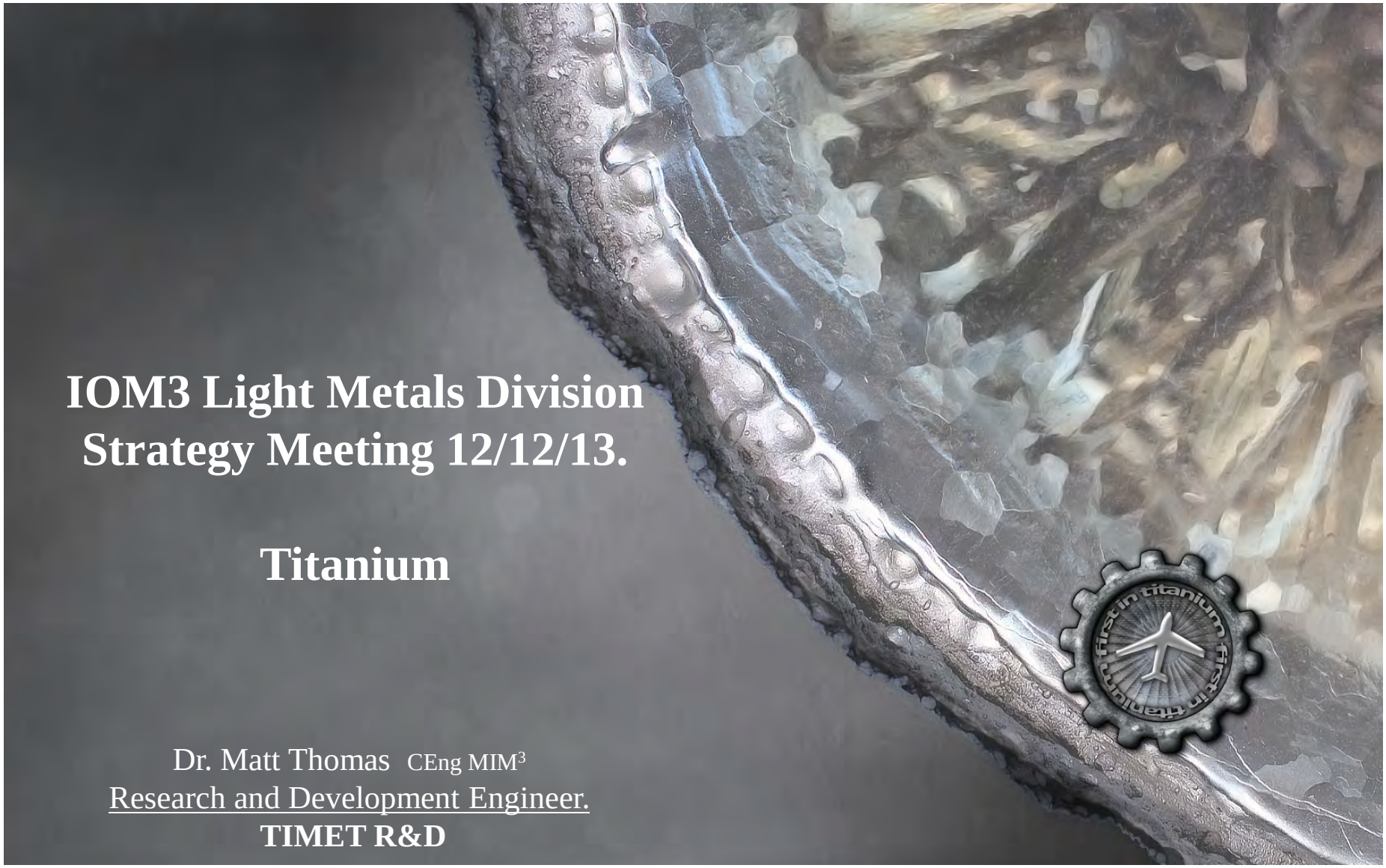


IOM3 Light Metals Division Strategy Meeting 12/12/13.

Titanium

Dr. Matt Thomas CEng MIM^3
Research and Development Engineer.
TIMET R&D

Introduction

Who are TIMET?

TIMET is the worlds leading manufacturer of titanium metal products. As a fully integrated titanium manufacturer and distributor, TIMET's activities span every phase of titanium research, manufacturing, sales and distribution.

