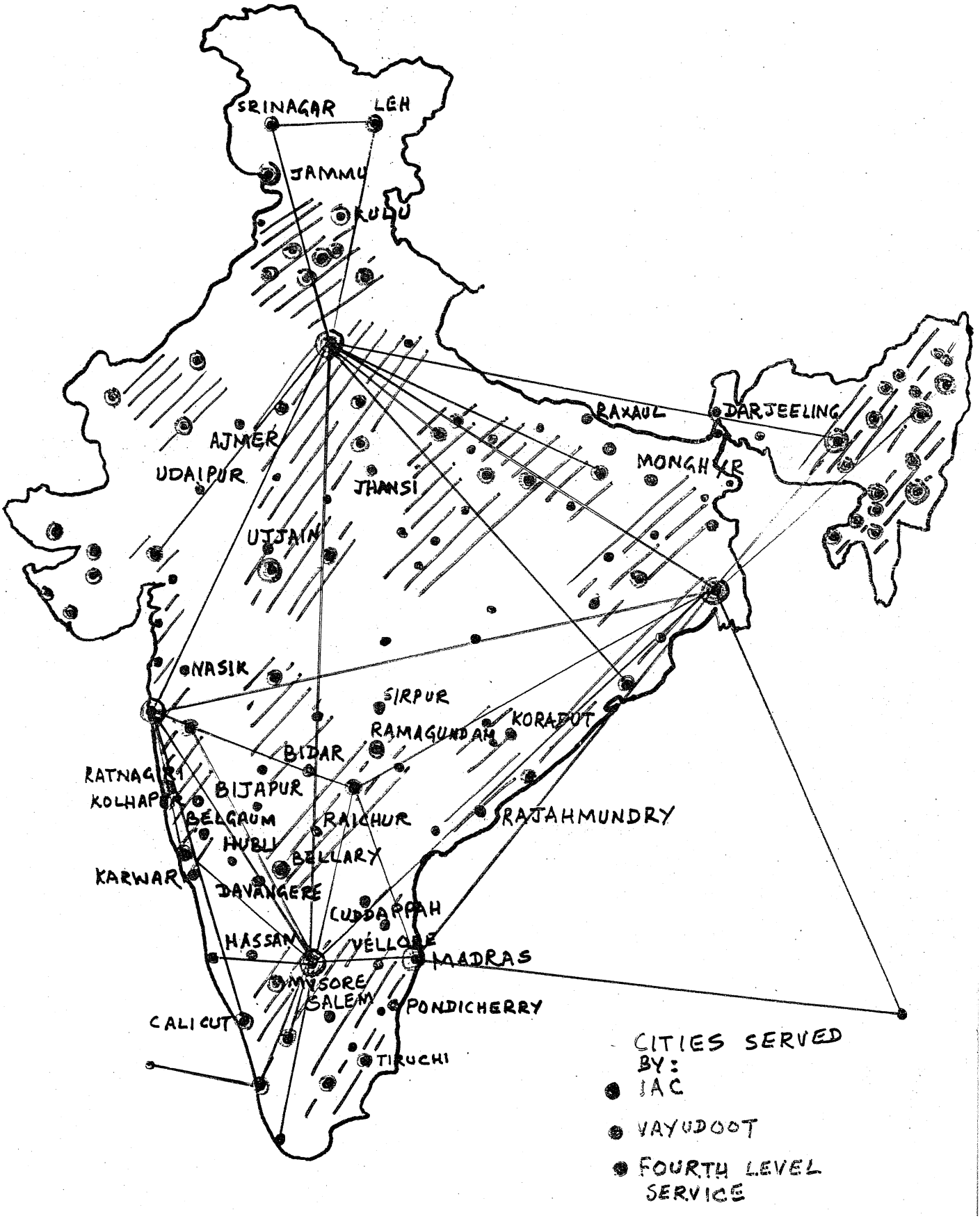
