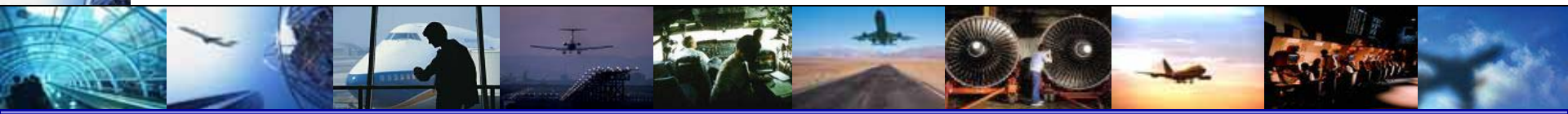
back Aviation Solutions

AVIATION DATA / ANALYSIS / CONSULTING / ASSET MANAGEMENT



Presentation To:

12th Annual Aero-Engine Cost Management Conference

4 February 2004

Presented By:

Scott Brandt, Vice President and Co-founder, BACK Aviation Solutions

State of the aero-engine manufacturing business

- Set the table for today's discussion
- How the industry for engines has changed over the last 10 years
  - Who has benefited
  - Who has lost market share
- The future of the aviation industry for engines
  - Who will benefit
  - Who will be affected the most

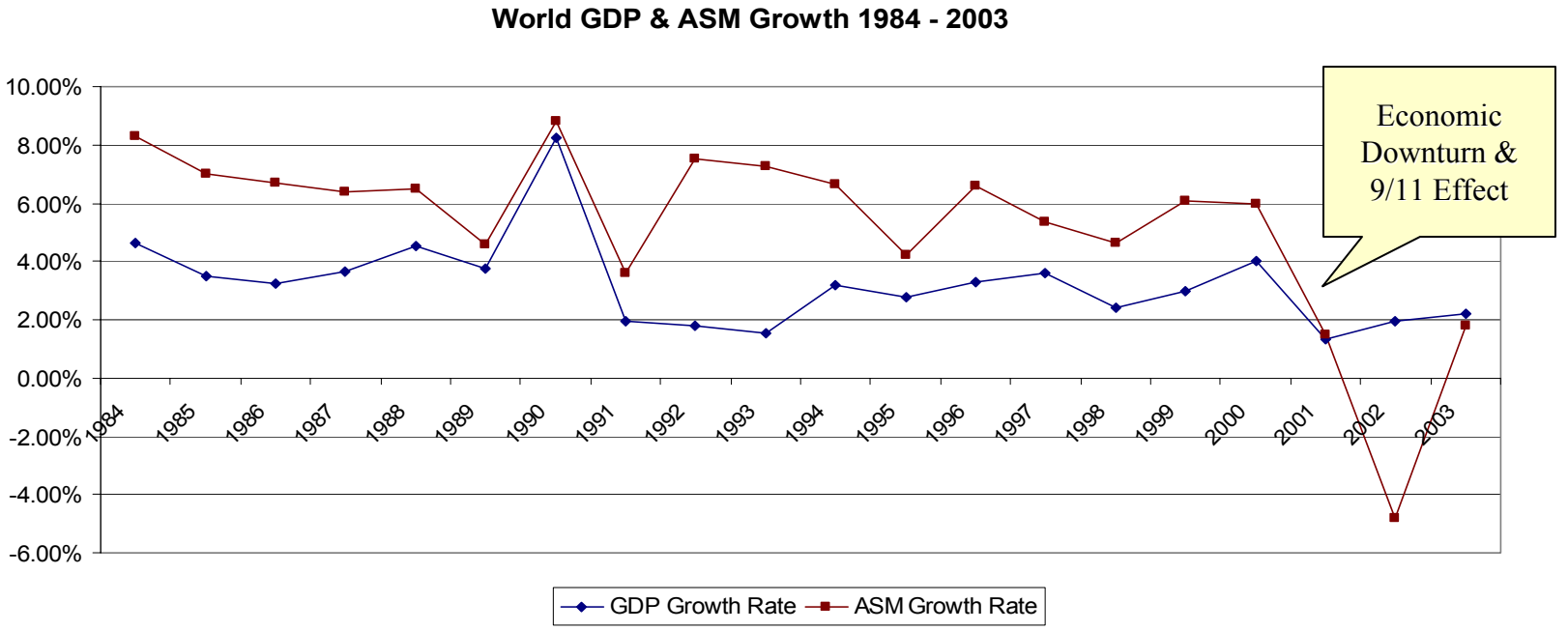
The airline industry has always been and will continue to be a cyclical business

- However, the most recent short term down cycle was the most severe in aviation history
  - North America, still the world's largest aviation market, has been impacted the most
    - Four U.S. carriers filed for bankruptcy protection (two have emerged)
    - The U.S. major airlines have over $100B of debt, with a market capitalization of only $3.7B
    - In Canada, one major airline is in bankruptcy, losing C$3M a day - burdened by some C$13B of debt
  - In Europe, the major carriers were less affected due to re-structuring and cost reduction efforts that occurred in the 1990s
    - However, the European market, is still highly fragmented (over 200 airlines, 75 of which are IATA carriers) and over capacity may be an issue in future
  - The Asia-Pacific region was the least affected prior to the SARS crisis because many of the industry problems were off-set by the significant market growth of recent years
  - Despite predictions of strong growth, the African and Latin American commercial airline industries are in danger of becoming insolvent
  - Nearly one-third of the Latin American airlines are technically bankrupt

In the last two years, the global airline industry has lost approximately 30 billion dollars

