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# **The Very Light Jets (VLJs) are coming...**

**Don Taylor  
March 18, 2005**





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# VLJ Manufacturers

(Not all will survive!)



Eclipse 500



Adam A700



Diamond D-Jet



Cessna Mustang



Avocet Project



Safire Jet



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# **The Eclipse 500**

## **A new breed of GA aircraft**

- **Similar in size, weight and cost to a new Baron**
- **But the similarity ends there**
- **Slower approach speeds, over twice the cruise speed and three times the altitude performance**
  - **Capable of operation from smaller airports, yet able to cruise comfortably in the high Flight Levels**
- **Disruptive technology is coming to GA**  
**Once it hits the market, GA will never be the same again**







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# Value Proposition: Twin-Engine Jet for \$1.175M

## Guaranteed

- Cruise speed 375 kt
  - Stall speed 67 kt
  - Range 1,280 nm  
w/pilot, 3 pax NBAA IFR
  - Useful load 2,250 pounds
- 
- Takeoff/landing distance <2,200 ft
  - Ceiling 41,000 ft
  - Certified for single-pilot operation
  - Powered by PW610F turbofan engine



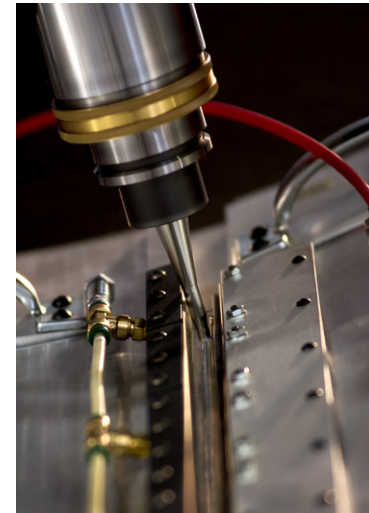


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# Key Enablers for the Eclipse 500



**Modern turbine technology**



**Innovative manufacturing  
technology and practices**



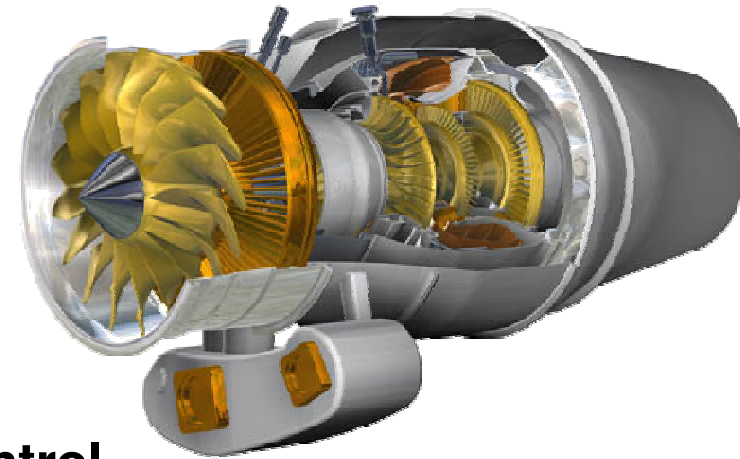
**Highly integrated avionics and systems**



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# A New Generation of Small, Light Weight Jet Engines by Pratt & Whitney Canada

- **PW600 engine family is the leader in the very light jet (VLJ) segment**
  - P&WC corporate strategy is to invest heavily in capturing this new category
    - PW615F (1,350 lbf) for Cessna Mustang
    - PW610F (900 lbf) for Eclipse 500
- **PW610F key features**
  - Dual-channel FADEC – total automatic control
  - APR OEI rated
  - Initial maintenance – 1,750 hours HSI, 3,500 hour TBO
  - Easy and quick maintenance
    - HSI on pylon
    - 1 ½ hour engine change

