Raytheon Aircraft Company

Supersonic Civil Aircraft Study

Sponsored Under NASA
Langley Contract L-71387D

FAA Supersonic Aircraft Workshop

November 13, 2003

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Program Objectives

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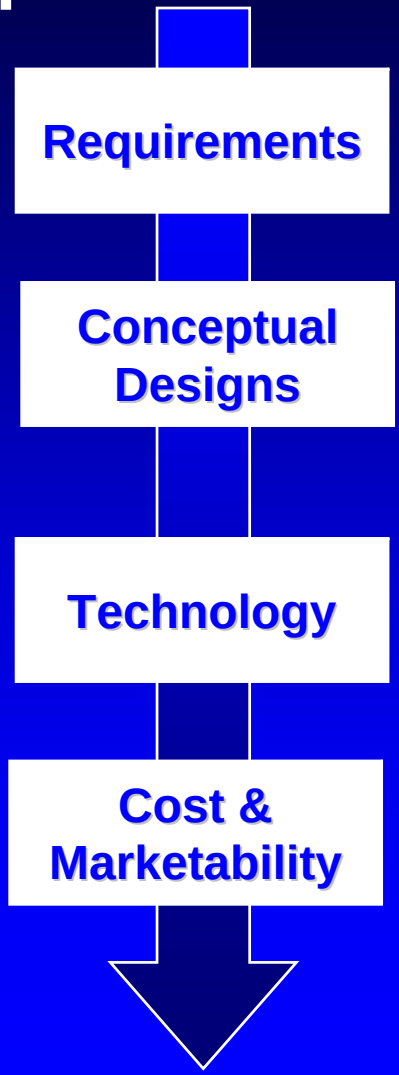
Four QSBJ objectives for current study:

- Develop design requirements for a small supersonic aircraft.
- Develop two conceptual configurations designed to meet the requirements, with the key differentiator being the reduced boom level for one of the vehicles
- Determine the technology suite required for these vehicles
- Perform a cost and marketability assessment of these vehicles



One year contract during 2003 Fiscal Year

Design Requirements Summary

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Requirement	Performance Design	Boom Constrained Design
Range (NM)	5,000	5,000
Cruise Speed (Mach)	1.8	1.8
T.O. Field Length (FT)	6,000 (SL, ISA)	6,000 (SL, ISA)
Outside cabin diameter	70"	70"
Payload	2 crew, 6 passengers	2 crew, 6 passengers
Takeoff Noise	FAR 36 Stage 4	FAR 36 Stage 4
Airworthiness	FAR Part 25, Concorde like Special Conditions	FAR Part 25, Concorde like Special Conditions
Initial Overpressure (psf)	-	0.4
Signature Shape	-	Ramp, h=0.3
MTOW (LB.)	-	-
Length (FT)	-	-
Cruise Altitude (FT)	-	-
Cost (US Dollars)	-	-
- : Denotes fallout parameter		

