Umlauf 352

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TECHNICAL NOTE

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Team Section: JET - AIRCRAFT DEFINITION

Title/Subject: X-100 AIRCRAFT DEFINITION NOTE

No. of pages :

Summary :

This note defines the X-100 Configuration as jointly agreed by DASA/Alenia/Aérospatiale during the Joint Programme Evaluation Phase. It is a new "Baseline" or "Example" Aircraft, to be refined and optimized by the future partners.

Modification	Date	No. of pages	Revised pages	Valid from
2	22.03.91			

	Prepared	Checked	Approved	Released internally	Released externally
Name:	Borchard/Hagen/Dr. Klug		Dr. Klug	Fischer	Krenz
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EC-F-8/003

3. GEOMETRY

3.0 Main Dimensions

Wing Span	(m)	30,358
Wing Area	(m^2)	96,00
Length, Overall	(m)	28,530
Length of Fuselage	(m)	28,530
at belly fairing	(m)	3,810
Height of Fuselage	(m)	3,790
Width of Fuselage	(m)	3,450
Height, Overall	(m)	10,284
Wheel Track	(m)	6,748
Wheel Base	(m)	11,223

3.1 Wing

3.1.1 Wing Main Data

Wing Reference Area	(m^2)	96
Aerodynamic Mean Chord (A.M.C.)	(m)	3,618
Geometric Mean Chord (G.M.C.)	(m)	TBD
Span	(m)	30,358
Aspect Ratio	(-)	9,6
Taper Ratio (Tip Chord/Root Chord)	(-)	0,26
Root Chord*	(m)	5,176
Kink Chord	(m)	3,428
Tip Chord (Nominal)	(m)	1,362
Sweep Angle (25 %)	(°)	23,5
Relative Thickness		
(Root*/Kink/Tip)	(%)	15,00/11,52/11,00
Root*-Wing-Setting	(°)	TBD
Dihedral of Wing Reference Area	(°)	5,0
Dihedral of Trailing Edge at Wing		
Root*	(°)	TBD
Dihedral of Trailing Edge at Kink	(°)	TBD

* Here, root is taken at fuselage side, i.e. max. width

3.1.2 Wing, Movable Parts

<u>Flaps</u>

Type:		Single slotted, Fowler	
Projected Area	inboard, per side	(m^2)	3,44
	outboard, per side	(m^2)	5,19
Span	inboard section	(mm)	3588
	outboard section	(mm)	6831
Chord	inboard section	(mm)	960
	outboard section		
	- root	(mm)	960
	- tip	(mm)	559
Max. Deflection, High Lift Mode		(°)	35

<u>Slats</u>

Number per side	(-)	4
Area per side	(m^2)	4,52

<u>Aileron</u>

Area (aft of hinge line) per side		(m^2)	1,25
Span (aft of hinge line)		(mm)	2581
Chord (aft of hinge line)	- root	(mm)	559
	- tip	(mm)	408

<u>Spoiler</u>

Number	per side		4
Area	outboard, per side	(m^2)	3,16
	~~inboard, per side~~	~~(m^2)~~	~~1,15~~
	~~total, per side~~	~~(m^2)~~	~~4,31~~
Span	each spoiler, }	(mm)	1865
	inboard }	(mm)	1828
	to }	(mm)	2099
	outboard }	(mm)	2548

3.2 Fuselage

3.2.1 Main Dimensions

Fuselage Length	(m)	28,530
Length of Cylindrical Part	(m)	12,639
Width/Height of Cylindrical Part	(m)	3,450/3,790
Distance from Nose to 25 % AMC Wing	(m)	12,827

3.3 Cabin and Cargo Hold

3.3.1 Doors

Location	Dimens. (in x in)	Dimens. (mmxmm)	Sill Height (mm)
Cabin Forward LH	72 x 34		3108
Cabin Forward RH	55 x 30		3108
Cabin Rear LH	72 x 30		3108
Cabin Rear RH	55 x 30		3108
Cargo Hold Forward RH		1442x1118	1840
Cargo Hold Rear RH		1422x1118	1914