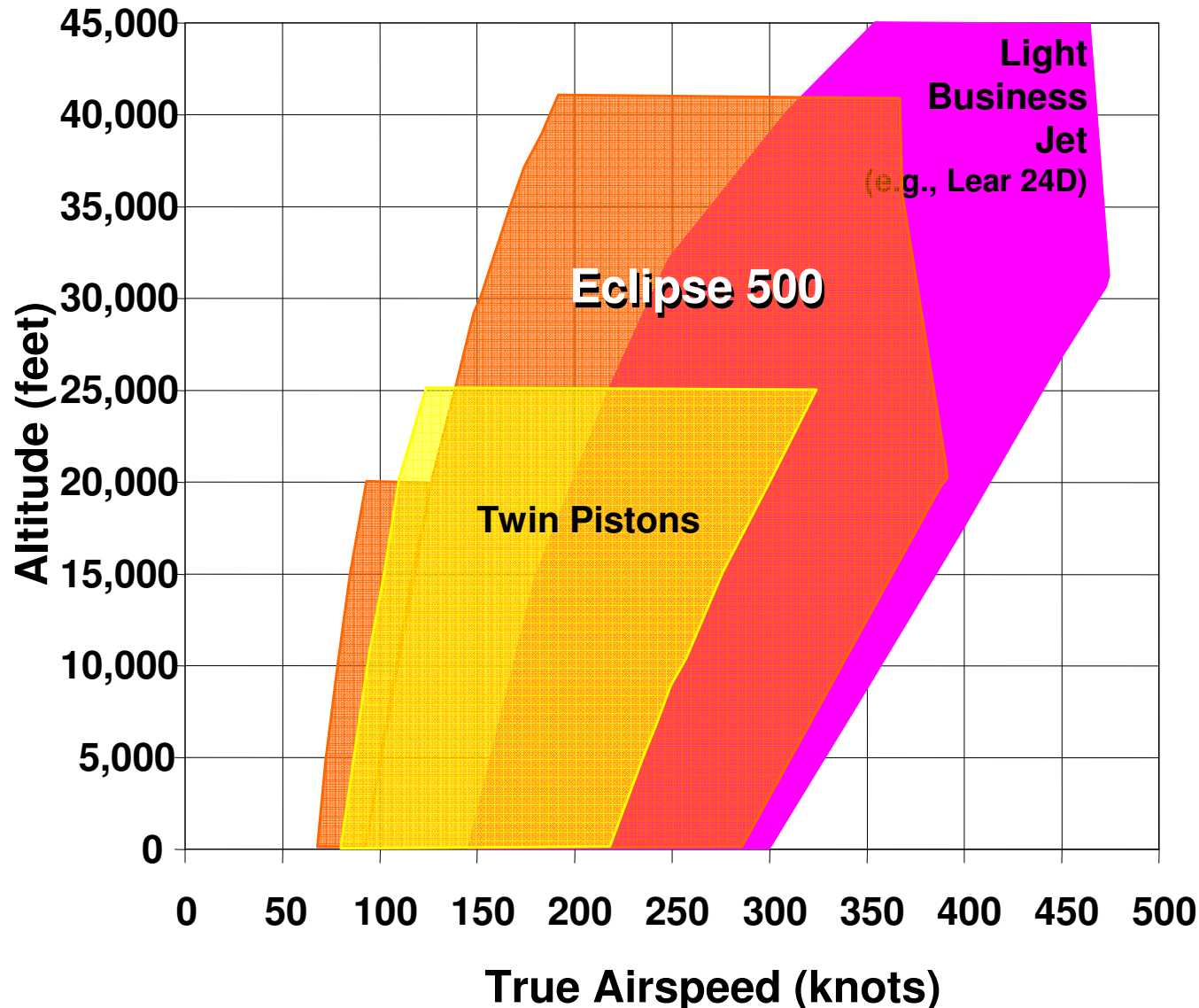




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# Eclipse 500 Is Designed for Safety

- **Large envelope of operations with low inertia**
  - **67 knot stall speed and 375 knot max cruise speed**
    - 87 knot approach, easy to avoid landing accidents (42% of business jet/turboprop)
  - **Quick accelerate / decelerate rates make possible quick, safe transitions from one phase of operations to the next**
  - **High gear/flap operation speeds**
    - $V_{FE} = 200\text{kts}$
    - $V_{LO} = 250\text{kts}$
    - $V_{LE} = 285\text{kts}$
    - $V_{MO} = 285\text{kts}$







