Target Design Specifications

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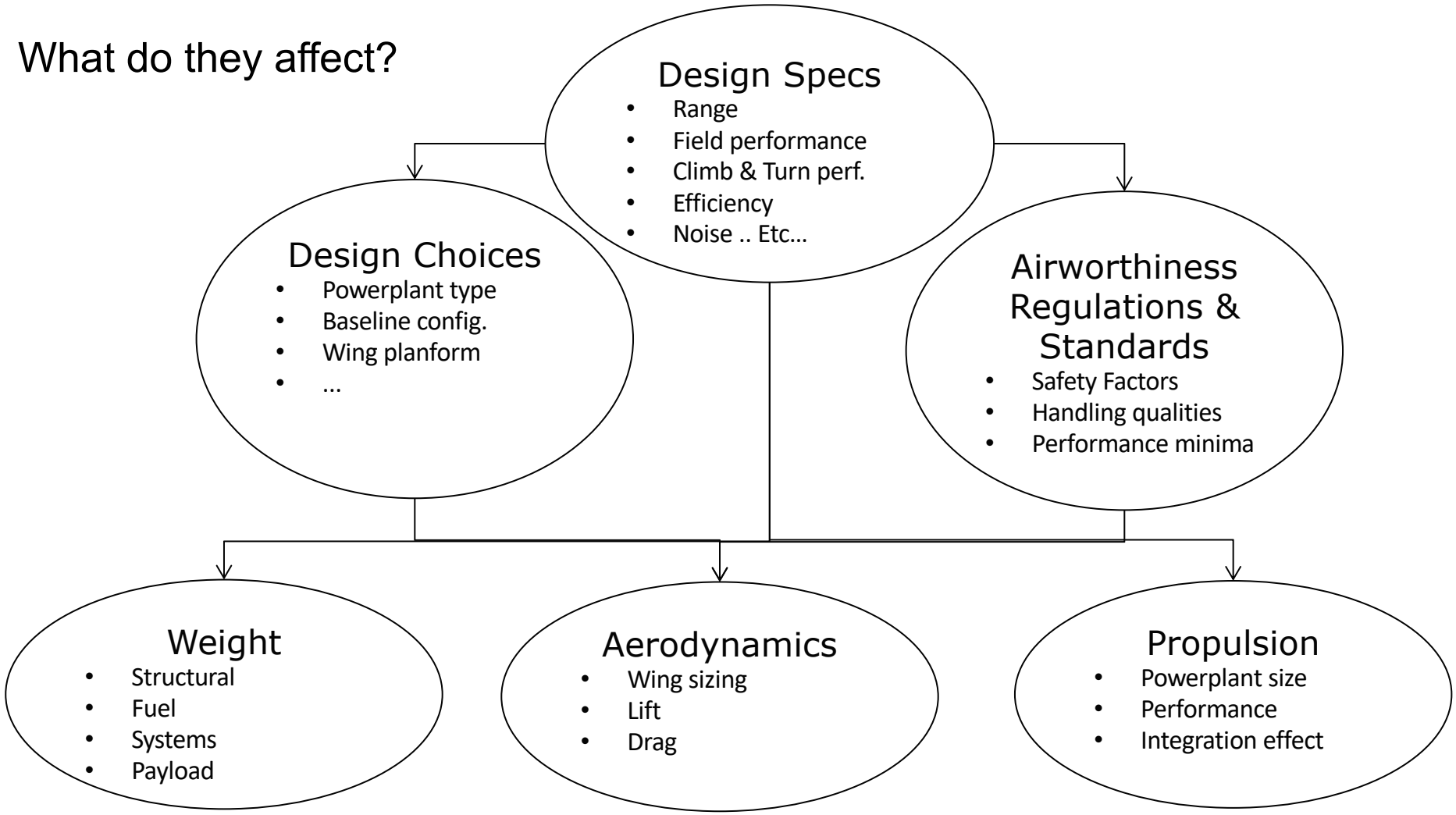
Why? To ensure that we get what the “client” asked for.

