by AAR.*

5. Key Performance Metrics

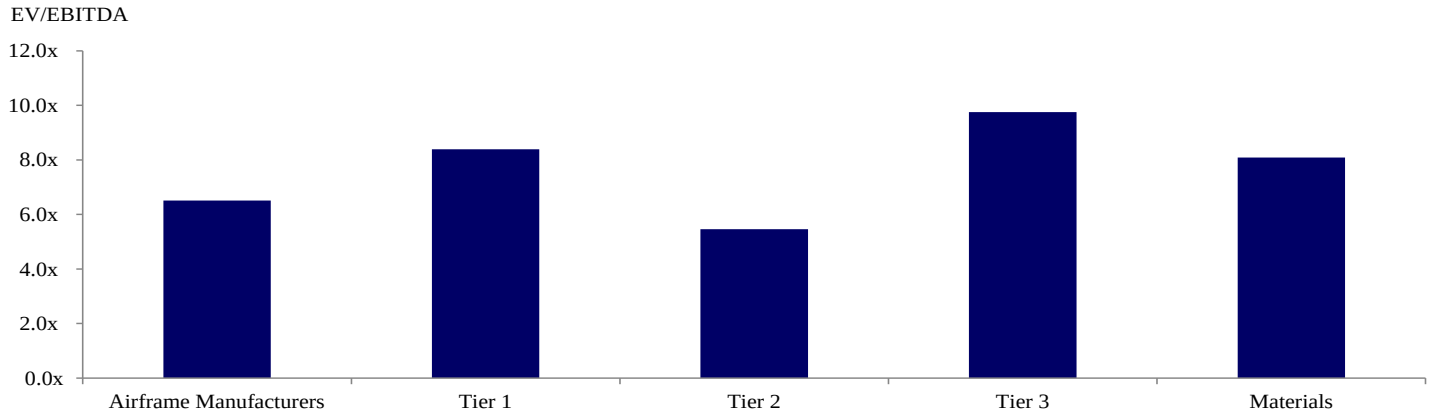
Key Performance Metrics

Value Chain Comparison

LTM EBITDA Margin



LTM EV/EBITDA Multiple



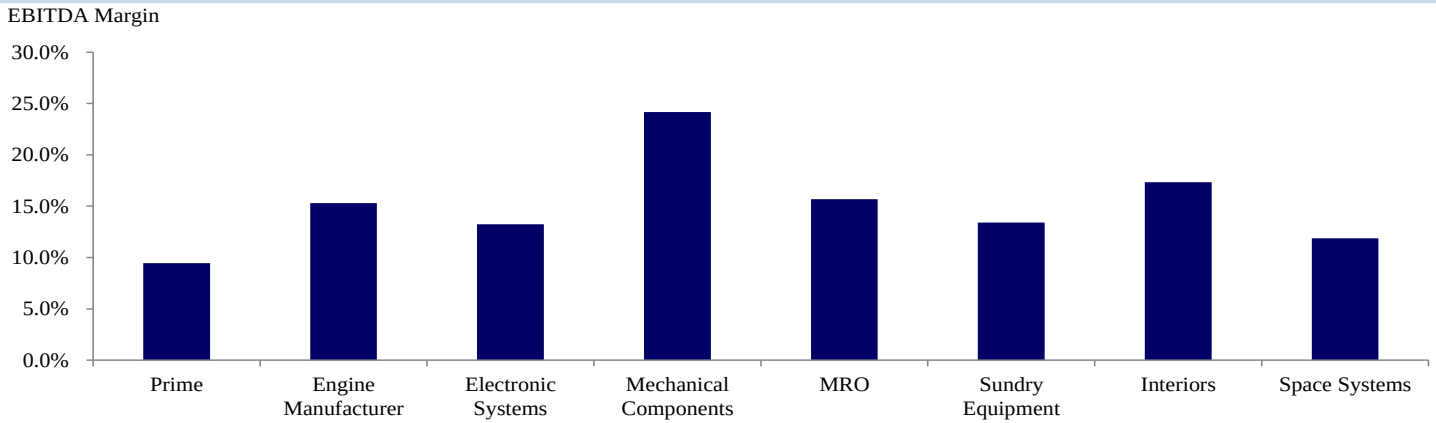
Tier 3 trades at a premium on account of higher EBITDA Margin