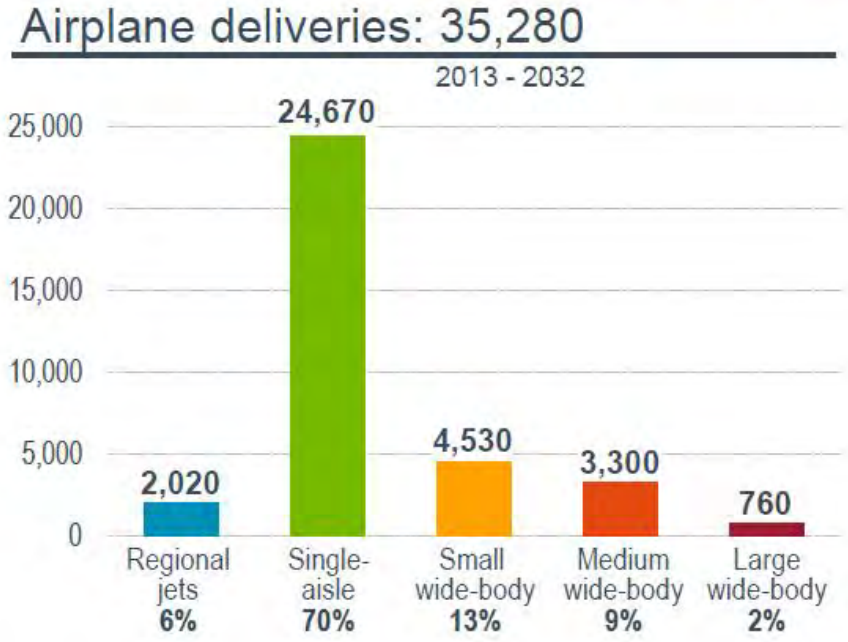
TIMET began in 1950 and was the first company specifically founded to produce titanium metal.

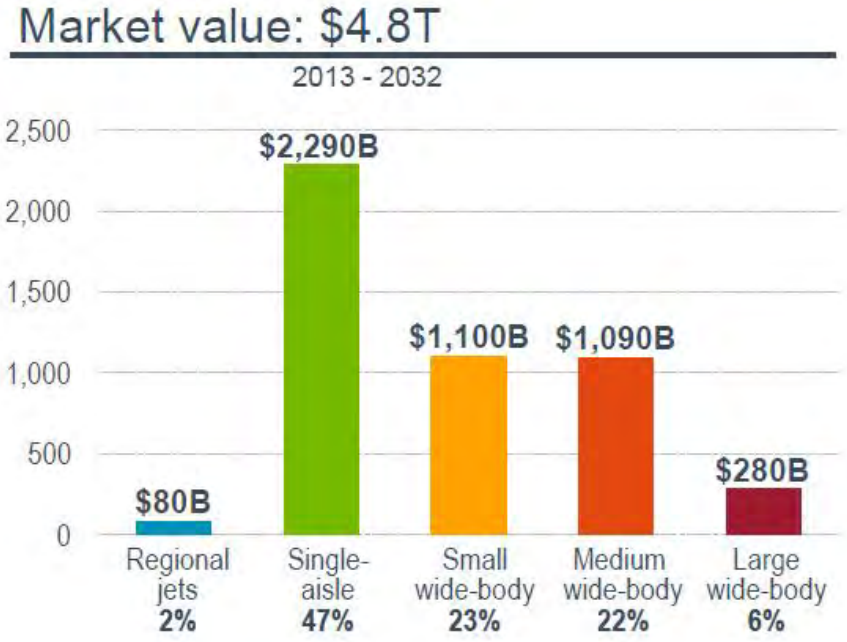
TIMET has manufacturing capabilities both in the United States and in Europe as well as sales offices and services centres selling "off the shelf " titanium inventory and offering value added services.

The Market

Recent IATA forecast states " airlines expect to see a 31% increase in passenger numbers between 2012 and 2017." Total passenger numbers will rise from 2.98 billion to 3.91 billion by 2017."

