Aircraft Design
Business Jet Project

Video

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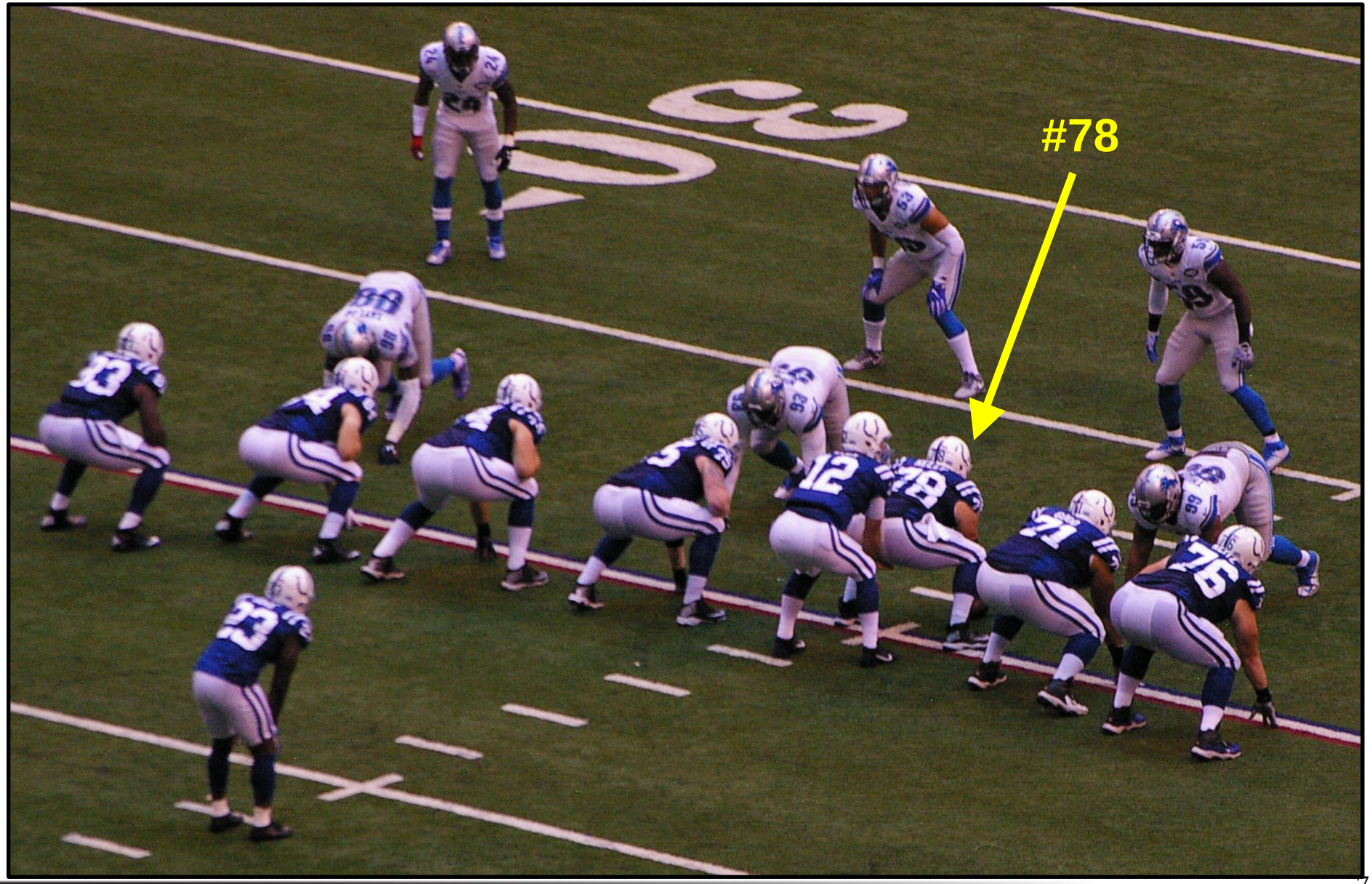