*(1)**Airframe Manufacturers** - BA US, AM FP, BBD/B CN, TXT US, UNAC RM, UUAZ RM, IRKT RM, RTVL RU; **Tier 1** - UTX US, GR US, SAF FP, MTX GR, SPR US, FNC IM; **Tier 2** - LMT US, RTN US, NOC US, LLL US, HO FP, ZC FP, TDY US, ESL US, MOG/A US, SAABB SS, XLS US, ULE LN, CW US, MANT US, GY US, MAL CN, LAT FP; **Tier 3** - PCP US, COL US, TDG US, MGGT LN, BEAV US, COB LN, TGI US, HEI US, SNR LN, ROLL US, AIR US, ATRO US, HRX CN, LMIA US, SIF US, DCO US; **Materials** - HXL US, CRDN US, UMC LN, AVON LN.*
(2)Enterprise Value calculation as of July 20XX

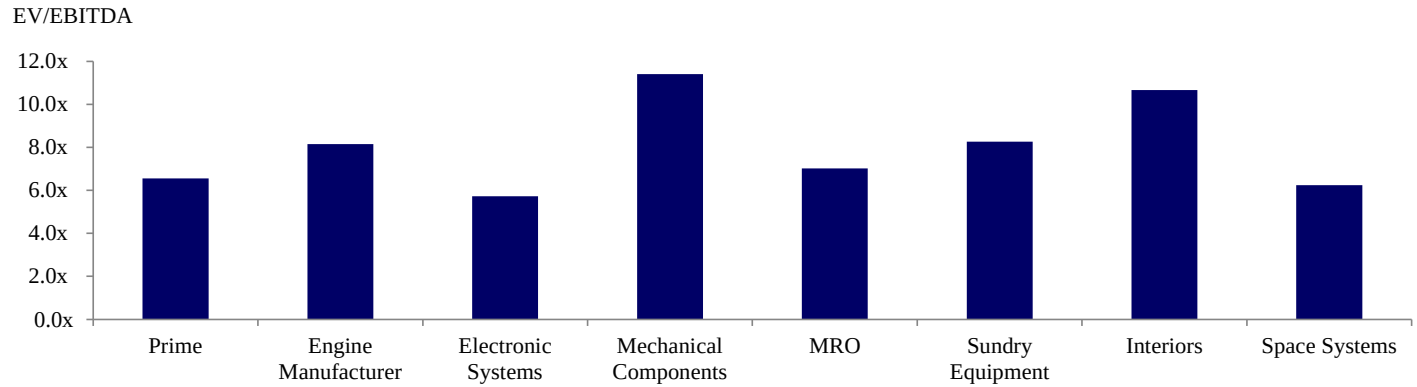
Key Performance Metrics

Category Comparison

LTM EBITDA Margin



LTM EV/EBITDA Multiple



Mechanical Component manufactures have the highest EBITDA margin

__Prime__ -BA US, EAD FP, AM FP, BBD/B CN, TXT US, SPR US, UNAC RM, UUAZ RM, IRKT RM, RTVL RU; __Engine Manufacturer__ - UTX US, RR/ LN, SAF FP, MTX GR; __Electronic Systems__ - LMT US, RTN US, NOC US, LLL US, COL US, HO FP , ZC FP, MGGT LN, COB LN, TDY US, FNC IM, ESL US, MOG/A US, SAABB SS, XLS US, ULE LN, CUB US, MANT US, ATRO US; __Mechanical Components__ - PCP US, GR US, TDG US, SNR LN, ROLL US, LMIA US, LAT FP; MRO - TGI US, HEI US, AIR US, HRX CN, MAL CN; __Sundry Equipment__ - SIF US; __Interiors__ - BEAV US, DCO US; __Space Systems__ - CW US, GY US

Enterprise Value calculation as of July 20XX

Key Performance Metrics

Recent Deals

Precedence Transaction Comparable

Announced Date	Target	Acquirer	Enterprise Value (in USD)	Enterprise Value / Revenue	Enterprise Value / EBITDA
	Composite Engineering Inc	Kratos Defense & Security Solutions Inc	155.0	1.65x	9.7x
	AMSAFE Global Holdings Inc	TransDigm Group Inc	750.0	2.88x	NA
	Force Protection Inc	General Dynamics Corp	237.9	0.41x	12.5x
	Vangent Holding Corp	General Dynamics Corp	960.0	1.37x	NA
	Schneller Holdings LLC	TransDigm Group Inc	288.5	3.43x	NA
	Sensis Corp	Saab AB	155.0	1.19x	NA
	Integral Systems Inc/MD	Kratos Defense & Security Solutions Inc	291.2	1.47x	NM
	Souriau	Esterline Technologies Corp	589.5	2.91x	NA
	Ansaldo Energia SpA	First Reserve Corp	1,772.7	1.02x	NA
	Herley Industries Inc	Kratos Defense & Security Solutions Inc	262.2	1.36x	8.1x
	Pacific Scientific Aerospace	Meggitt PLC	685.0	1.81x	8.7x
	Norkom Group PLC	BAE Systems PLC	165.6	2.47x	13.8x
	Dalsa Corp	Teledyne Technologies Inc	330.4	1.56x	8.6x
	ETI A/S	BAE Systems PLC	210.7	3.22x	NA
	Raytheon Applied Signal Technology Inc	Raytheon Co	457.6	2.03x	15.7x
	Abraxas Corp	Cubic Corp	124.0	2.07x	NA
	Enterprise Integration Group Business	Veritas Capital	815.0	1.30x	NA
	Argon ST Inc	Boeing Co/The	707.8	2.28x	41.0x
	Babcock Southern Holdings Ltd	Babcock International Group PLC	2,485.4	1.31x	14.7x
	Vought Aircraft Industries Inc	Triumph Group Inc	1,440.0	0.74x	6.2x
	Saab AB	Investor AB	1,460.6	0.43x	3.7x
	ODIM ASA	Rolls-Royce Holdings PLC	243.0	0.71x	6.7x
	Gichner Holdings Inc	Kratos Defense & Security Solutions Inc	133.0	0.90x	NA