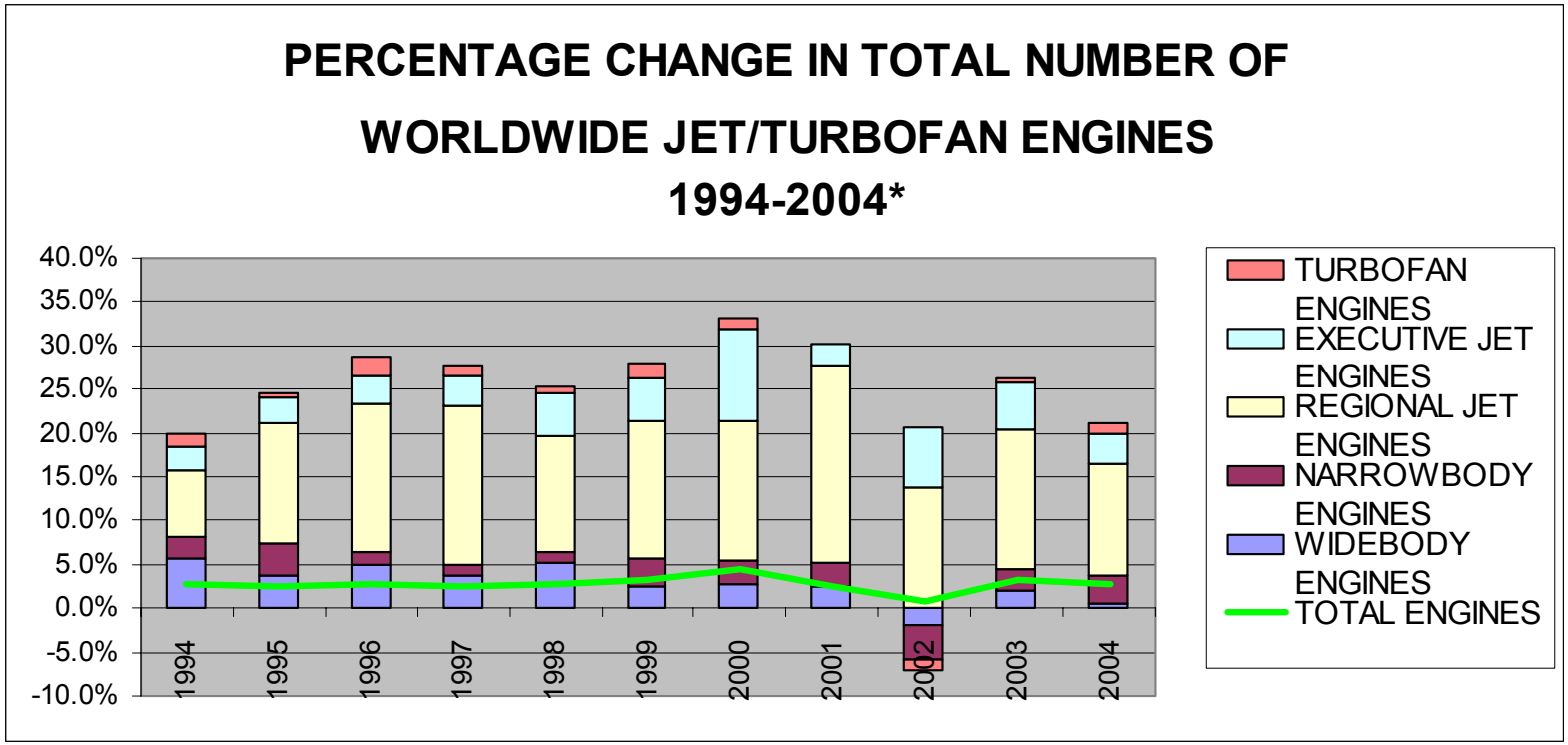
Air travel remains highly correlated to economic growth, measured as GDP, though the recent cycle appears anomalous

- The recent short term cycle began modestly in early 2001 with the bursting of the dotcom stock market "bubble" and then the normal cycle quickly became an extreme cycle after September 11th and SARS forcing negative ASM growth for the first time in aviation industry history
- However, the correlation factor, the factor by which we measure the relationship between GDP and ASMs, has always been, and continues to be, extremely high at 0.999375778



Total worldwide engine population has followed the trend in ASM growth as well

- During the last 10 years, total industry ASM growth has averaged approximately 4.5 percent per year, while the average growth in the total number of worldwide jet/turbofan engines has been 2.7 percent

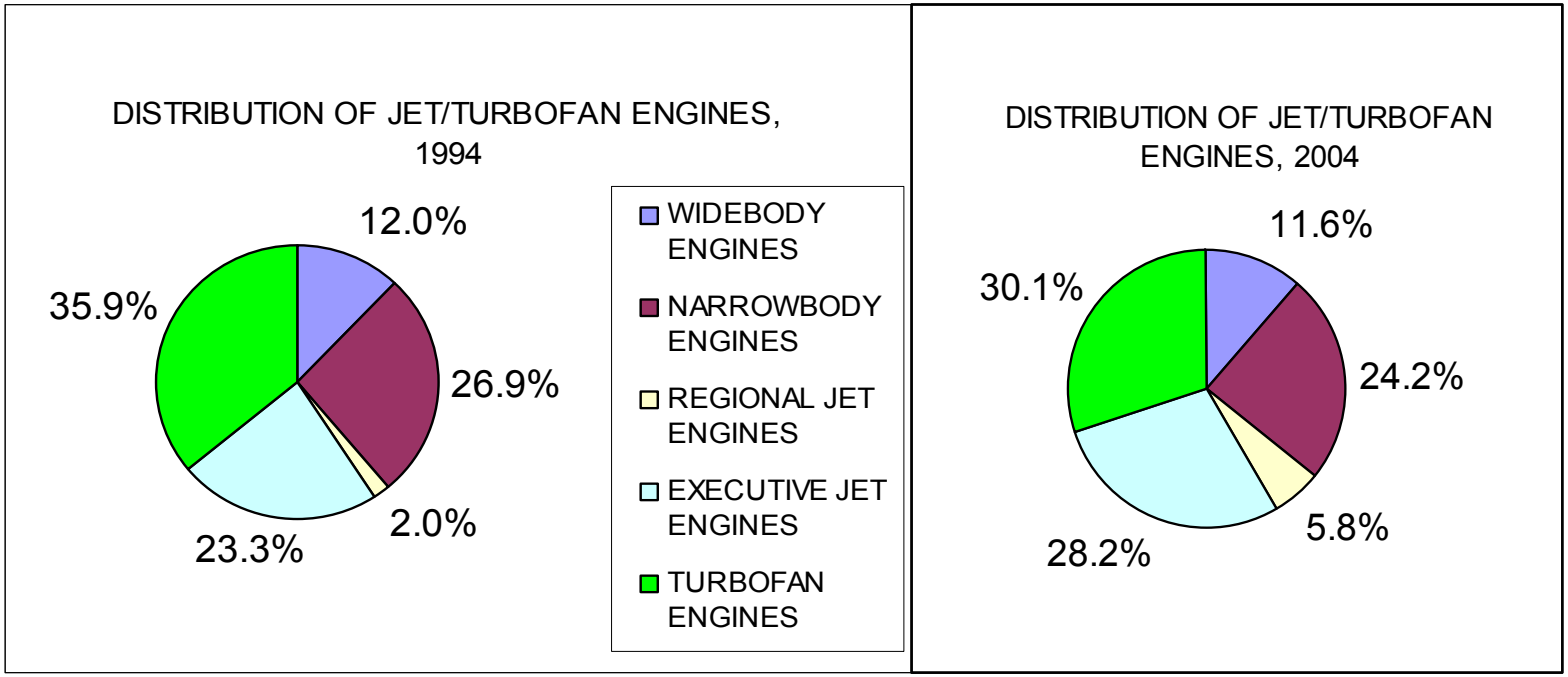


*Excludes Russian jets, and parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