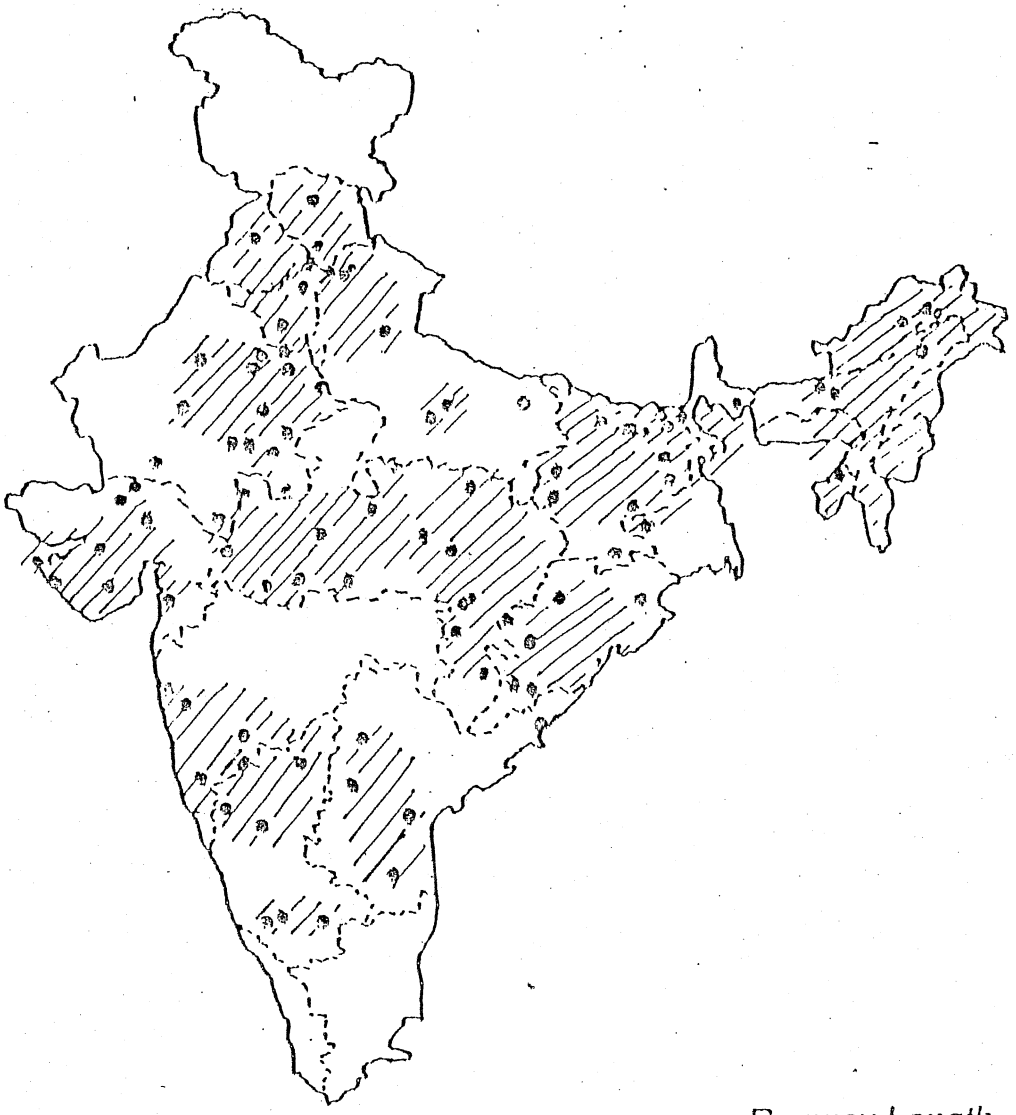
INDIAN AIRLINES & VAYUDOOT NETWORKS