Tier 3 dominates the deal activity with average EV/Revenue of 2.31 x

(1) Source: Bloomberg and press Release.
(2) Deals as of June 20XX.

6. Recent Trends

Recent Trends

Key Trends

Strategic Trends

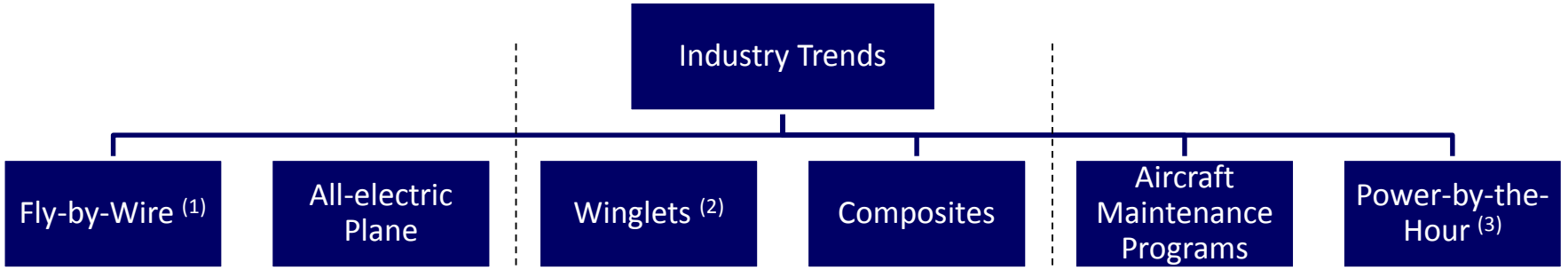
- **Performance-based contracts gain popularity**
  - With the decreased use of cost-reimbursable contracts by the U.S. government, companies are becoming more adept at utilizing and managing fixed price (performance-based contracts)
  - GE, Rolls Royce, and Pratt & Whitney are leaders of performance-based logistics services, utilizing accurate forecast models, and proactive real-time performance data to anticipate and prevent service interruptions
- **Risk sharing**
  - The aerospace industry is moving towards greater dependence on Tier 1s, reducing the number of suppliers and increased risk sharing by suppliers
  - For instance, Embraer had ~350 suppliers for their EMB145 aircraft including four risk sharing suppliers, which came down to 38 suppliers for EMB170/190 aircraft, with 16 risk sharing suppliers
- **Globalization of aerospace manufacturing**
  - Cost reduction, ability to focus on core business, and increased speed to market are the main factors driving the globalization/outsourcing in aerospace manufacturing
  - OEM integrators such as Airbus and Boeing are shifting their production to low cost China, India, Malaysia, Singapore and other Asian countries achieving 20.0-30.0% cost savings

Focus on efficiency leads to performance based contracts, risk sharing and outsourcing

Recent Trends

Technical Trends

Manufacturing and Service Trends



- Manual Flight Controls are Replaced by an Electronic Interface
- Reduces Weight
- Minimizes Human Error

- Improves Efficiency
- Reduces Fuel-Costs
- Improves Aerodynamicity

- Fixed-Fee Maintenance
- Provides Accurate Cost Projections
- Reduces Breakdown Costs

Increasing Fuel-Efficiency & Cost-Savings are driving the industry trends

(1) Fly-by-Wire: A system that replaces the conventional manual flight controls of an aircraft with an electronic interface
(2) Winglets are the near-vertical extensions of the wing tips, intended to improve the efficiency of the aircraft
(3) Power-by-the-Hour: A fixed-fee maintenance program which provides the operator with a fixed engine maintenance cost over an extended period of time

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