If the MoD asked for an advanced trainer, make sure we get

THIS

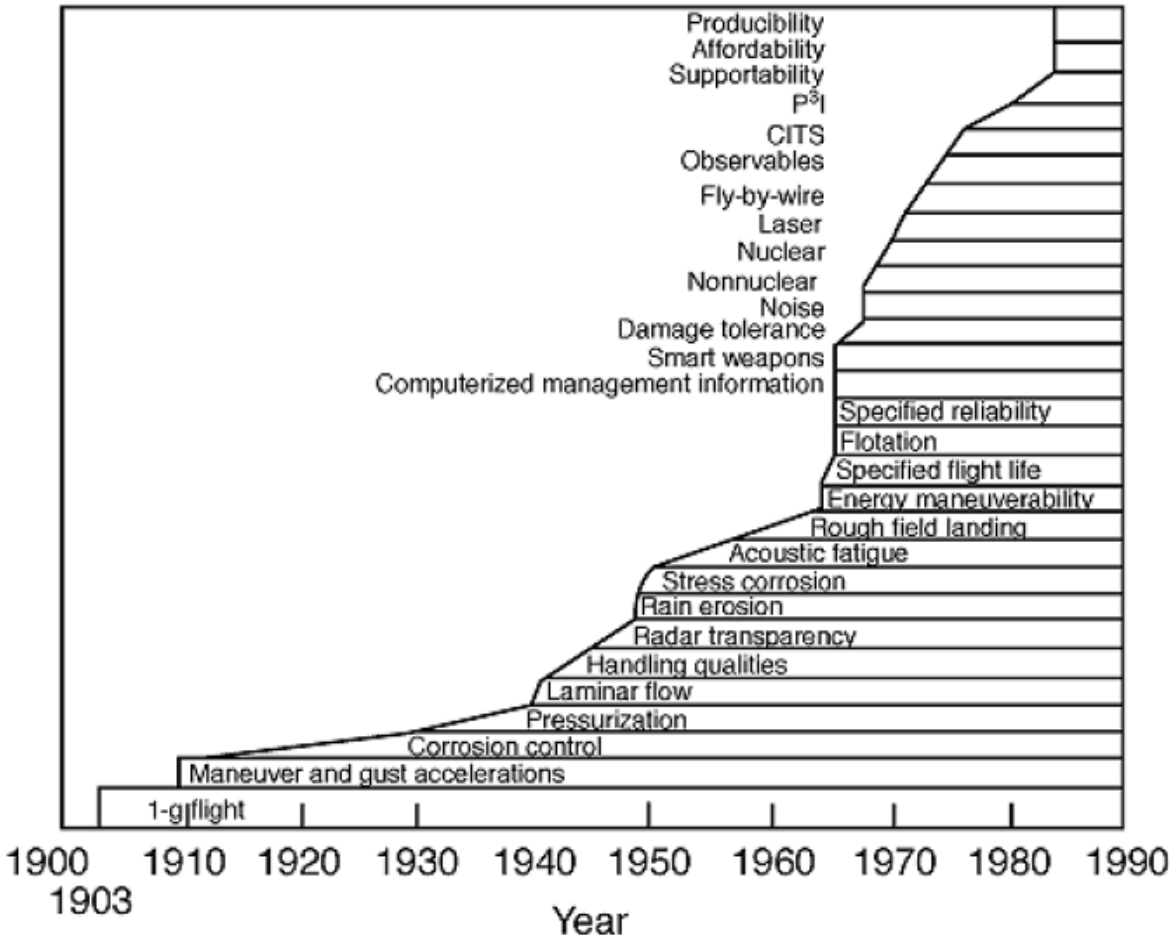
NOT THIS

What do they affect?

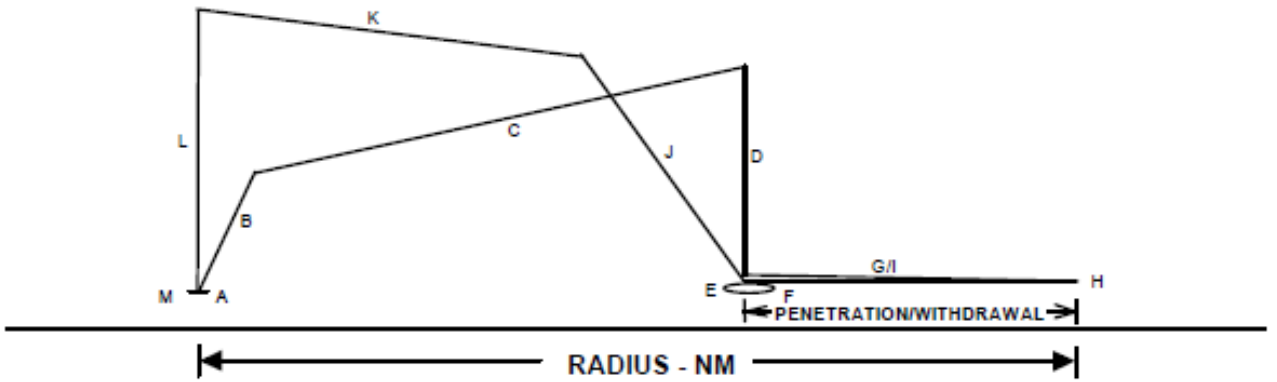


Client defines:

