

Aircraft Layout Choices

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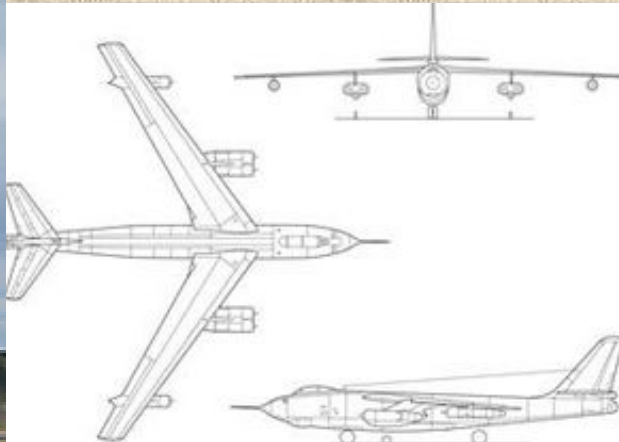
Objective

- ❑ For Fuselage, Wing, Tailplanes, Engines, LG, select :-
 - Conceptual shape
 - Functional characteristics
 - Relative position
- ❑ Driving Factors usually are :-
 - Functional Requirements
 - Safety & Reliability
 - Type of Propulsion
 - Flight Envelope
 - Technology, Economy & Production capabilities
 - History, Style, Passenger appeal
- ❑ More than one configuration may be suitable !

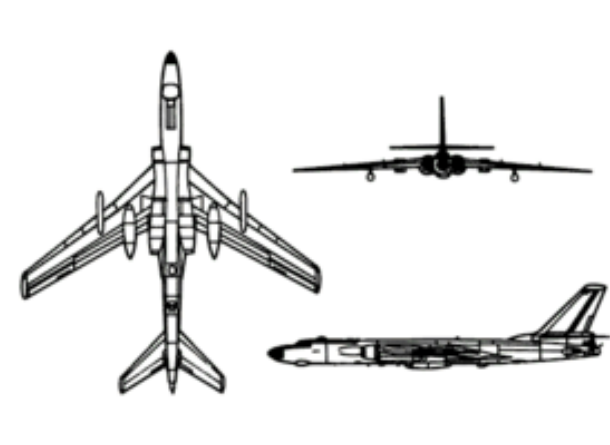
Three Strategic Bombers



AVRO Vulcan



Boeing B-47 *Stratojet*



Tupolev 16 *Badger*



Source: http://en.wikipedia.org/wiki/Avro_Vulcan



http://en.wikipedia.org/wiki/B-47_Stratojet



http://en.wikipedia.org/wiki/Tupolev_Tu-16

A brief comparison

	AVRO Vulcan	Boeing B-47	Tupolev Tu-16
GEOMETRY			
AR_w	2.78	9.43	6.60
S_w (m²)	330	132.7	165
W_{empty} (kg)	37144	35867	37200
MTOW(kg)	77111	100000	79000
T/W	0.31	0.22	0.24
W/S (kg/m²)	233.7	455	460
PERFORMANCE			
H_{sc} (km)	17.0	10.1	12.8
Range (km)	4171	6494	7200
V_{max} (kmph)	1040	977	1050
Max. L/D	17.0	17.2	??
T_{max} (kN)	4 x 49 = 196	6 x 32 = 192	2 x 93.2 = 186.4
Crew	5	3	4
First Use	1956	1951	1954

Advanced Tactical Fighter



http://en.wikipedia.org/wiki/File:Su-27_low_pass.jpg

☐ WHO WAS THE KEY COMPETITOR FROM USSR STABLE

Two competing designs for USAF-ATF



[http://en.wikipedia.org/wiki/File:Two_F-22A_Raptor_in_column_flight_-__\(Noise_reduced\).jpg](http://en.wikipedia.org/wiki/File:Two_F-22A_Raptor_in_column_flight_-__(Noise_reduced).jpg)

YF-22



http://en.wikipedia.org/wiki/File:F-22_Raptor_Internal_Weapons_Bay.jpg



http://www.fighter-planes.com/klein/yf23_r.jpg

YF-23



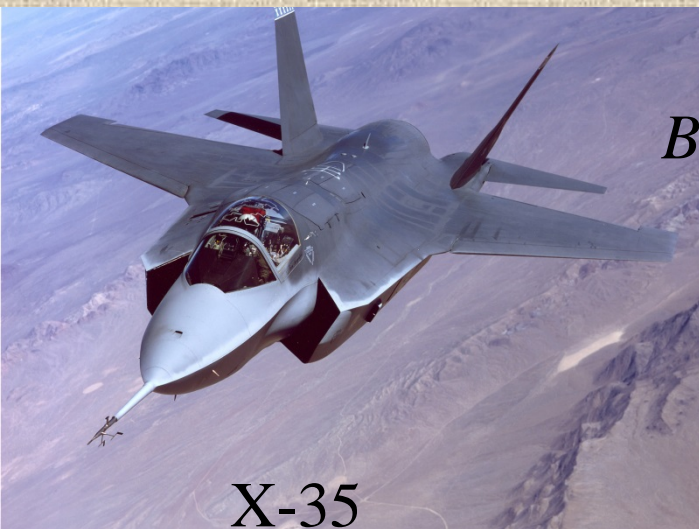
http://upload.wikimedia.org/wikipedia/commons/thumb/7/73/F-15_and_F-22.JPG/180px-F-15_and_F-22.JPG



<http://www.nationalmuseum.af.mil/shared/media/photodb/thumbnails/060810-F-1234S-003.jpg>

Joint Strike Fighter

- ❑ CALF (ASTOVL) : USMC & USAF (1992)
- ❑ JAST : USN (1993)
- ❑ JAST = CALF + JAST (1994) + RAF participation in 1995
- ❑ Replacement for F-16, A-10, F/A-18 and AV-8B
- ❑ CTOL, CV, STOVL
- ❑ Competition launched in 1996
 - Lockheed Martin X-35 v/s Boeing X-32
- ❑ Winner declared in 2000



Battle of X-Planes

We will watch
the video !



X-32

Various Layout Possibilities

▪ Wing Location

- High- Low- or Mid-wing ?
- Cabin and/or cockpit in front of wing ?

▪ Propulsion

- Single Engined, Prop. : Tractor or Pusher ?
- Single Engined, Jet : Nose or Rear mounted ?
- Multi Engined, Prop : Usually two & wing-mounted
- Multi Engined Propfans : Wing or Rear fuselage mounted
- Multi-Engined, Jets : 2, 3 or 4 engines ? Location ?

▪ Tailplane

- Horizontal Tail Aft, Canard, 3 surface, Tailless ?
- Configurations Conv., T, V, Inv. V, H, Inv. H, U, Inv. U

▪ Undercarriage

- Nosewheel, Tailwheel, Bicycle, Quadricycle,