Most interesting is the change in growth of regional and executive jet engines, versus traditional widebody and narrowbody engines

- Regional jet engines have increased approximately 15.1 percent per year over the last 10 years, while widebody and narrowbody engines have increased about 3.7 percent and 2.9 percent, respectively

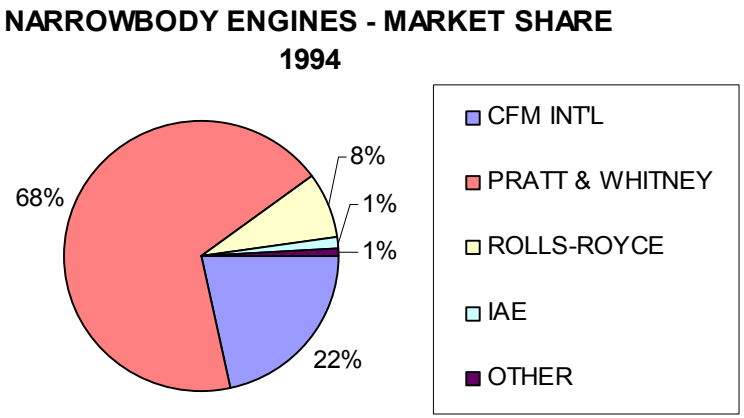


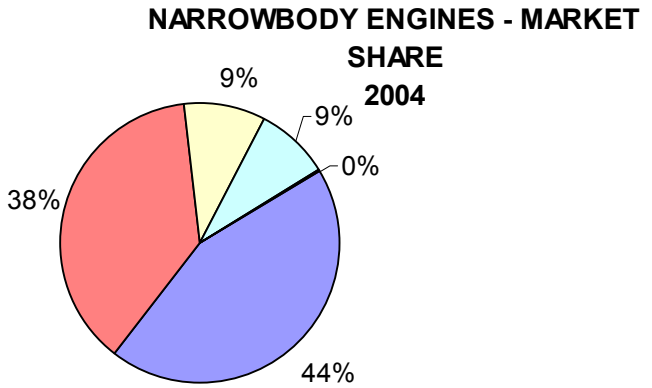
*Excludes Russian jets, and parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

For narrowbody engines, CFMI has gained a 44 percent share of the total market, double from 10 years ago

- The CFM56 engine is now the largest engine in terms of units, while the JT8D engine has fallen from 35 percent of the market to only 15 percent of the market





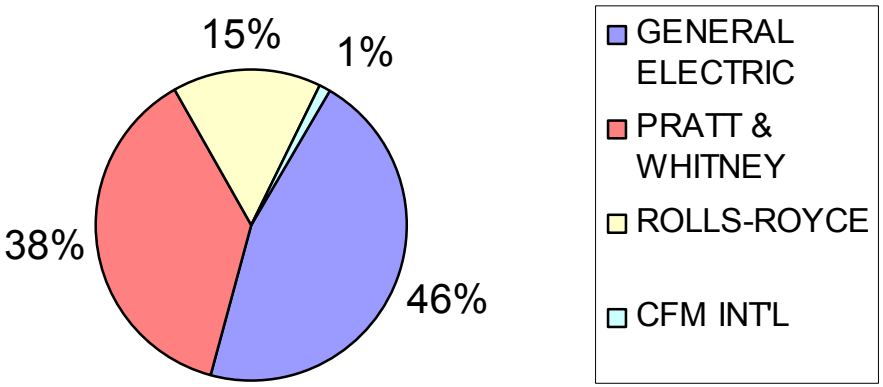
*Excludes Russian jets, and parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

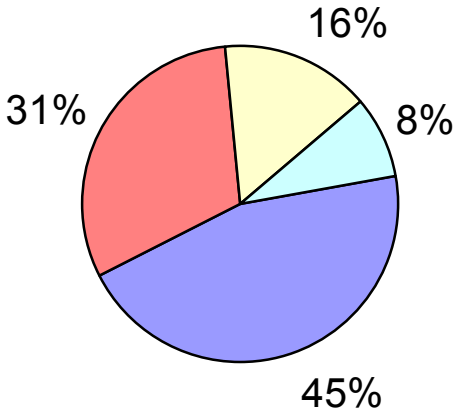
For widebody engines, GE is still the leader but CFMI has gained share at the expense of Pratt & Whitney

- The CF6 still has over 45 percent of the installed, active units in the market
- The CFM56-5C now has 8 percent of the installed, active units in the market, mainly at the expense of Pratt's JT9D, which in 1994 had over 27 percent of installed, active units, and now has less than 11 percent

WIDEBODY ENGINES - MARKET SHARE (UNITS) 1994



WIDEBODY ENGINES - MARKET SHARE (UNITS) 2004



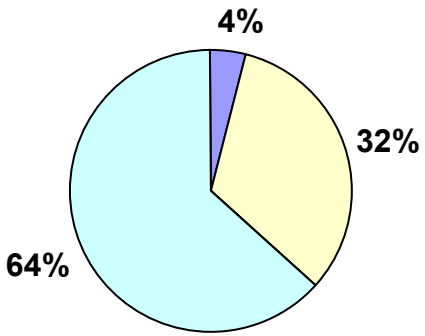
*Excludes Russian jets, and parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