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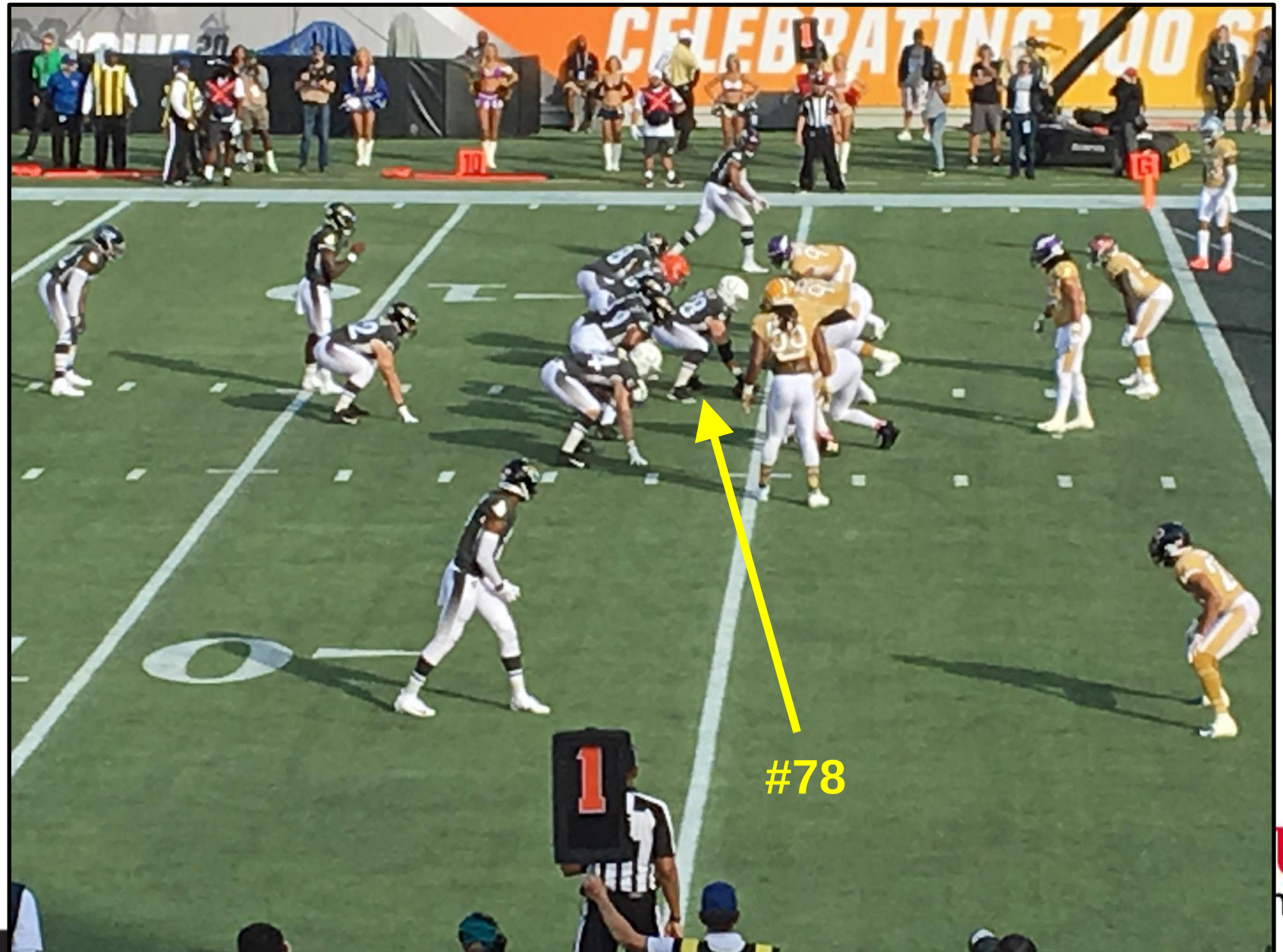

