Functional Requirements Design Ideas

Functional Requirements

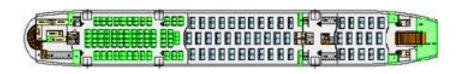
What not How

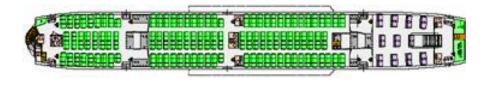
Design Ideas

How

Functional Requirements - What Design Ideas - How







(Courtesy of Airbus North America. Used with permission.)

Functional Criteria

| Criteria | Weight | Scale |
|------------------|--------|-------|
| Altitude | 50% | 1-5 |
| Cost | 20% | 1-5 |
| Turn Around Time | 10% | 1-5 |
| Durability | 10% | 1-5 |

Design Selection Matrix

| | Design 1 | Design 2 | Design 3 |
|------------------|----------|----------|----------|
| Altitude | | | |
| Cost | | | |
| Turn Around Time | | | |
| Durability | | | |
| TOTAL | | | |

Documentation

Explain

- How to make it
- How to operate it
- How to repair and service it
- How it works
- (Bonus) Why it may not work
 What can go wrong

Functional Requirements

What

not How

Functional Requirements - What not How -

Functional Requirements

- Available now
- Reasonable cost
- Sea-based, deep-interdiction
 - Carry heavy bomb loads for long distances
 - Precision strike
 - Carrier operation
- Highly maneuverable fighter
- Low radar signature

"Dash in, drop a lot of bombs,

Functional Requirements Design Ideas

| Functional Requirements | Design Ideas |
|---|---------------------|
| Available now | |
| • Reasonable cost | F-14D |
| • Sea-based, deep-interdiction | |
| Carry heavy bomb loads for long | F/A-18 |
| distances | + |
| | USAF |
| Precision strike | |
| Carrier operation | Su-27 |
| Highly maneuverable fighter | |
| • Low radar signature | |
| | JSF |
| "Dash in, drop a lot of bombs, | |

Design Selection

| TABLE 1 | F-18A | F-18E | F-14D | A-6E | Su-27 |
|--|------------|-----------|-----------|-----------|-----------|
| Weight empty (lb.) | 23,832 | 30,564 | 43,879 | 27,888 | 38,580 |
| Pilot and ammo (lb.) | 535 | 535 | 838 | 500 | 500 |
| Mm/no. of rounds | 20/570 | 20/570 | 20/675 | 0 | 30/150 |
| Internal fuel (lb.) | 10,860 | 14,400 | 16,200 | 15,939 | 20,723 |
| External fuel (lb.) | 7,431 | 7,206 | 3,854 | 0 | 0 |
| AAM (2); Sidewinders | 472 | 472 | 472 | 0 | 472 |
| No. of tanks/capacity | 3/330 | 2/480 | 2/280 | 0 | 0 |
| Bomb weight in lb. | 4,000 | 4,000 | 8,000 | 8,000 | 8,000 |
| Bombs: no. and type | (2) Mk 84* | (4) Mk 83 | (4) Mk 84 | (4) Mk 84 | (4) Mk 84 |
| Takeoff gross weight (lb.) | 47,130 | 57,177 | 73,253 | 52,327 | 68,275 |
| Takeoff fuel weight as % of gross takeoff weight | 37.5 | 36.8 | 27.4 | 30.5 | 30.4 |

Design Selection

| TABLE 2 | F-18A | F-18E | F-14D | A-6E | Su-27 |
|---|-----------|---------------|-----------|-------------|--------------------|
| Store stations | (2) 2,500 | Same as F-18A | (4) 2,000 | (5) 3,600 | (7) 2,000 |
| | (2) 2,350 | Same as F-18A | (2) 2,200 | _ | _ |
| | (1) 2,400 | Same as F-18A | (2) 1,800 | _ | _ |
| Wing area (sq. ft.) | 400 | 500 | 565 | 484 | 667 |
| Wingspan | 37.5 | 44.7 | 64.1/38.2 | 53 | 48.2 |
| Sea level static afterburner thrust (lb.) | 32,000 | 44,000 | 55,600 | 18,600 (*1) | 55,100 |
| Attack wing loading (bombs on board) (lb./sq. ft.) @ 60% fuel | 100 | 98 | 115 | 94.9 | 90 |
| Wing loading (bombs dropped) (lb./lb.) @ 60% fuel | 90 | 90 | 101 | NA | 78 |
| Attack thrust/weight (lb./lb.) @ 60% fuel | .80 | .90 | .85 | NA | .92 |
| Thrust/weight (bombs dropped; lb./lb.) @ 60% fuel | .89 | .98 | .97 | NA | 1.06 |
| Turning drag/lift factor | 28.5 | 24.4 | 15.9 | 16.4 | 25.8 |
| Attack-mission radius in n.m. | 290 (*2) | 390 (*2) | 402 (*2) | 500 (*2) | 420 (*2, *: |
| Radius x bomb load (R x B); n.m. x lb./10^6 or 1,000,000 | 1.16 | 1.56 | 3.22 | 4.00 | 3.36 |
| *1 No afterburner, *2 "Hi-lo-lo-hi" mission, *3 Probably low, | NA=not av | ailable | I | | I. |

Functional Criteria

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|--------------------------------|--------|-------|
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| Sea-based Deep Interdiction | 10% | 1-5 |
| Low Radar Signature | 20% | 1-5 |

Design Selection Matrix

| Functional Criteria | Design 1 | Design 2 | Design 3 |
|--------------------------------|----------|----------|----------|
| Available Now | | | |
| Reasonable Cost | | | |
| Sea-based Deep Interdiction | | | |
| Low Radar Signature | | | |
| TOTAL | | | |

Design Selection

| | F-14 | F/A-18 | Su-27 | JSF |
|-----------------------------|------|--------|----------|-----|
| Available Now | N□ | Y | Y | N |
| Reasonable Cost | N□ | ? | Y | N |
| Sea-based Deep Interdiction | Y | N | Y | Y |
| TOTAL | | | 1 | |

Functional Requirements - What not How -

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- "Dash in, drop a lot of bombs,

707

• 4 engines

727

• 3 engines

737

•2 engines

Airforce

• CTOL

F-16

Navy

• Carrier based

F-18

Marine

• STOVL

Harrier

737 NG•2 engines

737-600

737-700

737-800

737-900

Airforce

• CTOL

Joint Strike Fighter

Navy

• Carrier based

Marine

• STOVL

CF6-6

CF6-50

CF6-80A

CF6-80C2

CF6-80E1

CF-6

Oracle8i Database Family

- Oracle8i Enterprise Edition
- Oracle8i Standard Edition
- Oracle 8i Personal Edition
- Oracle8i Lite
- Oracle8i Appliance (h/w and s/w)