Airlines will need more than 35,000 new airplanes valued at $4.8 trillion

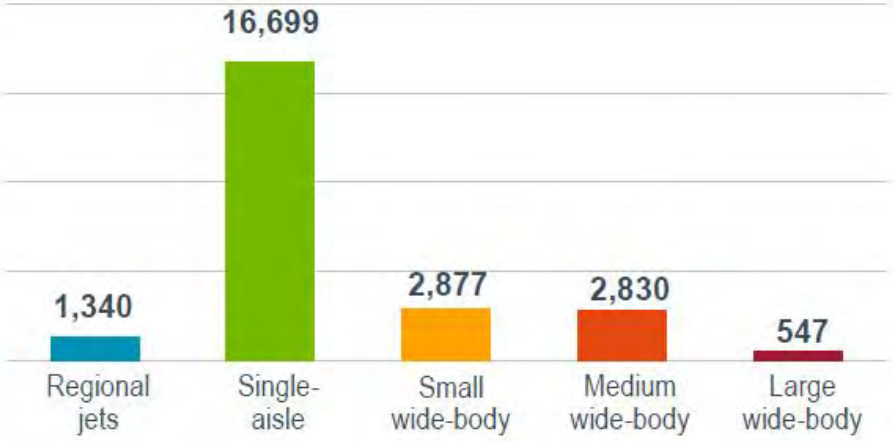




*Slides taken from ITA 2013

As well as ....

A large and valuable market … still in play



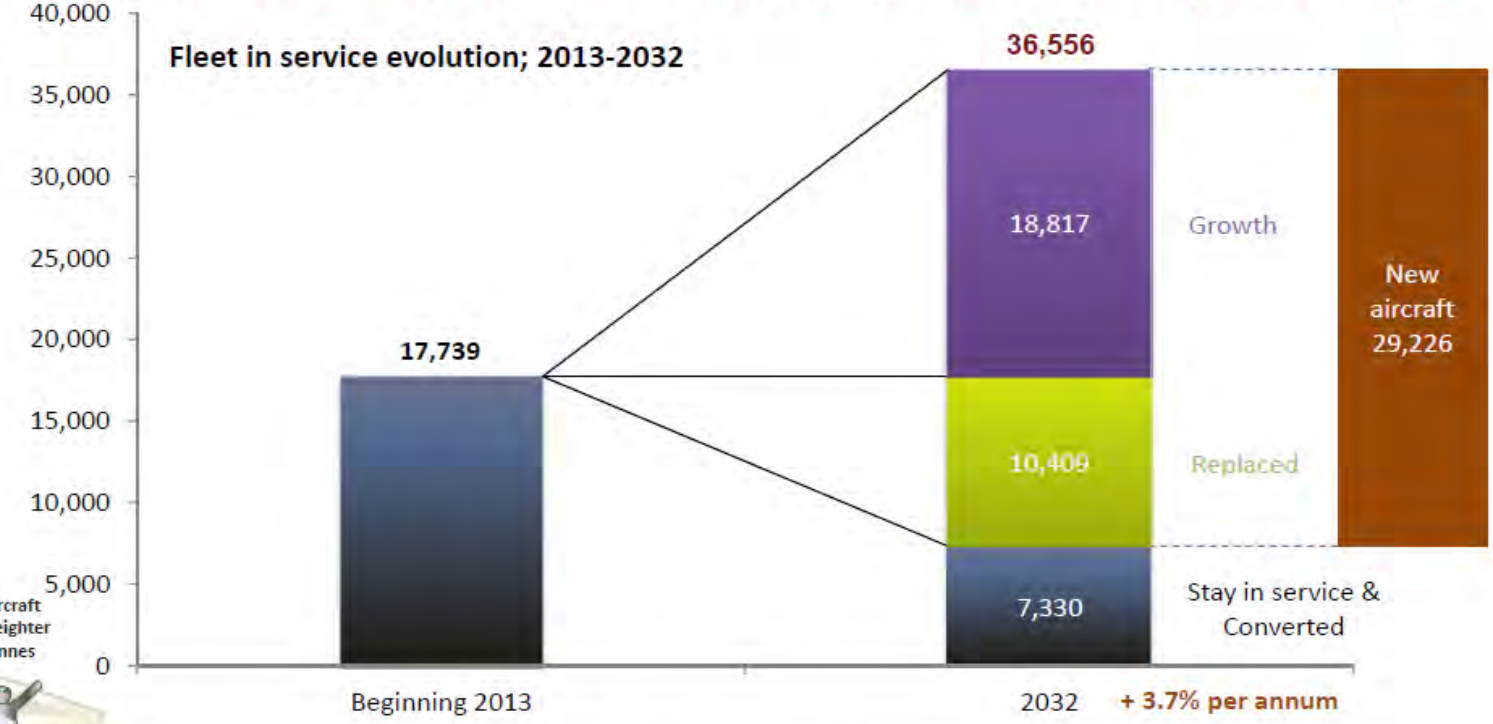
Total units: **24,300**

Total value: **$2.85T**

*Projected demand for new airplanes through 2032

*Slides taken from ITA 2013

Demand for over 29,200 new aircraft in the next 20 years 1/2



Source: Airbus
Note: Passenger aircraft ≥100 seats, Freighter aircraft ≥10 tonnes

