Standard Aircraft Characteristics

F-89C
SCORPION
Northrop

TWO J35-A-33A
ALLISON

F-89C (-33A ENGINES)

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BY AUTHORITY OF
THE SECRETARY
OF THE AIR FORCE

RESTRICTED
POWER PLANT
No. & Model ............. *(2) J35-A-33A
Mfr. .................. Allison
Engine Spec No. ........ 316A
Type .................. Axial
Length .................. 189.5'
Diameter ................. 37.0'
Weight (dry) ............ 2725 lb
Tail Pipe ........ Auto, Two-Position
Augmentation .......... Afterburning
*See page 6, note (c)

MISSION AND DESCRIPTION
Navy Equivalent: None
Mfr's Model: N-35

The principal mission of the F-89C is the interception and destruction of hostile aircraft under night and inclement weather conditions.

This airplane carries a crew of two (pilot and radar operator) seated in tandem in a cockpit having selective automatically controlled heating and pressurization facilities. The airplane is equipped with a full power control system, yaw stabilizer, all-weather interception radar, Instrument Landing System, A-1 Flight Computer, thermal anti-icing, split-surface type speed brakes, double-slotted wing flaps, ejection seats and anti-G suit provisions. An E-1 Fire Control System is utilized.

DEVELOPMENT
This F-89C is similar to the F-89B except for installation of J35-A-33A engines, addition of tip tank fuel dumping system, selective cabin air conditioning and pressurization system and aerodynamically balanced elevators.

First Flight (XF-89) .................. Aug 48
First Flight (YF-89A) .............. Nov 49
First Acceptance (With J35-A-33A engine) ............ Jul 52
Production Completed ........ Nov 52

ENGINE RATINGS
S. L. Static LB RPM MIN
Max: *6950 - 8000 - 5
Mil: 5400 - 8000 - 30
Nor: 4800 - 7650 - Cont
*With afterburner operating
NOTE: Values are for engine with fixed inlet screens

DIMENSIONS
Wing
Span* ............... 56.0'
Incidence (root) 1°30'
(Tip) 1°30'
Dihedral ............... 1°
Sweepback (LE) 5°8'
Length .................. 53.5'
Height .................. 17.5'
Tread ................. 21.9'
*Includes non-jettisonable tip tanks

BOMBS
NONE

GUNS
No Type Size Rds ea Location
6.5M-24A-L, 20mm, 200, Fus, nose

ROCKETS
NONE

WEIGHTS
Loading Lb L.F.
Empty .................. 24,958(A)
Basic ............... 26,334(A)
Design .............. 33,693 5.67
Combat (Point) ........ 33,137 5.67
Combat (Area) ........ 32,428 5.67
Max T.O. .............. 37,619 3.67
Max Land .............. 33,593

(A) Actual
* For Basic Mission
↑ Limited by mission
↓ Limited by sinking speed

FUEL
Location No. Tanks Gal
Wg, inbd ........... 2 214
Wg, outbd ....... 2 535
Fus* ............... 2 202
Wg, ext ........... 2 506
Total ............. 1559
Grade ............... JP-4
Specification ...... MIL-F-5624A

OIL
Fus, eng ........... 2 (tot) 7
Grade ............... 1010
Specification ...... MIL-0-6081
*Self-Sealing

ELECTRONICS
UHF Command ...... AN/ARC-27
Omni-Direct ........ AN/ARN-14
Glide Path ........ AN/ARN-18
Radio Compass ...... AN/ARN-6
Radar Ranging ...... AN/APC-33
IFF ..................... AN/APX-6
Interphone ........ AN/AIC-2
Marker Beacon ...... AN/ARN-12

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## Loading and Performance—Typical Mission