7-4



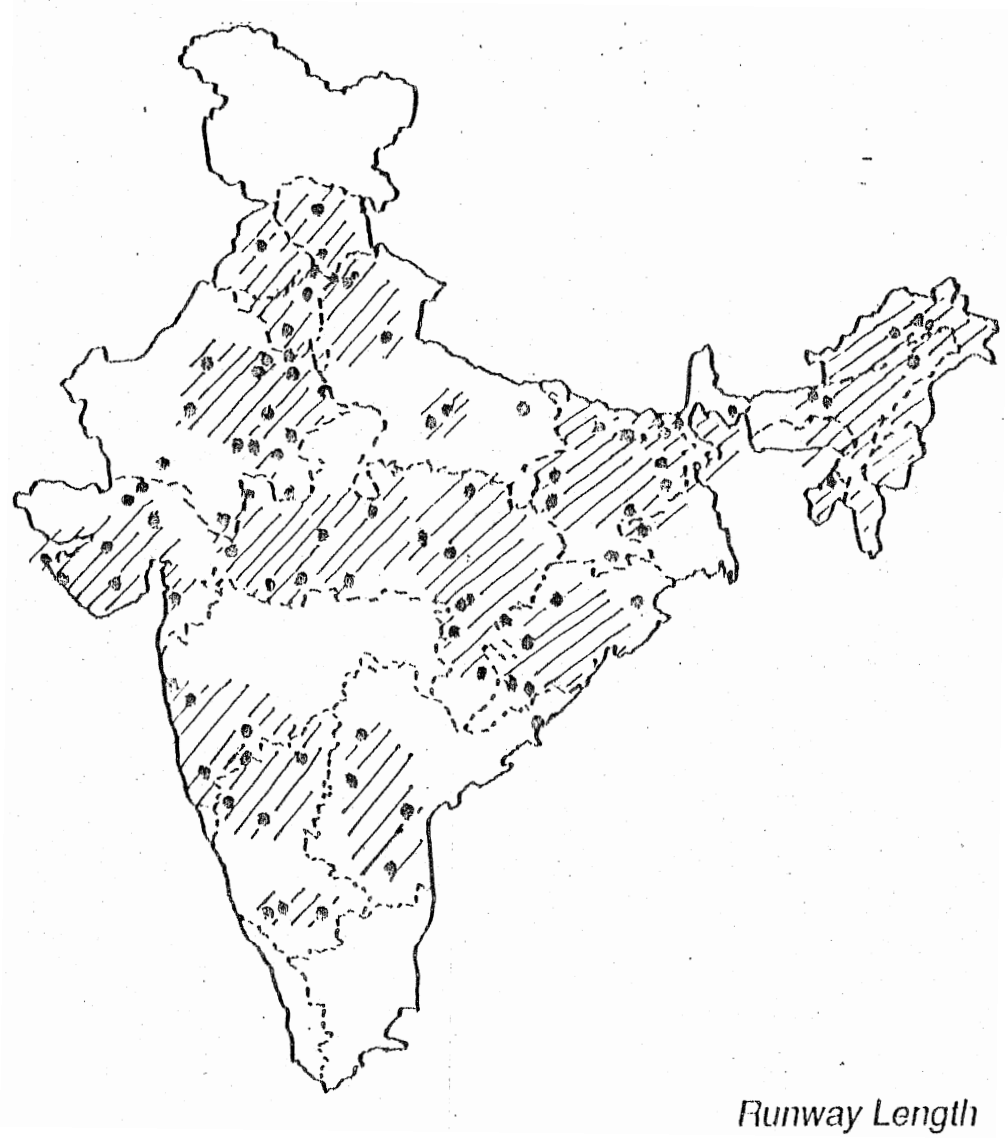
Distribution of Airfields Suitable for Community Aerial Services