# Eclipse Aviation Is Succeeding

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- **Flight testing with FAA conforming aircraft underway**
- **\$398M of equity and debt funding**
- **2,150+ orders on books**
- **190,000 ft<sup>2</sup> of facilities in place**



- **Company is 380+ employees and growing**
- **Manufacturing 6 additional test aircraft**
- **On track for FAA certification in March 2006**
- **On track for JAA certification by the end Q2 2006**





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# Very Light Jets

## How will they fit in the airspace?

- **Air Traffic Control assumptions:**
  - All aircraft are the size of a large commercial jet
  - All aircraft want to land at the major airports
  - All aircraft should maintain the same speed on final
    - It makes lining them up easier
- **Results**
  - Airspace has been designed to ease the controller's job, not the pilot's
  - Traffic flow is set-up for hubs and spokes
  - Vast quantities of airspace have been wasted because of uncertainty about where the aircraft really are
    - Because of the radar based ATC system



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# VLJ's & the Air Space

- **Current Air Traffic Control system:**
  - Uses 50 year old technology to separate aircraft
  - Radar on the ground needs multiple sweeps to build a track file on a target aircraft
  - Radar requires >15 seconds to obtain usable data
  - Only then can it determine position, direction and speed
  - Altitude information comes from the target aircraft via an on board altitude encoder
- **Result**
  - Positional uncertainty – large airspace buffers are required and airspace is wasted
- **Solution**
  - RHSM (Reduced Horizontal Separation Minimums - much like RVSM)



# Reduced Separation

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- **Is RHSM possible?**
  - **Yes, the technology has been around for years**
    - Technology developed in the early 90's
  - **Automatic Dependent Surveillance-Broadcast (ADS-B)**
    - Each aircraft broadcasts its highly accurate, GPS derived position, altitude, speed and direction once per second
  - **Cockpit Display of Traffic Information (CDTI)**
    - CDTI traffic information from ADS-B is highly accurate and may be received and displayed by any properly equipped aircraft
  - **Result: ADS-B/CDTI equipped aircraft can see each other**
    - If barometric altimetry is adequate for 1,000' vertical separation, GPS position data should allow 1,000' horizontal separation





# Free Flight

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- **ADS-B and CDTI are enablers for Free Flight**
- **Autonomous aircraft and self separation will free up the airspace**
- **Resistance to change**
  - **Naysayer concerns - improve radar and hire more controllers**
    - The responsibility for separation should remain on the ground
- **Is it possible that pilots could self separate?**
  - **Netherlands trials – pilots liked it and reported it was much easier than they expected**
- **Question:**
  - **If a radar based ATC system did not exist and two “Free Flight” aircraft had a conflict in flight, would we elect to resolve this problem through a third party on the ground?**



# VLJ's as Air Taxis

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- **Air Taxi is a new business model**
  - The market is in development and will change air travel
- **VLJ's are the enabler for this concept**
- **The idea brings direct air service closer to the customers home or business**
- **VLJ aircraft will have very low operating cost**
- **Air Taxi aircraft will fly from one small airport to another, bypassing all hubs and spokes**
- **Result: A whole new method of transport that brings fast, affordable air travel closer to the customer's front door**
  - NASA study shows that average door to door speed for a 500 mile trip is 70 mph using airlines
- **Will the model work?**
  - Eclipse has customers that are betting it will



# VLJ's and Major Hubs

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- **VLJs will be able to utilize 10,000 airports in the U.S.**
  - Airlines only serve around 600 airports
- **Will VLJ's fly into the major airline hubs, adding congestion and taking up runway time?**
  - Absent the special runways and procedures, logic suggests this will not happen
  - Why fly into a hub when there are feeder airports closer to ultimate destination
  - Rarely will a VLJ choose the congestion, TSA screening, landing fees and hassle associated with airports that have 10,000' runways they don't need
    - Owner operators will avoid the hassle and the Air Taxi model is based on using small airports closer to the customers home
  - **VLJ's could easily operate into and out of major hubs using small, 3,000' runways**
    - Curved approaches could provide easy access
    - One or more inexpensive, low load bearing runways could be located in the corner of a hub





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# The VLJ Revolution

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