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>BASIC MISSION</th>
<th>POINT INTERCEPT</th>
<th>AREA INTERCEPT</th>
<th>POINT INTERCEPT ALTERNATE</th>
<th>ESCORT</th>
<th>FERRY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAKE-OFF WEIGHT (lb)</td>
<td>37,619</td>
<td>37,619</td>
<td>33,693</td>
<td>37,819</td>
<td>36,869</td>
<td></td>
</tr>
<tr>
<td>Fuel at 5, 5 lb per gal (grade JP-4) (lb)</td>
<td>10,075</td>
<td>10,075</td>
<td>6149</td>
<td>10,075</td>
<td>10,075</td>
<td></td>
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<tr>
<td>Payload (Ammunition) (lb)</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Wing loading (lb/sq ft)</td>
<td>59.0</td>
<td>55.0</td>
<td>52.9</td>
<td>59.0</td>
<td>57.8</td>
<td></td>
</tr>
<tr>
<td>Stall speed (power off) (kn)</td>
<td>112</td>
<td>112</td>
<td>106</td>
<td>112</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>Take-off to 30 ft (min)</td>
<td>2540</td>
<td>2540</td>
<td>1950</td>
<td>2540</td>
<td>2420</td>
<td></td>
</tr>
<tr>
<td>Rate of climb at 30 ft (fpm)</td>
<td>10,500(5)</td>
<td>10,500(5)</td>
<td>10,500(5)</td>
<td>4500</td>
<td>4630</td>
<td></td>
</tr>
<tr>
<td>Rate of climb at 40,000 ft (fpm)</td>
<td>2910(5)</td>
<td>2910(5)</td>
<td>2910(5)</td>
<td>2390</td>
<td>2480</td>
<td></td>
</tr>
<tr>
<td>Time: SL to 40,000 ft (min/f)</td>
<td>8.81(5)</td>
<td>34.7(5)</td>
<td>8.4(5)</td>
<td>6.3/20,000</td>
<td>6.0/20,000</td>
<td></td>
</tr>
<tr>
<td>Time: SL to 50,000 ft (min/f)</td>
<td>26.2(5)</td>
<td>17.5(5)</td>
<td>17.5(5)</td>
<td>13.1/30,000</td>
<td>12.5/30,000</td>
<td></td>
</tr>
<tr>
<td>Service ceiling (100 fpm) (ft)</td>
<td>52,700(5)</td>
<td>52,700(5)</td>
<td>52,700(5)</td>
<td>37,000</td>
<td>37,400</td>
<td></td>
</tr>
<tr>
<td>Service ceiling (one engine out) (ft)</td>
<td>28,000</td>
<td>31,000</td>
<td>28,000</td>
<td>28,000</td>
<td>28,600</td>
<td></td>
</tr>
<tr>
<td>COMBAT RANGE (n, mi.)</td>
<td>297</td>
<td>222</td>
<td>222</td>
<td>222</td>
<td>222</td>
<td></td>
</tr>
<tr>
<td>COMBAT RADIUS (n, mi.)</td>
<td>423</td>
<td>423</td>
<td>423</td>
<td>423</td>
<td>423</td>
<td></td>
</tr>
<tr>
<td>Average cruising speed (kn)</td>
<td>35,700</td>
<td>36,000</td>
<td>36,000</td>
<td>36,000</td>
<td>36,000</td>
<td></td>
</tr>
<tr>
<td>Initial cruising altitude (ft)</td>
<td>39,000</td>
<td>39,000</td>
<td>39,000</td>
<td>39,000</td>
<td>39,000</td>
<td></td>
</tr>
<tr>
<td>Final cruising altitude (ft)</td>
<td>1,54</td>
<td>1,42</td>
<td>1,42</td>
<td>1,42</td>
<td>1,42</td>
<td></td>
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<tr>
<td>Total mission time (hr)</td>
<td>1.71</td>
<td>0.36</td>
<td>0.36</td>
<td>0.36</td>
<td>0.36</td>
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<tr>
<td>TOTAL MISSION TIME (hr)</td>
<td>46,800</td>
<td>49,200</td>
<td>49,200</td>
<td>49,200</td>
<td>49,200</td>
<td></td>
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<tr>
<td>Intercruise altitude (ft)</td>
<td>32,428</td>
<td>32,428</td>
<td>32,428</td>
<td>32,428</td>
<td>32,428</td>
<td></td>
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<tr>
<td>COMBAT WEIGHT (lb)</td>
<td>33,137</td>
<td>32,487</td>
<td>32,487</td>
<td>33,446</td>
<td>28,630</td>
<td></td>
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<tr>
<td>Combat altitude (ft)</td>
<td>46,800</td>
<td>47,250</td>
<td>47,250</td>
<td>47,250</td>
<td>47,250</td>
<td></td>
</tr>
<tr>
<td>Combat speed (kn)</td>
<td>463</td>
<td>465</td>
<td>465</td>
<td>492</td>
<td>493</td>
<td></td>
</tr>
<tr>
<td>Combat climb (fpm)</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>3045</td>
<td>2685</td>
<td></td>
</tr>
<tr>
<td>Combat ceiling (500 fpm) (ft)</td>
<td>46,800</td>
<td>47,250</td>
<td>47,250</td>
<td>40,200</td>
<td>46,600</td>
<td></td>
</tr>
<tr>
<td>Service ceiling (100 fpm) (ft)</td>
<td>49,200</td>
<td>49,200</td>
<td>49,200</td>
<td>49,200</td>
<td>49,200</td>
<td></td>
</tr>
<tr>
<td>Service ceiling (one engine out) (ft)</td>
<td>31,400</td>
<td>34,300</td>
<td>34,300</td>
<td>23,100</td>
<td>23,100</td>
<td></td>
</tr>
<tr>
<td>Max rate of climb at SL (fpm)</td>
<td>10,420</td>
<td>10,720</td>
<td>10,720</td>
<td>10,330</td>
<td>12,580</td>
<td></td>
</tr>
<tr>
<td>Max rate at optimum altitude (kn)</td>
<td>546/10,500</td>
<td>546/10,500</td>
<td>546/10,500</td>
<td>546/10,500</td>
<td>546/10,500</td>
<td></td>
</tr>
<tr>
<td>Basic speed at 49,000 ft (kn)</td>
<td>487</td>
<td>481</td>
<td>481</td>
<td>498/35,000</td>
<td>498/35,000</td>
<td></td>
</tr>
<tr>
<td>LANDING WEIGHT (lb)</td>
<td>28,916</td>
<td>29,500</td>
<td>29,500</td>
<td>29,500</td>
<td>28,630</td>
<td></td>
</tr>
<tr>
<td>Ground roll at SL (ft)</td>
<td>2530</td>
<td>2575</td>
<td>2575</td>
<td>2575</td>
<td>2510</td>
<td></td>
</tr>
<tr>
<td>Total from 50 ft (ft)</td>
<td>3875</td>
<td>3735</td>
<td>3735</td>
<td>3735</td>
<td>3650</td>
<td></td>
</tr>
</tbody>
</table>