Aircraft Design Process

Airplane's Mission

Cool New Gadgets

Historical Parameters

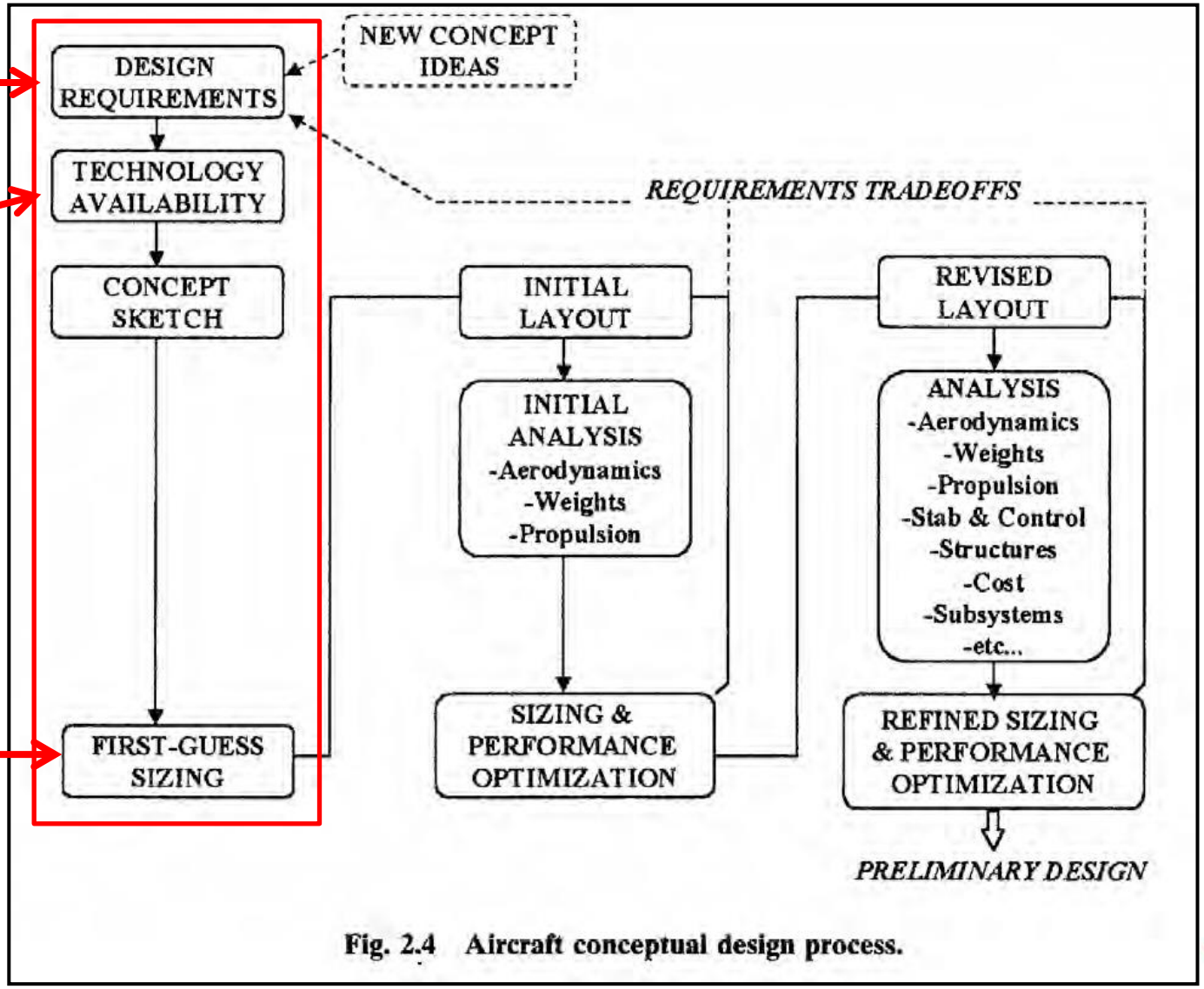

Fig. 2.4 Aircraft conceptual design process.