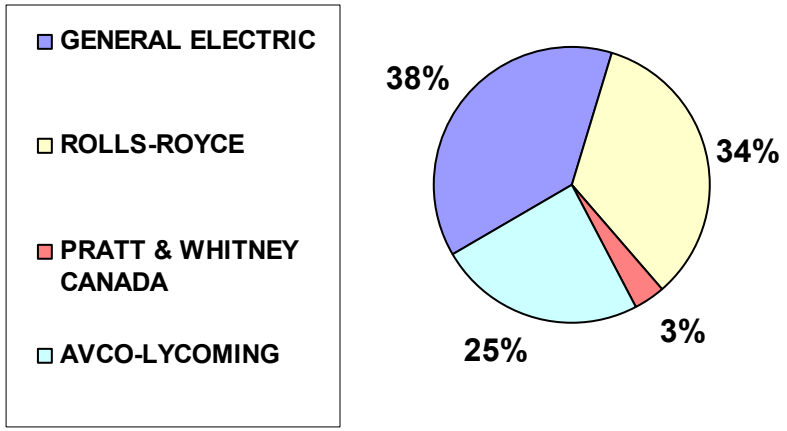
The population of regional jet engines has changed significantly with the introduction of over 1,700 wide selling CRJs and ERJs over the last 10 years

- There are now over 2,300 active regional jet aircraft worldwide, up from a little more than 400 ten years ago
- The primary beneficiary has been GE, with their CF34, and Rolls Royce, with their AE3007

REGIONAL JET ENGINES - MARKET SHARE (UNITS) 1994



REGIONAL JET ENGINES - MARKET SHARE (UNITS) 2004

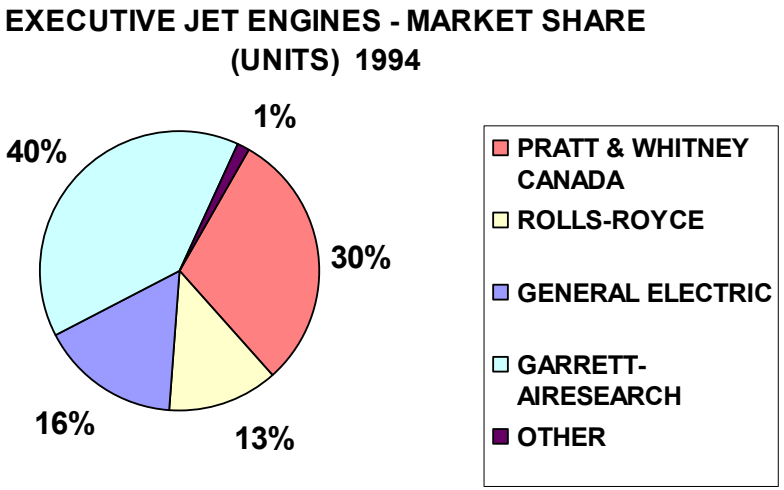


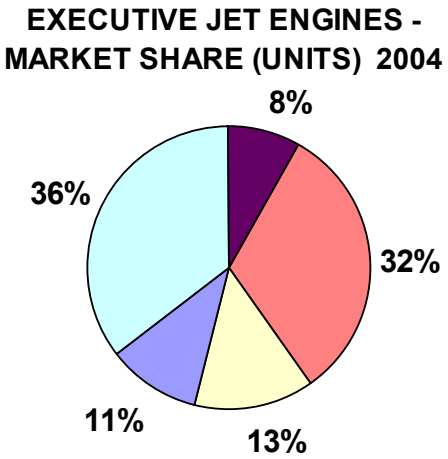
*Excludes Russian jets, and parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

Similarly, executive jet engines have benefited from the significant increase in sales of jets such as the Gulfstreams, Canadair Challenger, and Cessna Citations

- There are now over 12,000 active executive jet aircraft worldwide
- The primary beneficiary has been Garrett-Airesearch with their TFE731, GE with their CF34, Pratt & Whitney Canada with their JT15, and Williams with their FJ44



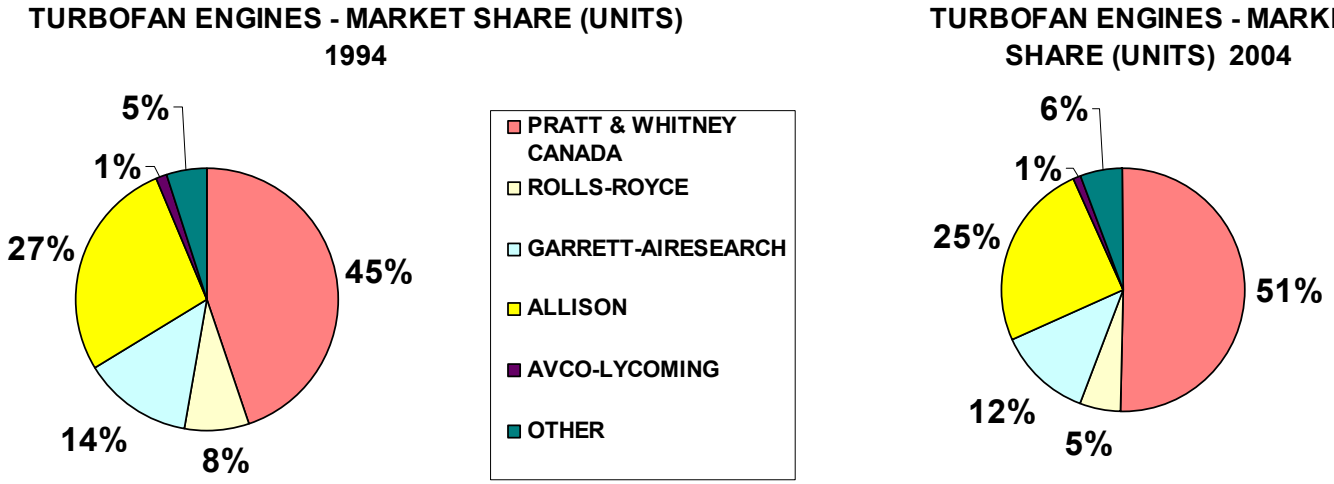


*Excludes parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

Finally, turbofan engines have seen the least growth of any engine category, due to substantial aircraft retirements and encroachment by RJs

- There are only 2,000 more active turbofan engines today (approx. 26,600) than there were 10 years ago
- Of the slow growing market, however, Pratt & Whitney Canada has been able to increase their market share to over 50 percent with their PWC100 engine