- Type & Role (Mission)
- Number of crew
- Payload
- Range
- Flight altitude & speed
- Ceilings
- Turn rates
- G-limits
- Runway Requirements
- Powerplant
- R&M targets
- Design standards
- Cost targets



Evolution of Aerospace Vehicle Design requirements



	SEGMENT	FUEL	TIME	DISTANCE	SPEED	ALTITUDE	THRUST SETTING (1)
A	WARM-UP, TAKEOFF, AND ACCELERATE TO CLIMB SPEED	20 MIN @ GROUND IDLE + 30 SEC @ TAKEOFF / MAXIMUM / IRT (A/B IF REQUIRED) + FUEL TO ACCELERATE FROM OBSTACLE CLEARANCE TO CLIMB SPEED @ IRT. NO DISTANCE CREDIT.					
B	CLIMB (PARA 4.2.2)				MINIMUM TIME CLIMB SCHEDULE (4)	TAKEOFF TO OPTIMUM CRUISE	INTERMEDIATE
C	CRUISE (PARA 4.2.3)				OPTIMUM CRUISE	OPTIMUM CRUISE	
D	DESCENT (PARA 4.2.8)	NONE	NONE	NO CREDIT		END CRUISE TO LOITER	
E	LOITER (PARA 4.2.6) (5)		10 MINUTES	NO CREDIT	INSTANTANEOUS CORNER SPEED	2000 FEET PRESS. ALT.	
F	ACCELERATE				LOITER TO PENETRATION	2000 FEET PRESS. ALT.	MAXIMUM/INTERMEDIATE
G	PENETRATION (PARA 4.2.4)			30 NM INCLUDING ACCEL	0.8 MACH OR Virt WHICHEVER IS LOWER	2000 FEET PRESS. ALT.	
H	COMBAT (2) and (3)	ONE 2000 FT ENERGY EXCHANGE PLUS ONE 180 DEG TURN @ (Virt - 50 KTAS) WITH MAX SUSTAINED G's @ MAXIMUM/MAXIMUM A/B. (1) EXPEND HALF OF AIR-TO-GROUND STORES. NO DISTANCE CREDIT.					
I	WITHDRAWAL (PARA 4.2.4)			30 NM	0.8 MACH OR Virt WHICHEVER IS LOWER	2000 FEET PRESS. ALT.	
J	CLIMB (PARA 4.2.2)				MINIMUM TIME CLIMB SCHEDULE (4)	2000 FEET PRESS ALT. TO OPTIMUM CRUISE	INTERMEDIATE
K	CRUISE (PARA 4.2.3)				OPTIMUM CRUISE	OPTIMUM CRUISE	
L	DESCENT (PARA 4.2.8)	NONE	NONE	NO CREDIT		END CRUISE TO LANDING	
M	RESERVES	20 MIN + 5% OF INITIAL FUEL		NO CREDIT	MAXIMUM ENDURANCE	SEA LEVEL	

*MIL-STD-3013A is a good reference for terms, mission profiles and requirements commonly encountered in mission specs.

Example:

USAF Advanced Tactical Fighter program (1982 RFI)

- Supercruise
- STOL
- Low Observability (stealth)
- Reduced cost of ownership

Later refined in the 1985 Statement of Operational Need

- Crew of one
- Combat radius of 800 nmi
- Supercruise up to Mach 2
- Ability to operate form 2,000 ft runway
- Long range first-look, first-shot, first-kill capability against any enemy aircraft
- Very stealthy to ensure outstanding survivability in combat (internal fuel & weapons)
- Excellent subsonic and supersonic maneuverability (upto 9g turn)
- Totally new integrated modular digital avionics system
- Double the F-15 sortie rate, 15 minute turnaround time, 75% of faults fixed within 4h
- Aircraft cost of $40 million for 750 aircraft, Life cycle cost comparable to F-15

D.C. Aronstein, “Advanced Tactical Fighter to F-22 Raptor”, AIAA, 1998
Sherman N. Mullin “The Evolution of the F-22 Advanced Tactical Fighter”, AIAA, 1992