Demand for over 29,200 new aircraft in the next 20 years 2/2

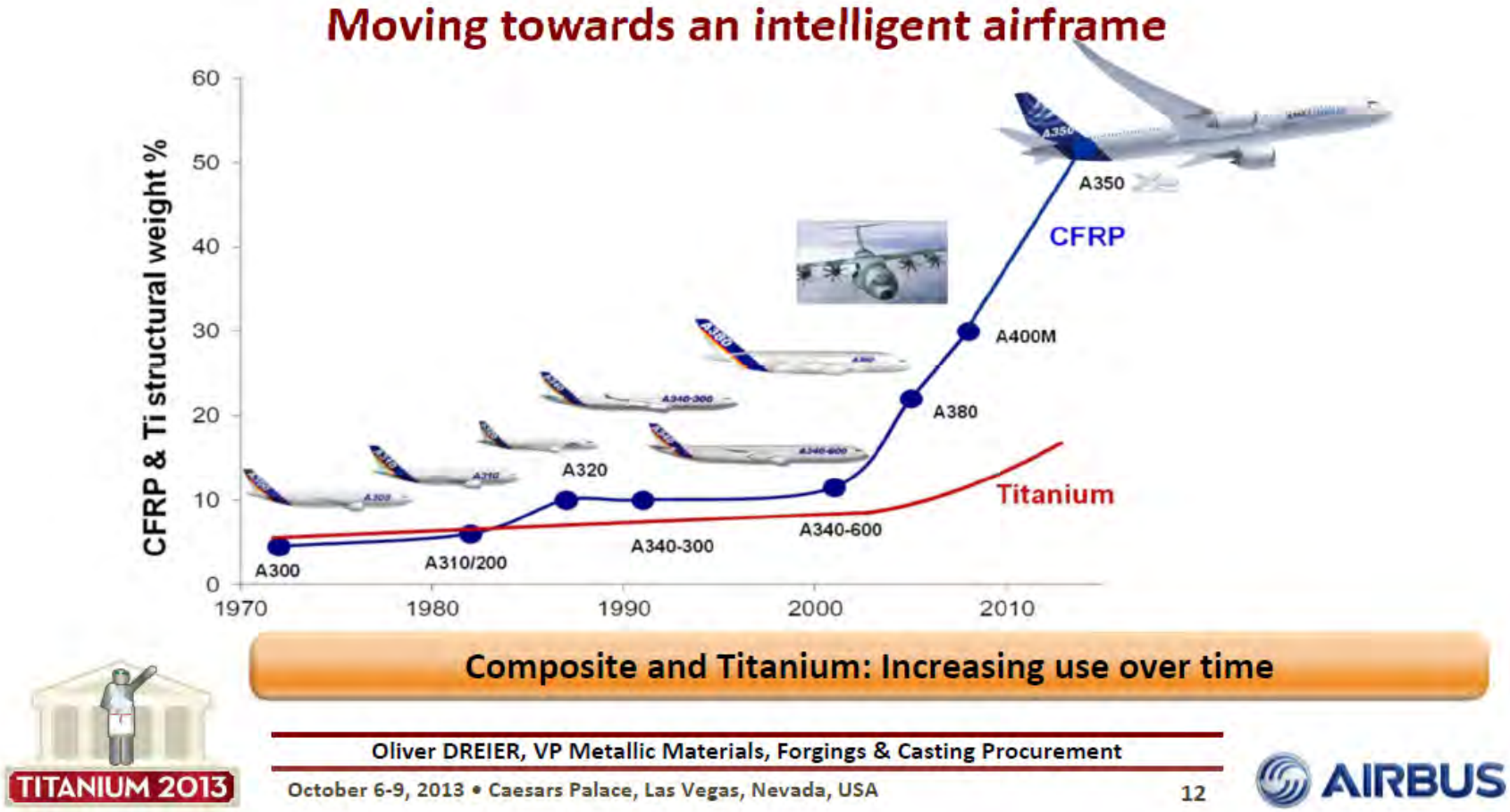
20,242 single-aisle aircraft

7,273 twin-aisle aircraft

1,711 very large aircraft

Passenger aircraft (≥ 100 seats)
Jet freight aircraft (>10 tons)

Market value of $4.4 trillion



20 years: 35,000 + 29,200 = 64,200 aircraft at approx 180tonnes (MZFW) each.
If correct and realised, ~ over 1 million tonnes of Ti in new aircraft.