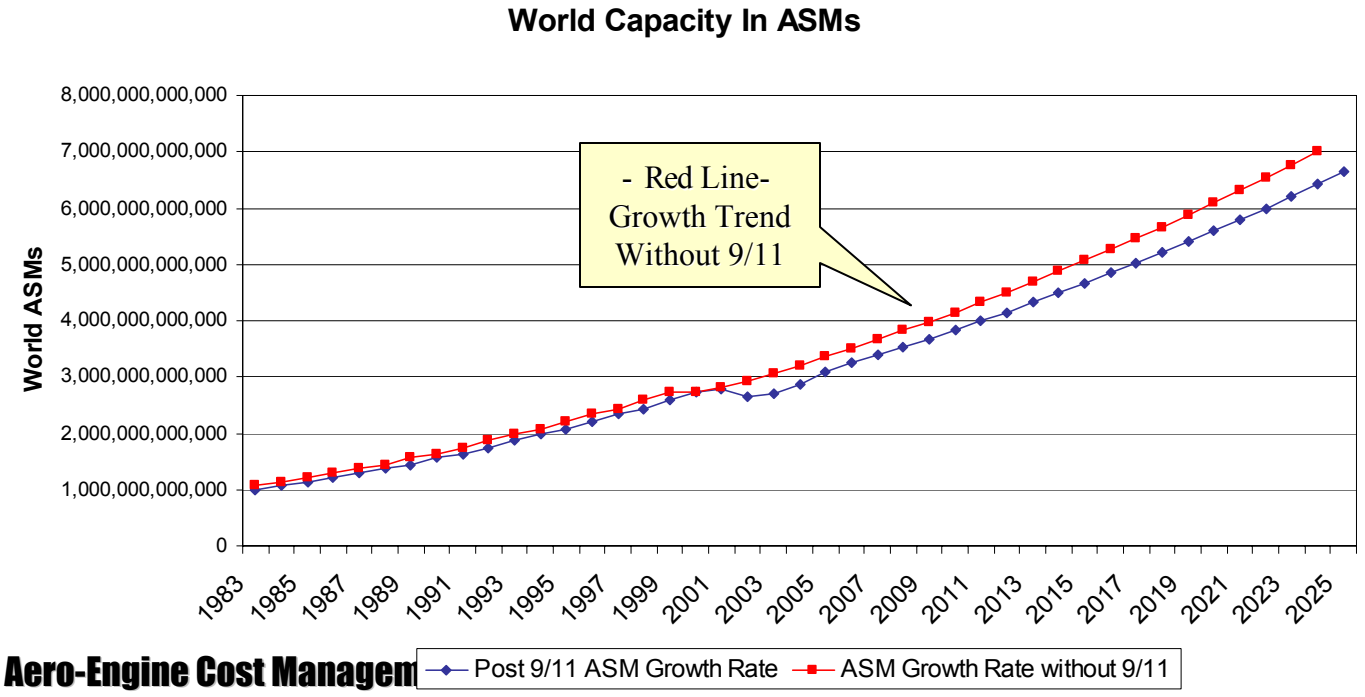


*Excludes Russian, piston, parked and retired aircraft

Source: BACK Aviation's Fleet iNet database

For the future, the good news is that the long-term forecast remains healthy

- Over time, cycles smooth out as economic growth becomes the key driver of airline traffic and capacity
- While worldwide air travel will not recover to pre-September 11, 2001 levels until later 2004 or early 2005, the long-term average growth trend will recover to a parallel trend
- Economic growth, 2004–2023
  - Major projections for the 20-year period 2004 to 2023 are as follows:
    - Worldwide economic growth (GDP) will average 3.08% per year
    - Airline capacity growth (ASM) will average 4.19% per year



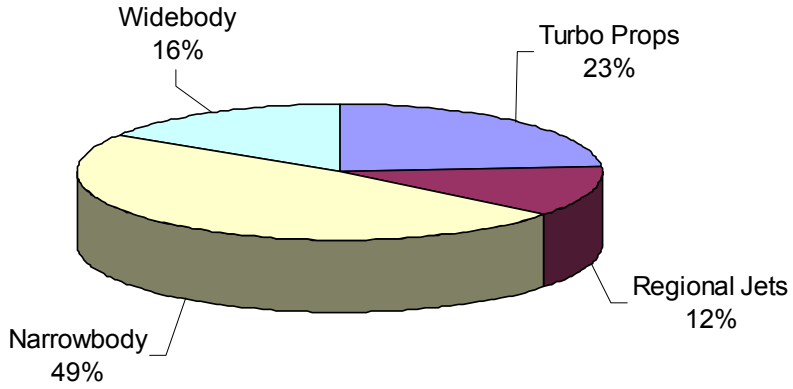
BACK performs its annual fleet forecast using a methodology that takes into account worldwide and regional demand, capacity and economic activity

- Fleet forecast methodology
  - An aircraft deliveries forecast is developed using an econometric model that correlates ASM's and economic activity for commercial jet aircraft
  - The model predicts the overall growth in scheduled airline activity by world region:
    - North America (including U.S., Canada, and the Caribbean), South & Central America (including Central America and Mexico), Europe (East and West), Middle East, Africa, and Asia-Pacific.
  - Growth in specific blocks reflecting distance, density, and aircraft seat class are developed based upon historical trends and projections of economic activity
  - Market demand, by aircraft seat class, is then adjusted for retirements from the existing fleet, firm orders, and deliveries to produce projected market demand for aircraft units

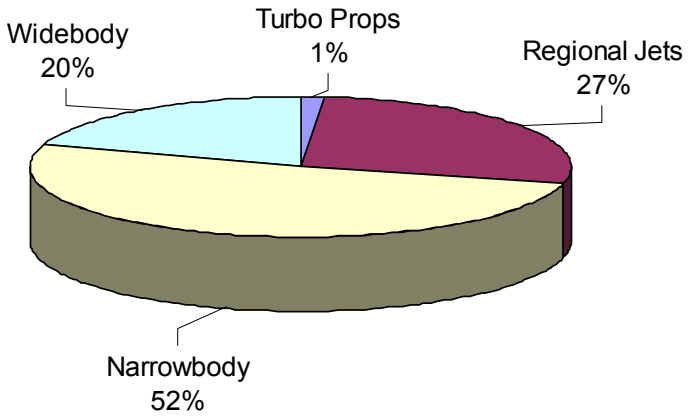
Using our model, we project the world's fleet will almost double over the next 20 years