3.3.2 Cabin

Cabin Length (excl. Cockpit)	(mm)	19891
Max. Length Seating Area	(mm)	15875
Max. Height	(mm)	2160
Max. Width	(mm)	3228
Floor Width	(mm)	3023
Hatrack Volume (all y)		
- per m, per side	(m^3)	0,395
- total	(m^3)	6,271

3.3.3 Cargo Hold

Forward Hold

Length	(mm)	4070
Height	(mm)	1108
Floor Area	(m^2)	4,070
Total/Usable Volume	(m^3)	8.75/8.01

Rear Hold

Length	(mm)	6452
Height	(mm)	1108
Floor Area	(m^2)	6,227
Total/Usable Volume	(m^3)	13,08/12,34

3.4 Vertical Tail

Vertical Tail Area	(m^2)	17,20
A.M.C.	(m)	3,52
G.M.C.	(m)	TBD
Span	(m)	5,268
Aspect Ratio	(-)	1,614
Taper Ratio (Tip Chord/Root Chord)	(-)	0,348
Root Chord (Nominal)	(m)	4,846
Tip Chord (Nominal)	(m)	1,684
Sweep Angle (25 %)	(°)	35
Relative Thickness	(%)	11
Distance Fuselage Reference Line/ Root Chord (Nominal)	(m)	1,307
Rudder Area	(m^2)	5,16
Rudder Span in % Total Span	(%)	100
Hinge Line at % of AMC	(%)	70
Rudder Chord - root	(m)	1,454
Rudder Chord - tip	(m)	0,505
Rudder Movement (Operation)	(°)	TBD
Rudder Movement (for Structure Possibilities)	(°)	TBD
Area Ratio Vertical/Wing		0,1792
Distance 25 % AMC Wing to 25 % AMC Fin	(m)	11,780
Tail Volume		0,583

Note: Vertical tail area must be checked for stability and control

3.5 Horizontal Tail

Tailplane Reference Area	(m^2)	25,0
Net Area		TBD
A.M.C.	(m)	2,425
G.M.C.	(m)	TBD
Span	(m)	11,181
Aspect Ratio	(-)	5,0
Taper Ratio (Tip Chord/C/L Chord)	(-)	0,330
Centre Line Chord (Aircraft C/L)	(m)	3,362
Tip Chord	(m)	1,110
Sweep Angle (25 %)	(°)	28
Dihedral	(°)	6
Relative Thickness (Root/Tip)	(%)	10/10
Elevator Reference Area (total)	(m^2)	5,94
Elevator Span per side	(m)	4,777
Elevator Hinge Line at % AMC	(%)	70
Elevator Chord - root	(m)	0,911
- tip	(m)	0,333
Stabilizer Movement	(°)	TBD
Elevator Movement	(°)	TBD
Distance 25 % AMC Wing to 25 % AMC Tailplane	(m)	12,516
Area Ratio Tailplane/Wing		0,260
Tail Volume		0,901

Note: Horizontal tail area must be checked for stability and control

ATA 24 Electrical Power

Power will be generated by two engine-driven 60 KVA generators (one per engine). The generators supply 115/200 V AC power to the electrical distributing system. Engine-driven generators shall be of IDG type. A Variable Speed, Constant Frequency or Variable Frequency, Constant Frequency electrical power system is under consideration.

An auxiliary generator driven by the APU is mainly used for ground operation, but can also substitute an engine-driven generator in case of failure. The auxiliary generator will produce 115/200 V 400 Hz AC power; DC busses will be fed via TRU's (transformer-rectifier unit).

Emergency power is provided by two batteries and one single phase static inverter. Batteries can start the APU.

In case of double engine failure, a RAT (Ram Air Turbine) will be extended automatically. This provides hydraulic and electric power to supply essential AC power and, via a TRU, essential DC power.

ATA 25 Equipment/Furnishing

SEE 2.3

ATA 26 Fire Protection

Conventional fire detection and extinguishing systems will be used.

ATA 27 Flight Controls

The flight control system comprises the following surfaces:

Directional Control	1 rudder
Roll Control	1 aileron on each wing, complemented by spoilers
Pitch Control	trimmable horizontal stabilizer with an elevator on each side
Airbrakes	symmetrical operation of spoilers on each wing
Lift Dumping	symmetrical operation of all spoilers on each wing
Slats	4 segments on each wing
Flaps	2 segments on each wing

All control surfaces are fully hydraulically powered and electrically signalled in normal operation.