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**NOTES**

1. Max power.
2. Military power.
4. Includes the following times for take-off and acceleration to best climb speed: Mission I 1.7 min., Mission II 1.5 min., Mission III 1.5 min.
5. Allowances made for weight reduction during ground operation and climb.
6. Time is to service ceiling.
7. See note (b) page 6.

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**PERFORMANCE BASIS**

(a) Data source: Based on flight tests of F-89A aircraft.
(b) Performance is based on powers shown on page 3.
NOTES

FORMULA: POINT INTERCEPT MISSION I AND MISSION III

Take-off, accelerate to best climb speed, climb on course to combat ceiling at maximum power, combat for five minutes at combat ceiling with maximum power, and loiter at 35,000 ft at maximum endurance speed. Allowances include two minutes at normal power and one minute at maximum power at sea level for start and take-off, and 20 minutes at maximum endurance speed at sea level for reserve and landing.

FORMULA: AREA INTERCEPT MISSION II

Take-off, climb on course to cruise ceiling at military power, cruise on course at long range speed at cruise ceiling, climb on course to combat ceiling at maximum power, combat for five minutes, and cruise back to base at long range speed at cruise ceiling. Range free allowances include two minutes at normal power and one minute at maximum power at sea level for start and take-off, five minutes at maximum power at combat ceiling for combat, 5% of initial fuel and 20 minutes at maximum endurance speed at sea level for reserve and landing.

FORMULA: RADIUS MISSION IV

Take-off, climb on course to cruise ceiling at military power, cruise on course at long range speed at cruise ceiling, combat for 20 minutes cruise to base at long range speed at cruise ceiling. Range free allowances include five minutes at normal power and one minute at maximum power at sea level for start and take-off, five minutes at maximum power and 15 minutes at military power at 35,000 ft for combat, 5% of initial fuel and 20 minutes at maximum endurance speed at sea level for reserve and landing.

FORMULA: RANGE MISSION V

Take-off, climb on course to cruise ceiling at military power and cruise to destination at long range speed at cruise ceiling. Range free allowances include five minutes at normal power and one minute at maximum power at sea level for start and take-off, 5% of initial fuel and 20 minutes at maximum endurance speed at sea level for reserve and landing.

GENERAL NOTES:

(a) For detailed planning refer to Technical Order AN 01-15FDC-1 and other applicable technical orders.

(b) Below 20,000 ft, limit IAS = 470 km, or $M = 0.90$ whichever is less (temporarily restricted to 425 IAS or 0.90 Mach below 20,000 ft by T.O. 01-15FD-173, 4 March 1953, pending structural demonstrations).

(c) This brochure covers airplanes AF 51-5872 thru 51-5886 with J35-A-33A engines installed. Early F-89C's (AF 50-741 thru 50-804) have J35-A-21B engines; other F-89C's (AF 51-5787 thru 51-5801) have J35-A-33 engines. Aircraft performance with -33A's is essentially the same as the -33A's.

(d) Engine rating shown on page 3 are manufacturer's guaranteed ratings. Power values used in performance calculations are as follows:

<table>
<thead>
<tr>
<th>(2) J35-A-33A</th>
<th>S, L, Static</th>
<th>LB</th>
<th>RPM</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max:</td>
<td>*7400</td>
<td>8000</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Mil:</td>
<td>5600</td>
<td>8000</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Nor:</td>
<td>4900</td>
<td>7650</td>
<td>Cont</td>
<td></td>
</tr>
</tbody>
</table>

*With afterburner operating (with inlet screens installed)

PERFORMANCE REFERENCE:


REVISION BASIS:

To reflect latest characteristics and performance data.

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