- Worldwide demand for commercial airplanes, 2004–2023
- The world fleet will grow to 33,392 passenger aircraft by 2023, from 16,858
- Total market potential is 20,009 new commercial passenger aircraft
  - 7,178 replacement aircraft
  - 12,831 growth aircraft

World Passenger Fleet 2003



World Passenger Fleet 2023



Source: BACK Aviation Solutions Fleet iNet and World Fleet Forecast

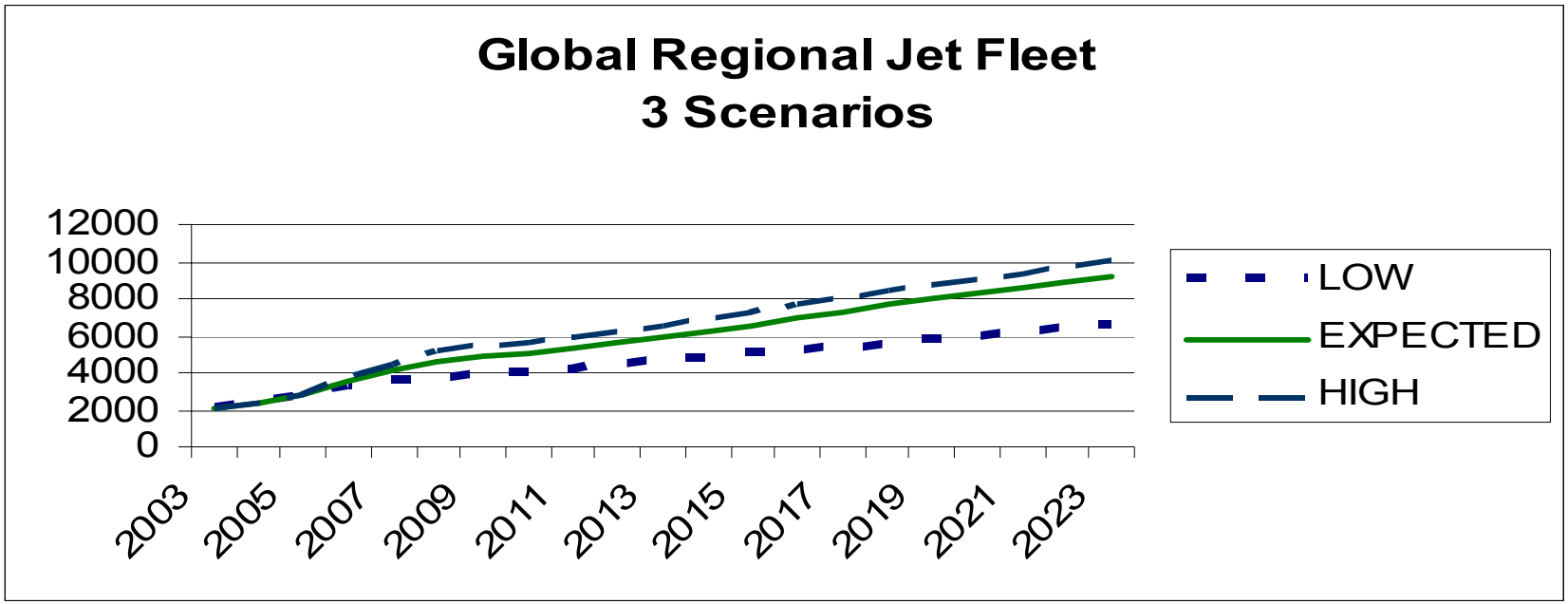
* As of December 31, 2003, passenger aircraft only, including Russian aircraft

BACK creates three possible scenarios for RJ growth

- **Scenario I - Low Demand**
  - No replacement of turboprops
  - Growth in turboprop markets is transferred to RJs
  - Natural growth in 30-59 seat RJs goes to RJs
  - All demand in 60 to 100 seat markets goes to 100-119 RJs
  - 20% of market demand in 100-119 seat goes to 100-119 seat RJs
  - 0 % 120-139 seat market
- **Scenario II - Expected Demand**
  - Replacement of turboprops (1:1 60+ seat; 2:1 40-59 seats: 3:1 20-39 seat)
  - Growth in turboprop markets is transferred to RJs
  - Natural growth in 30-59 seat RJs goes to RJs
  - All demand in 60 to 100 seat markets goes to RJs
  - 30 % of 100 seat market is transferred to 100-119 seat RJs
  - 10% of the 120-139 seat market is transferred to the 100-119 seat RJs
- **Scenario III - High Demand**
  - Replacement of turboprops (1:1 60+ seat; 2:1 40-59 seats: 3 for 1 20-39 seat)
  - Growth in turboprop markets is transferred to RJs
  - Natural growth in 30-59 seat RJs goes to RJs
  - All demand in 60 to 100 seat markets goes to RJs
  - 40 % of 100 seat market is transferred to 100-119 seat RJs
  - 20% of the 120-139 seat market is transferred to the 100-119 seat RJs