Fleet Age: Future Aircraft Retirements
"Over the next 20 years, the airline industry will need 35,280 new airplanes, of which 41 percent will replace older, less efficient airplanes; nearly 59 percent of the new deliveries will reflect growth in emerging markets and evolving business models."
Boeing Current Market Outlook 2013-2032
American Airlines
44%
≥20 yrs. old
US Airways
22%
United
15%
Southwest
15%
Delta
39%
Source: April 2013 Airline Monitor

Total Commercial Airframe Titanium Demand

Mill Shipments (lbs in MMs)

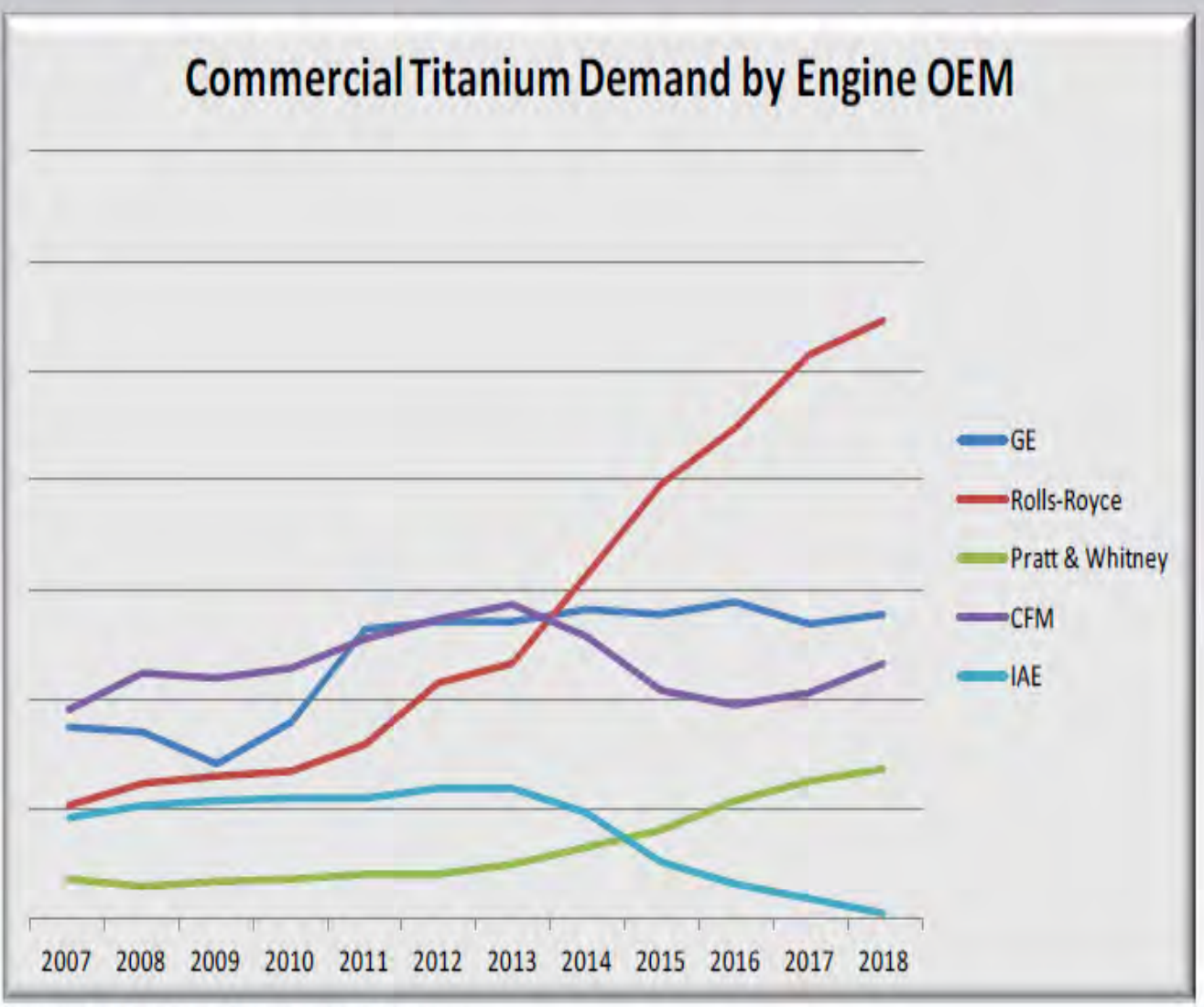
RTI Estimates

Changes in Jet Engine Design

- Limited introduction of composites
- Larger thrust engines
  - Consume more nickel-based and titanium alloys per engine
- Higher engine temperatures
  - Nickel-based alloy content in compressor growing