"Aircraft Design: A Conceptual Approach" by Daniel P. Raymer, page 9

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Aircraft Design Process

Airplane's Mission

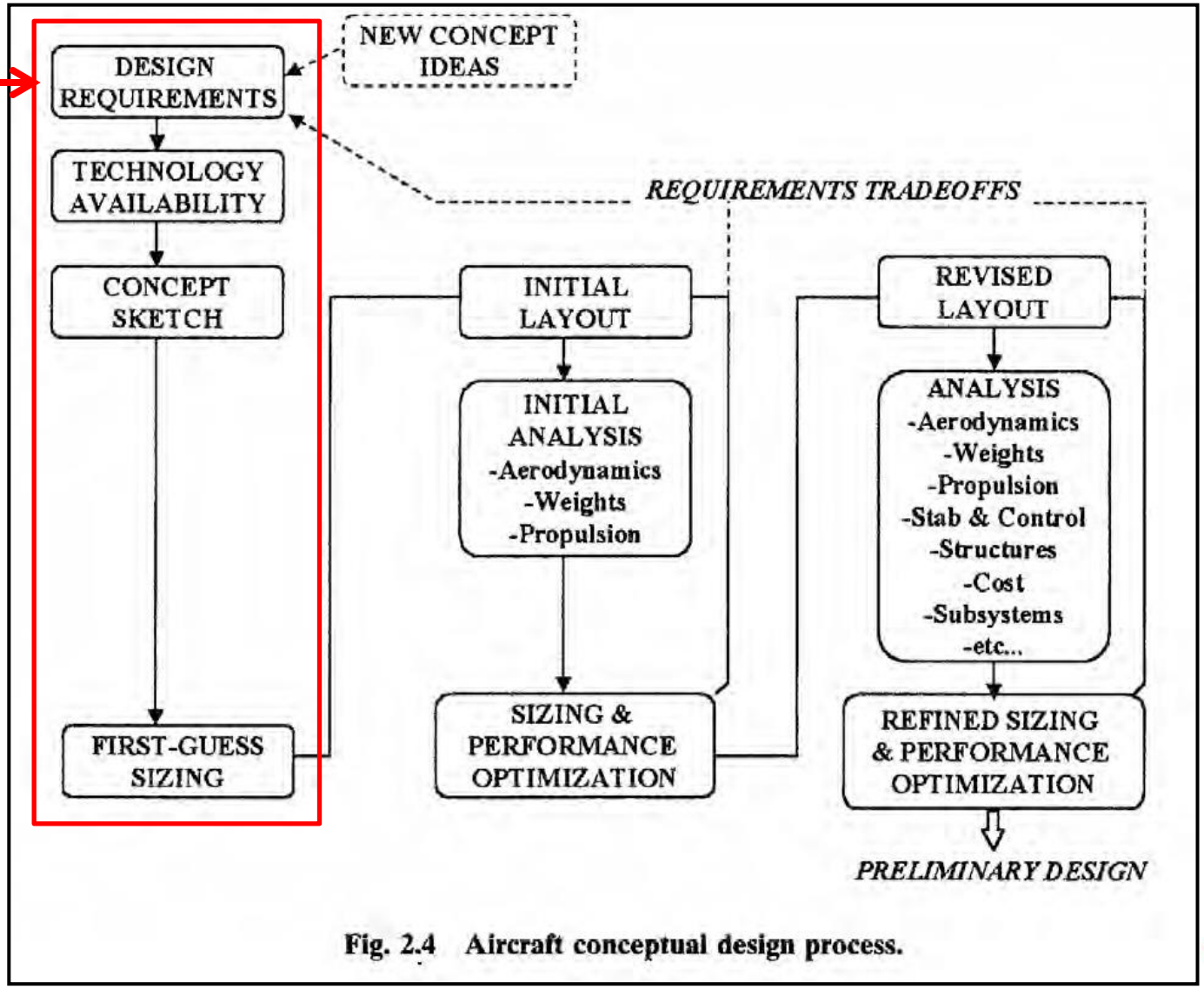

Fig. 2.4 Aircraft conceptual design process.

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Business Jet Mission

Who are the customers for business jets?

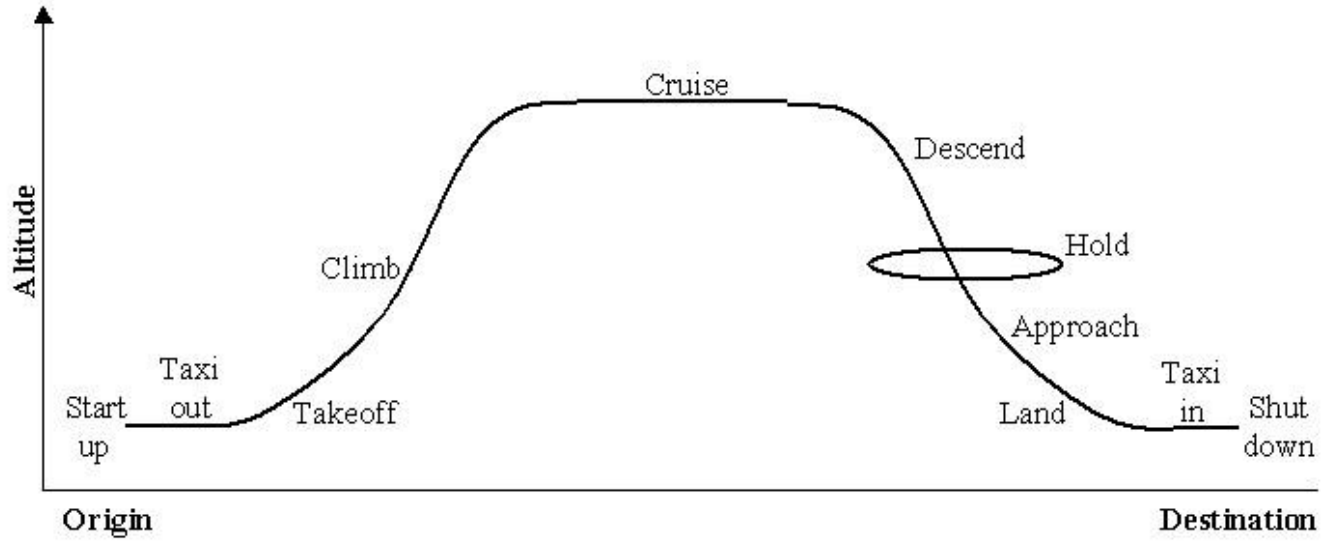
What does a business jet need to do?