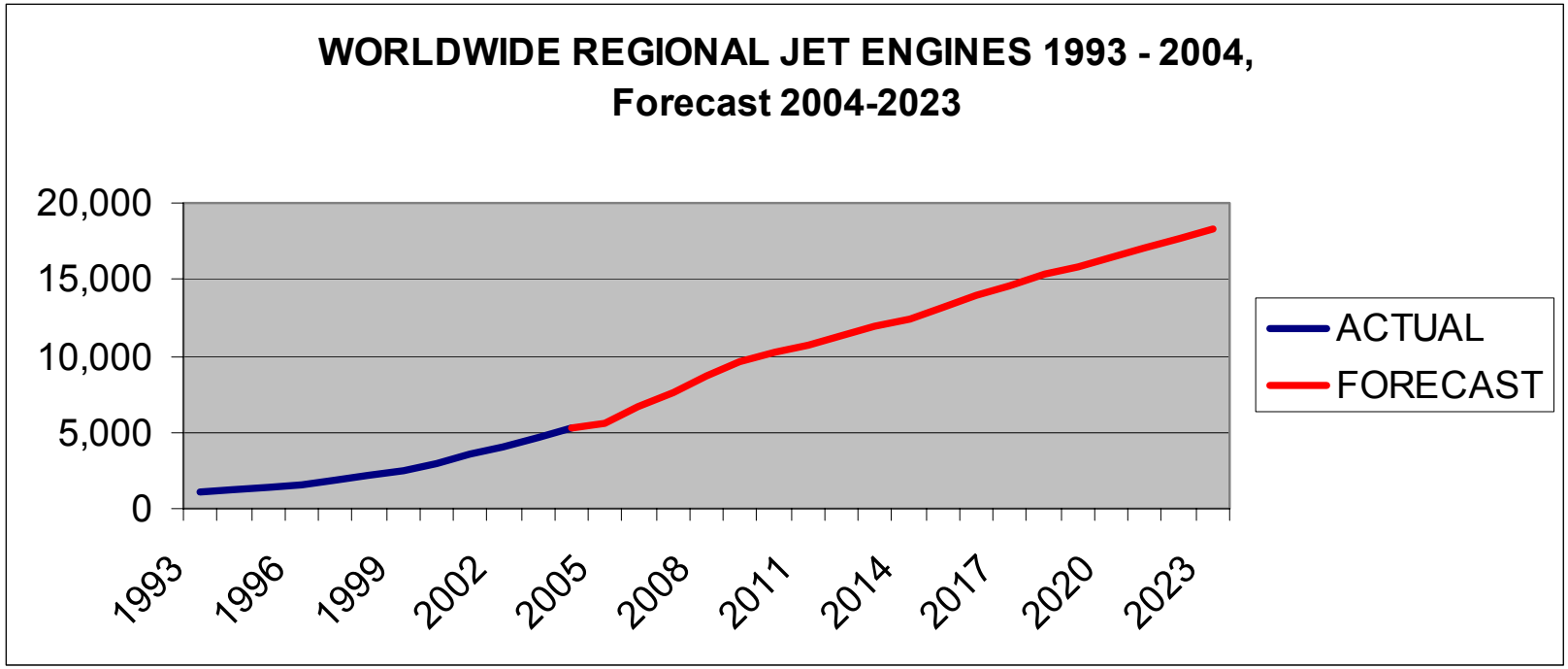
The three scenarios lead to a forecast of total worldwide Regional Jet fleet

- The High scenario leads to over 10,000 RJs by 2023
- The Low scenerio still includes over 6,300 RJs by 2023



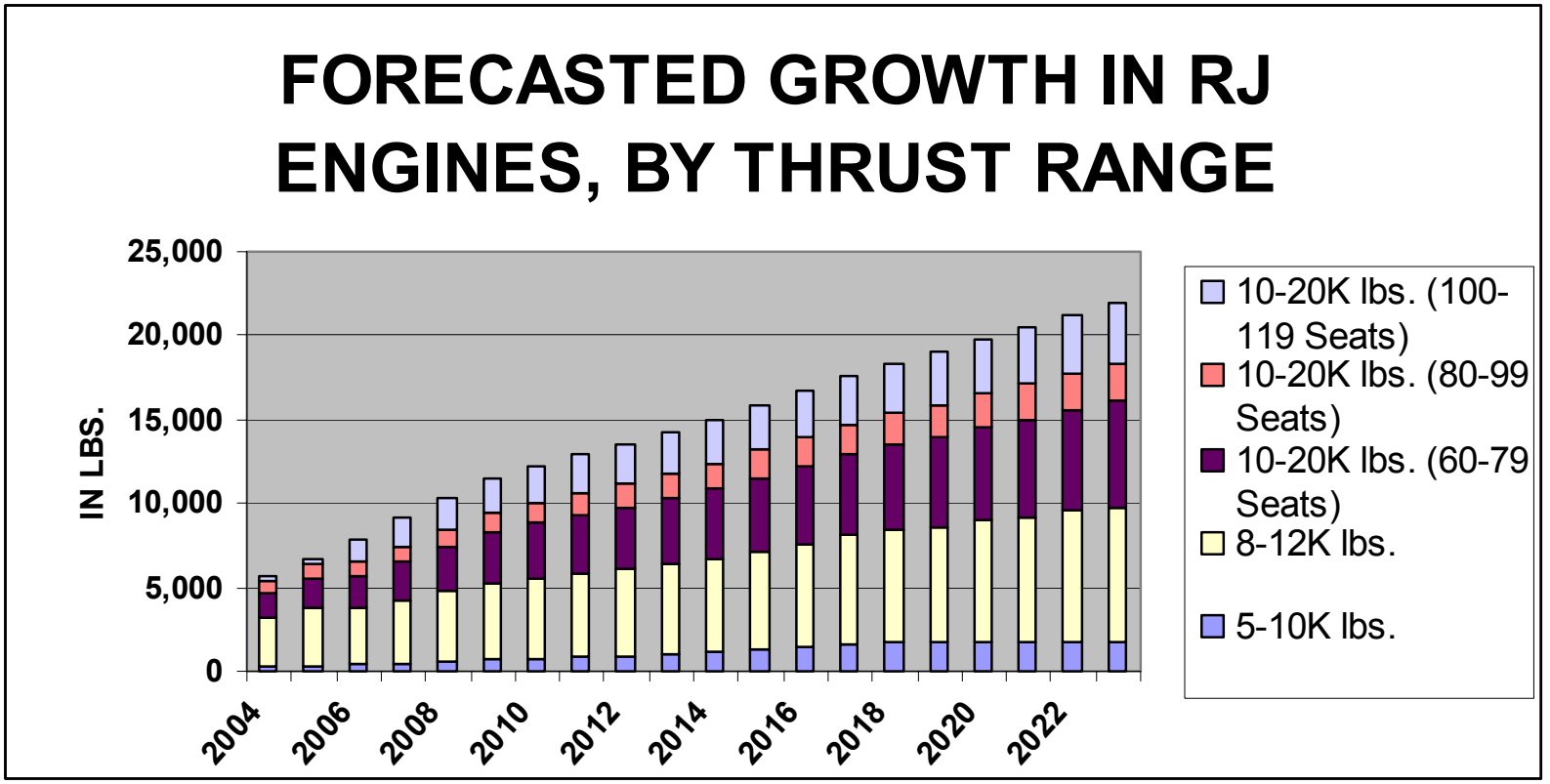
Using the RJ forecast, we predict RJs will take a disproportionate share of future aircraft sales, creating substantial demand for engines in the 5,000 to 20,000 lb. thrust category