  - High temp powder/cast & wrought alloys
- New titanium-based materials
  - Gamma TiAl
- Additive Manufacturing

Evolutionary Change

Titanium Demand by Engine OEM

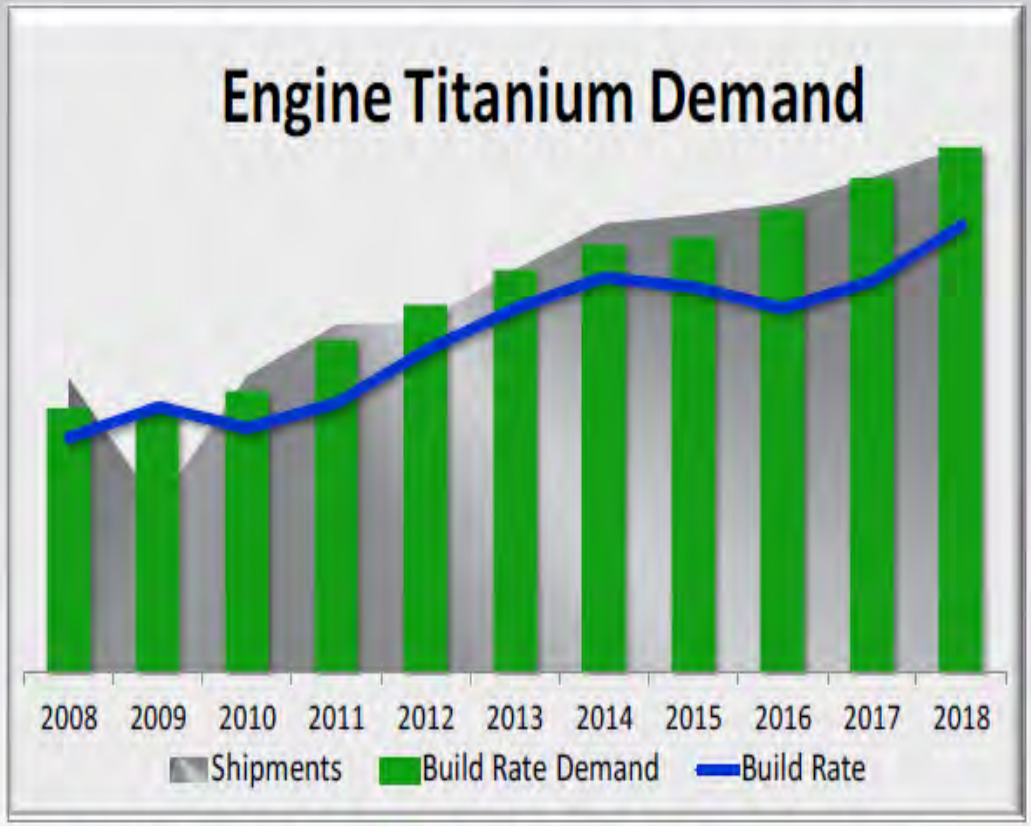


- P&W regains share at expense of IAE
- CFM impacted by NEO and MAX transition as well as fan content
- Rolls-Royce largest titanium consumer
- GE's growth dampened by fan content

Source: 2012 July Airline Monitor w/ TIMET estimate

Conclusion

- Fundamental drivers and backlogs remain strong
- Large high-bypass turbofans continue to drive titanium demand
- Near term shipments impacted by program delays and inventory management



Source: 2012 July Airline Monitor w/ TIMET estimate

Titanium Demand to Increase >40% Through 2018

UK University Developments and Capabilities