The trimmable horizontal stabilizer and the rudder are also mechanically signalled.

Pilot controls consist of two side-stick controllers one on each side console. Rudder pedals, pitch trim wheels, etc. are of conventional design.

The computer system for flight control will comprise two dissimilar computers in charge of primary and secondary flight control functions.

ATA 28 Fuel System

There is a conventional fuel system with fuel storage in both outer wing boxes and an optional center tank for fuel capacity enlargement.

ATA 29 Hydraulic Power

Hydraulic power is used to operate primary and secondary flight controls and the landing gear system.

There are three independent hydraulic systems among which the users are shared in order to ensure safe aircraft control in the event of loss of any two systems. Hydraulic power is generated by two engine-mounted variable displacement piston pumps for two systems and one electrical pump for the third system. In case of loss of hydraulic power due to engine failure, there are electrically driven hydraulic pumps in each system or a power transfer unit will be installed to ensure landing gear operation.

Emergency power is provided by a ram air turbine-driven pump for one system, to be used in case of double engine failure.

ATA 30 Ice and Rain Protection

The leading edge (slats) outward of the engine pylons will be protected by a conventional system using hot bleed air from the engines.

An ice protection system for the empennage is not required (Note: This assumption must be verified!).

Windshields and miscellaneous probes and other items (e. g. drain mast) will be protected by electric heating.

6. DESIGN CRITERIA AND LIMITATIONS

6.1 Speeds

V_A (Manoeuvering)	kts CAS	TBD
V_B (Gust)	kts CAS	TBD
V_{MO}	kts CAS	340
M_{MO}	-	0,81
V_D	kts CAS	370 (with overspeed protection system)
M_D	-	0,88

6.2 Manoeuvre Loads

Manoeuvre Load Factor	+ 2,5 - 1

6.3 Max. Flight Level

Max. Flight Level ft	39000

6.4 Cabin Pressure Altitude

Design Pressure Differential	psi 8,06

6.5 Fatigue Life Design

Crack-free fatigue life 25000 cycles.

Structural endurance under normal operating conditions allowing for minor repairs, but not for replacement of major structural parts

60000 hrs/75000 cycles

TABLE 8-1

DESIGN REQUIREMENTS AND OBJECTIVES - PERFORMANCE

Range (full pax, 0.77 Mach)	
X-100, X-200	1500 nm
X-200ER	2300 nm
X-100ER	not defined
Take-off	
SL ISA, full pax	
X-100	5000 ft
X-200	5250 ft
ER-versions	not defined
Denver (5330 ft elev., ISA + 31° C) full pax, 1000 nm mission	12000 ft
One Engine Out Net Ceiling	
Engine failure 30 minutes after T.O., full pax, 500 nm mission, ISA + 10° C, Anti-icing off	19000 ft
Engine failure at T.O., full pax, 500 nm mission, ISA + 10° C, Anti-icing on	12000 ft
Speed	
M_{MO}	0.81
V_{MO}	340 kts CAS
M_{Cruise}	0.77

TABLE 8-2

PERFORMANCE SUMMARY

Range (full pax, Mach .77, 35000 ft)	1500	nm
Take-off (SL ISA, MTOW)	4400	ft
Take-off (Denver: 5330 ft elev., ISA + 31° C) (full pax, 1000 nm mission)	9650	ft
One Engine Out Net Ceiling, geopotential (full pax, 500 nm mission, ISA + 10° C, Anti-icing off)	19500	ft
One Engine Out Net Ceiling 12000 ft (full pax, 500 nm mission, ISA + 10° C, Anti-icing on)	after 90 nm	
AEO Ceiling (Initial Cruise Altitude, 500 ft/min rate of climb at M=.75, ISA +10°, 97 % MTOW)	36500	ft
Time to climb to 31000 ft, TOW 500 nm, full pax		
climb schedule 250/330/.75	21	min
climb schedule 250/280/.75	15	min
Approach Speed (MLW)	116	kts CAS
Landing Field, SL ISA, dry runway	3850	ft