- Over the next 20 years the world's RJ fleet will almost quadruple, going from 6 percent of the world's fleet in 2003 to 13 percent of the world's fleet in 2023
- This represents a compounded average growth rate of about 7 percent per year



Engines in the 10,000-20,000 lbs. thrust range will have the highest demand, with a CAGR or over 13.4 percent

- These growth rates are highest in the Europe, Asia/Pacific, and North American regions



RJ growth will have an impact by accelerating engine type retirement and future production rates for narrow body equipment

- Lager turbofan aircraft in the 40-59 and 60-79 seat classes are most at risk, including:
  - SAAB 2000
  - ATR 42
  - FOKKER (F-27-50)
  - DHC-7-100
  - DHC-8-400
  - ATR 72-100/200
  - BRITISH AEROSPACE ATP
- BACK projects that the RJ effect will increase retirements for turbofan aircraft yielding an average decrease in the size of the world's fleet of turbofan aircraft of about 9.5 percent per year, mostly impacting:
  - AE2100
  - PWC100

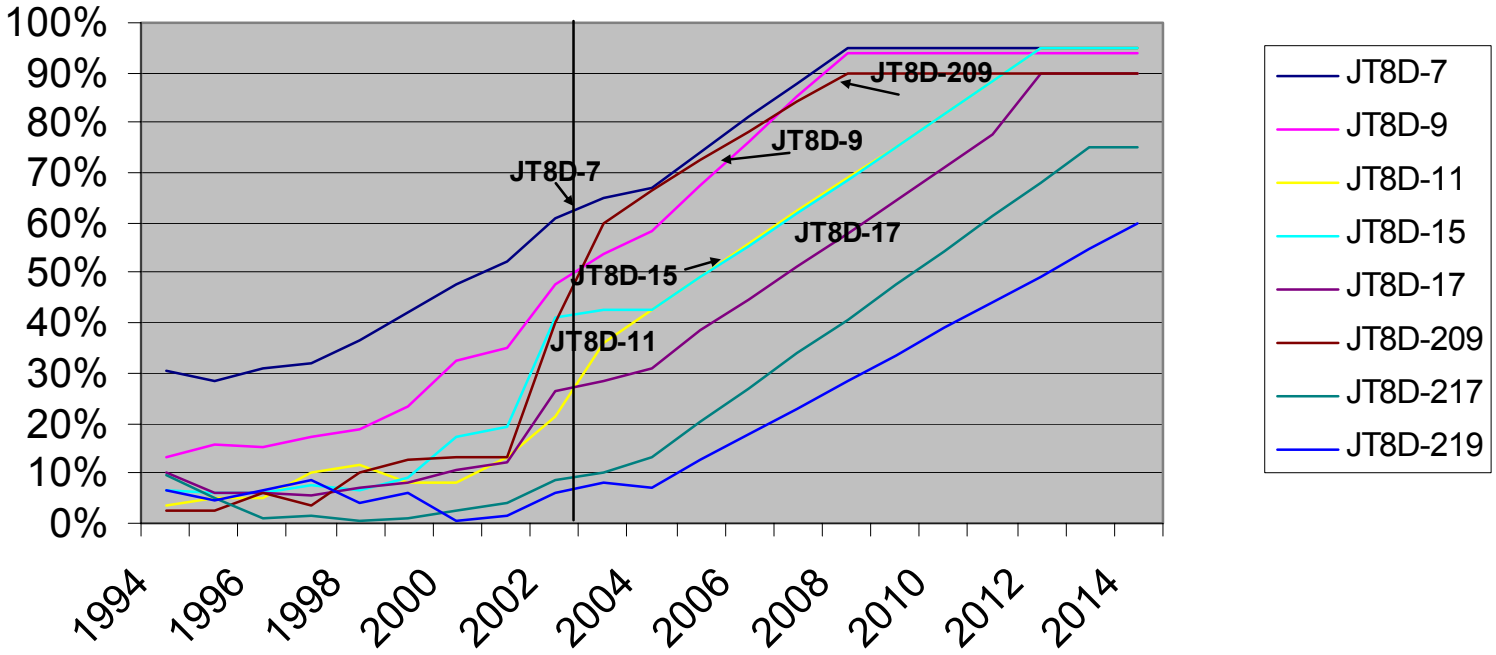
RJ growth will have an impact by accelerating engine type retirement and future production rates for narrow body equipment (cont'd)

- Smaller narrow body aircraft will also be disproportionately affected
  - 80-99 seat class
    - DC9 (10-20)
    - Fokker F28
    - BAC 111
  - 100-119 seat class
    - DOUGLAS DC 9 (30-40)
    - DOUGLAS MD-87
    - BOEING 717-200
    - BOEING 737-200
    - BOEING 737-500
    - BOEING 737-600
    - AIRBUS A318-100
    - BOEING 727-100
  - 120-139 seat class
    - DOUGLAS DC-9-50
    - DOUGLAS MD-82
    - BOEING 737-300
    - BOEING 737-700
    - AIRBUS A319-100
    - DOUGLAS MD-81-83-88
    - DOUGLAS MD-90-30
    - BOEING 737-400
    - BOEING 737-800
    - AIRBUS A320-100
    - AIRBUS A320-200
    - BOEING 727-200

The JT8D engine will be the most affected, accelerating the retirement over the next 4-10 years

- BACK forecasts the JT8D-7 and -9 will be the most affected, with the engine effectively in retirement by 2008
- The -15, -17, and -217A engines will also be significantly impacted, and will be fully retired by 2011

JT8D RETIREMENT RATES 1994- 2014



Source: BACK Aviation Solutions Fleet iNet and World Fleet Forecast

The aero-engine manufacturing business has recently gone through many changes, along with the commercial airline business, but the biggest changes are yet to come

- The airline industry has always been and will continue to be a cyclical business
- Total worldwide engine populations has followed the trend in ASM growth
- Regional and Executive jet engines have benefited from the significant increase in sales of such jets
- Turbofan engines have seen the least growth of any engine category, due to substantial aircraft retirements and encroachment by RJs
- The good news is that the long-term forecast remains healthy
- BACK projects the world's fleet will almost double over the next 20 years
- RJs will take a disproportionate share of future aircraft sales, creating substantial demand for engines in the 5,000 to 20,000 lb. thrust category
- RJ growth will have an impact by accelerating engine retirements and reducing future production rates for narrow body equipment
- Several versions of the JT8D engine will be most affected by this trend