Low-Boom Configuration

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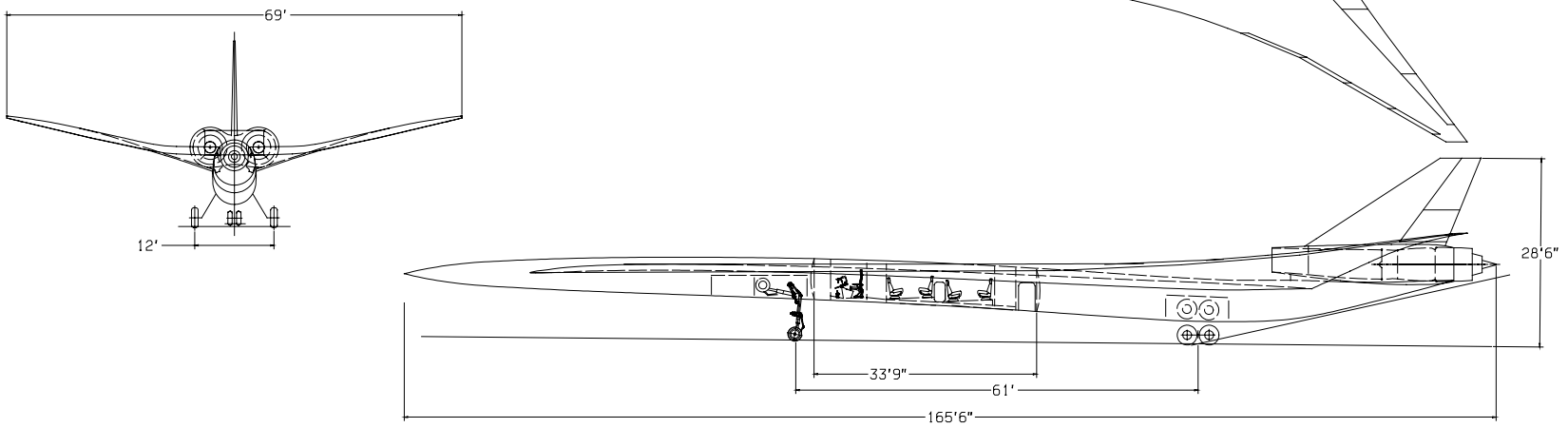
Wing:	
Area	2743 ft²
AR	1.74
OB LE. Sweep	60°
Oper.. Empty Wt.	49,180 lb
Payload	1,200 lb
Fuel	68,820 lb
TOGW	119,200 lb



High-Boom Configuration

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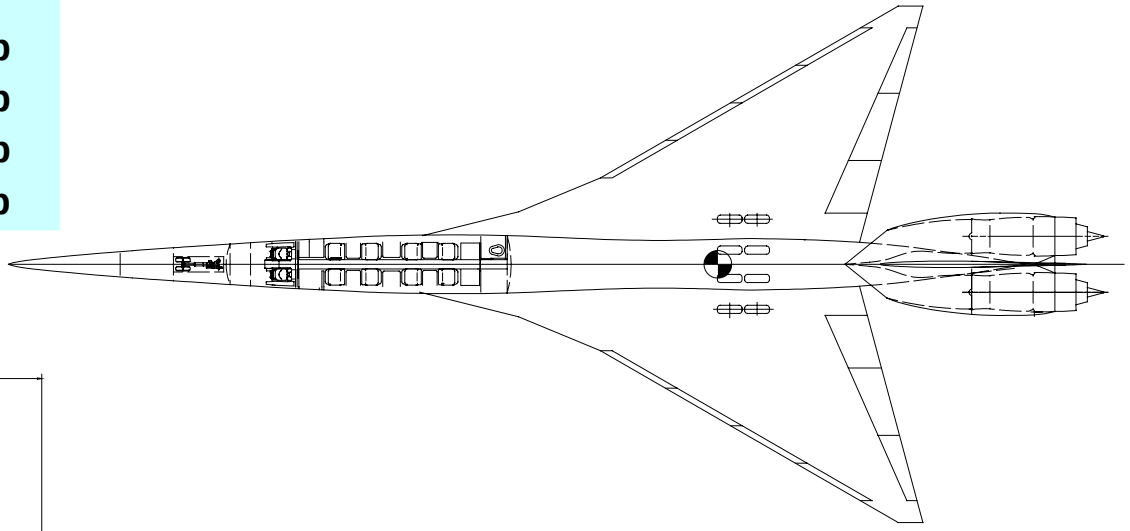
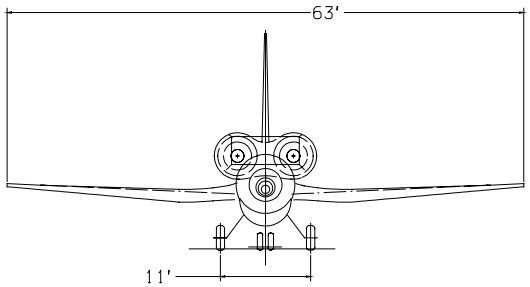
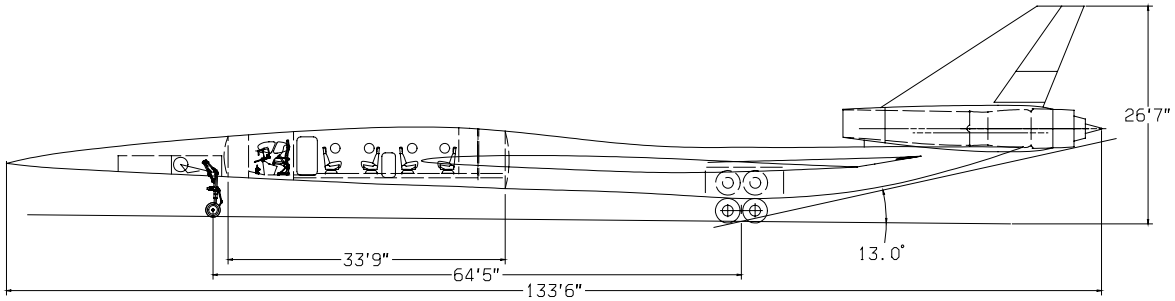
Wing:	
Area	**1770 ft²**
AR	**2.24**
OB LE. Sweep	**60°**
Oper.. Empty Wt.	**42,240 lb**
Payload	**1,200 lb**
Fuel	**57,920 lb**
TOGW	**101,360 lb**