Who are the passengers on a business jet?

What technologies need to be on a business jet?

How does a corporation justify buying a business jet?

How does an individual justify buying a business jet?



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Part I – Understanding the Problem

Study the historical data and determine the project's feasibility
Set some requirements for this class of business jet
- **Maximum Range (NM)**
- **Number of Passengers**

Choose an initial Takeoff Gross Weight (lb)

Part II – Initially Sizing the Aircraft

Use historical data to pick some more design parameters
Use ITERTOW-BIZ spreadsheet for analysis

Part III – Refining the Design

Use ITERTOW-BIZ results to pick an initial wing size
Use WINGLOAD-BIZ spreadsheet for more analysis

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Part IV – The Rest of the Initial Design Details

Use WINGLOAD-BIZ results to pick some more design parameters
Use WING-BIZ spreadsheet for more analysis
Use FUSELAGE-BIZ to size the aircraft fuselage
Use TAIL-BIZ to design the vertical and horizontal tails
Fill out the aircraft design parameter tables
Hand-check a couple of the analysis answers
Answer a few questions about your design choices

Part V – A Peek at the Second Iteration

Refined Weight, Wetted Areas, and Drag Polar Estimates

Part VI – Project Conclusions

3-View Drawing and Marketing Brochure
Answer a few questions about your design
Look at the sensitivity of two requirements

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	Units	Value
REQUIREMENTS		
Range	NM	
Number of Passengers	#	
Passenger Payload	lb	
AIRCRAFT WEIGHTS		
Takeoff Gross Weight	lb	
Fuel Capacity	lb	
Operating Weight Empty	lb	
Structure Factor	--	
PROPULSION		
Maximum Thrust	lb	
Cruise TSFC	lb/lb-hr	
WING		
Wing Area	ft^2	
Wing Span	ft	
Aspect Ratio	--	
Root Chord	ft	
Tip Chord	ft	
Taper Ratio	--	
Leading Edge Sweep	degrees	
Trailing Edge Sweep	degrees	
Half-Chord Sweep	degrees	
M.A.C. length	ft	
y_{MAC} location	ft	
FUNDAMENTAL PARAMETERS		
Takeoff T/W	--	
Takeoff W/S	lb/ft^2	

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TAIL DESIGN		Units	Horizontal Tail	Vertical Tail	Main Wing
Leading Edge Sweep Angle	Λ_{LE}	degrees			
Trailing Edge Sweep Angle	Λ_{TE}	degrees			
Quarter-Chord Sweep Angle	$\Lambda_{c/4}$	degrees			
Root Chord	c_r	ft			
Tip Chord	c_t	ft			
Span	b	ft			
Height	h	ft			
Taper Ratio	λ	--			
Surface Area	S	ft^2			
Aspect Ratio	AR	--			
MAC length	MAC	ft			
y_{MAC} location	y_{MAC}	ft			
Distance from tail's c/4 of MAC to wing's c/4 of MAC	l_{HT}	ft			
Distance from tail's c/4 of MAC to wing's c/4 of MAC	l_{VT}	ft			
Horizontal Tail Volume Coefficient	C_{HT}	--			
Vertical Tail Volume Coefficient	C_{VT}	--			
FUSELAGE DESIGN		**Units**	**Value**		
Fineness Ratio	L/D	--			
Fuselage Length	L	ft			
Fuselage Diameter	D	ft			

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Questions?