Configuration Basic Characteristics

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	LOW - BOOM	HIGH - BOOM
MTOW (lbs)	119,200.	101,360.
T/W	0.426	0.433
W/S (lb/ft^2)	43.5	57.3
OEW / MTOW	0.413	0.417
Volume (ft^3)	6,030.	4,500.
Wetted Area (ft^2)	7,879.	5,510.
Aircraft Length (ft)	165.5	133.5
Wing Area (ft^2)	2,743.3	1,770.0
Wing Span (ft)	69.0	63.0
Wing AR	1.74	2.24
Outb. LE Sweep (deg)	60.0	60.0

Marketability
Supersonic Flight Over Land

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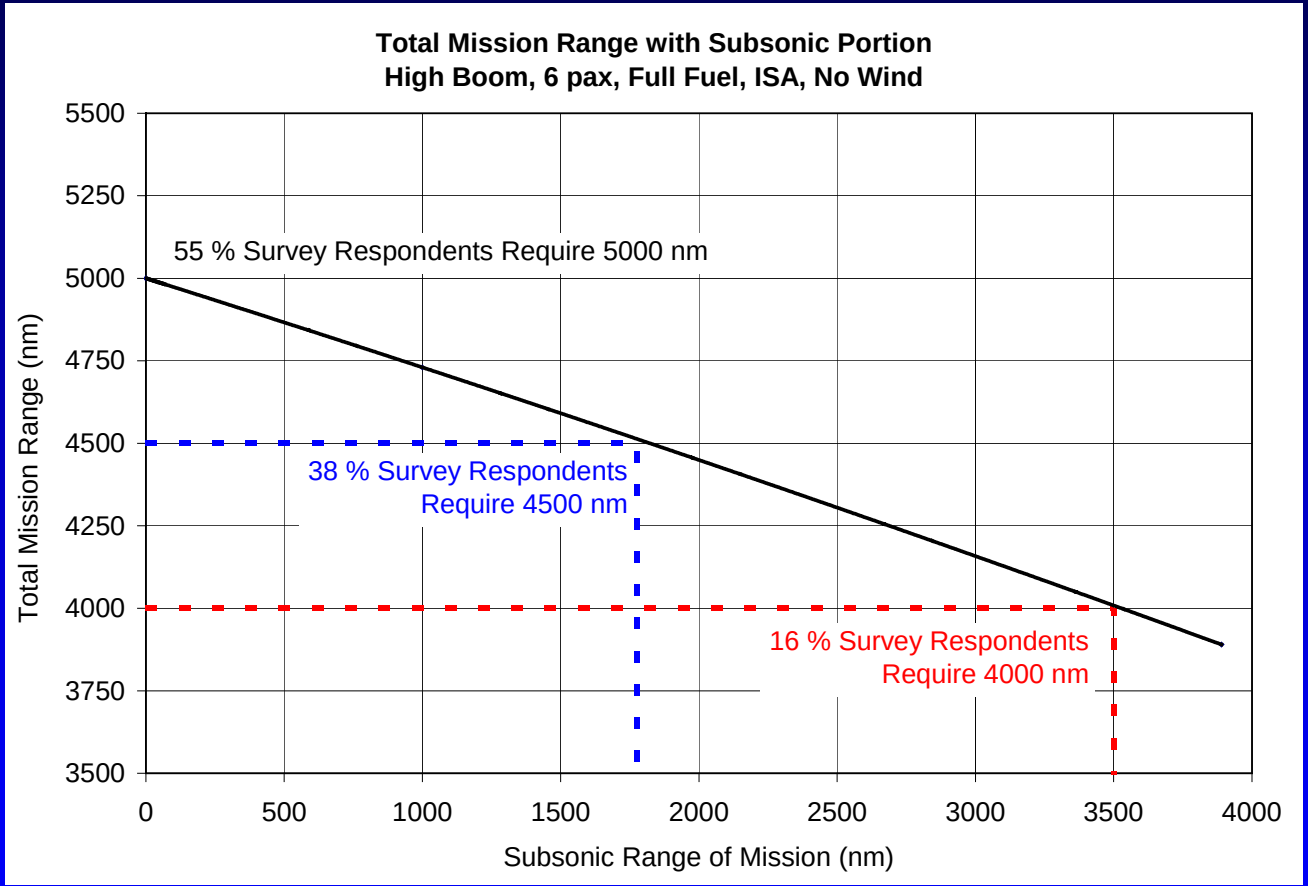
With restrictions on supersonic flight over land:



- Range of aircraft is decreased below design point
- Average speed is decreased → Longer mission duration
- Operating costs increase
- Utility to customer limited
- Business case is challenged

Definition of regulatory requirements to allow supersonic flight over land is imperative

Study Conclusions

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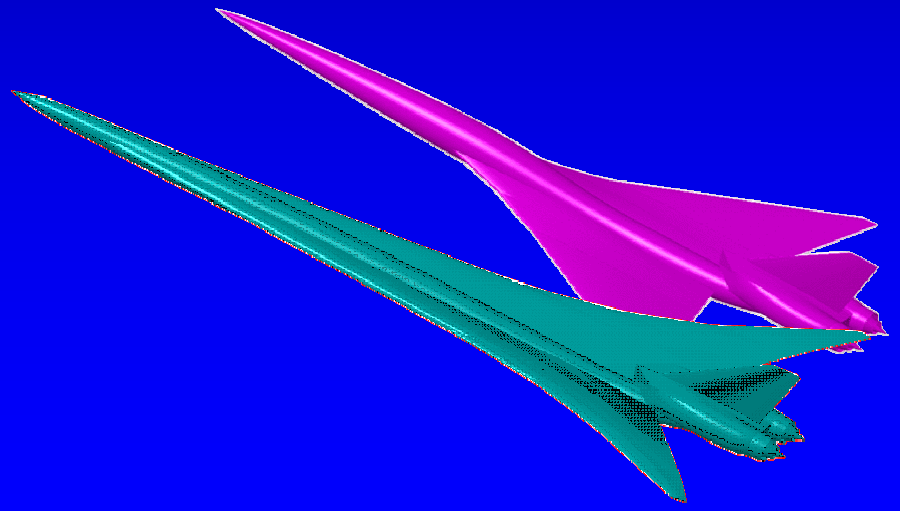
- **Small civil low-boom supersonic aircraft will be technically achievable**
  - **Dependant on reasonable technology maturation in several key areas over the next ten years**
- **Size and weight consequences of a low-boom design are small relative to utility gained**
  - **Business case is challenging without the ability to fly supersonic over-land**



Observations

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- **Several key enablers must happen before the commercialization of supersonic aircraft**
  - **Environmentally acceptable boom criteria must be established**
  - **Regulatory requirements for certification and operation of supersonic aircraft must be codified**
  - **Critical technologies must be demonstrated and benefits quantified.**
- **Supersonic business jets are a technology stepping stone in an overall strategy of advancing aeronautics and the global transportation system**

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The World is Small...

When You Fly A

Beechcraft