Runway Length

- 900m to 1200m
- 600m to 900m

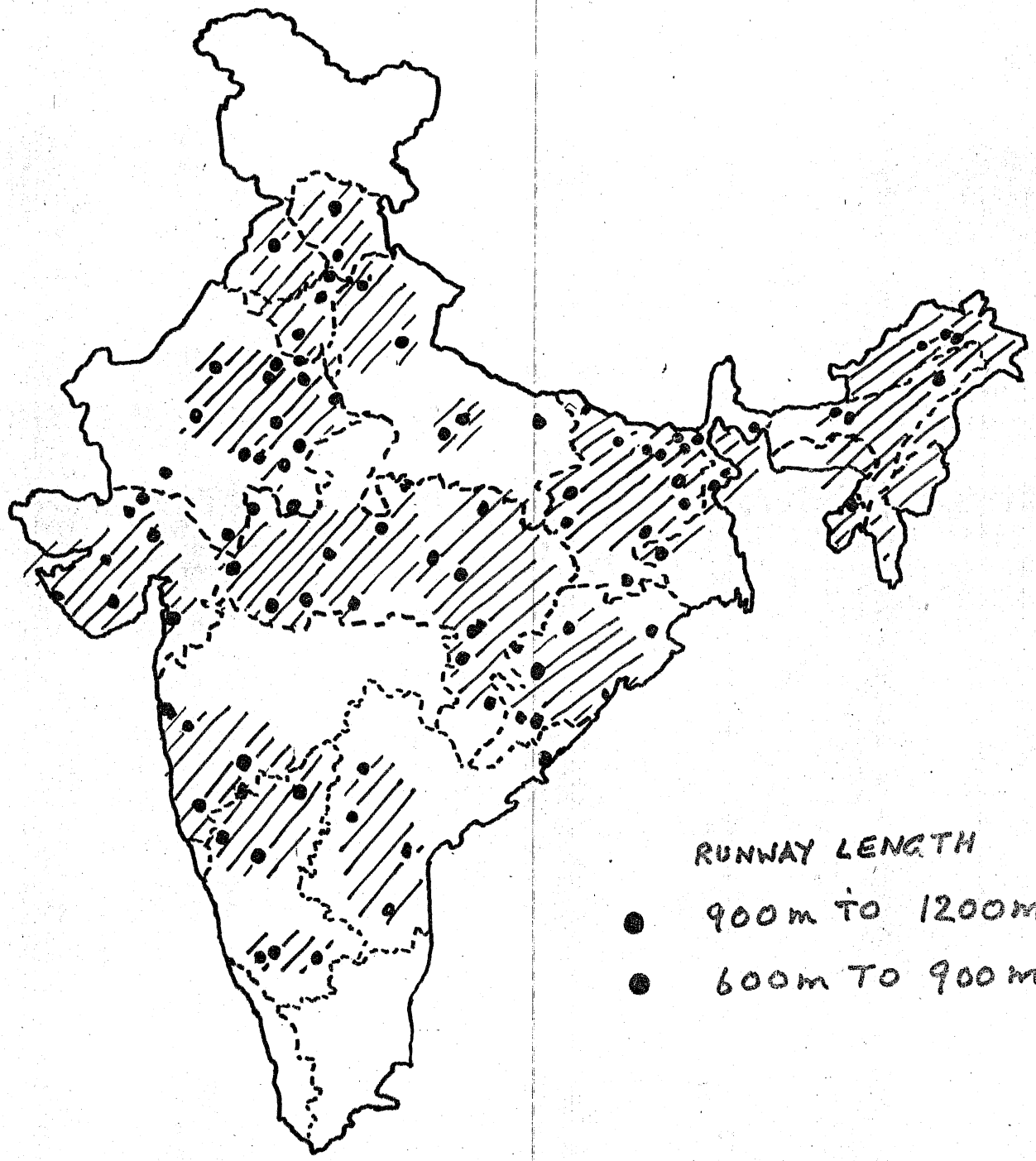
Distribution of Airfields Suitable for Community Aerial Services



Runway Length

- 900m to 1200m
- 600m to 900m

DISTRIBUTION OF AIRFIELDS SUITABLE FOR COMMUNITY AERIAL SERVICES



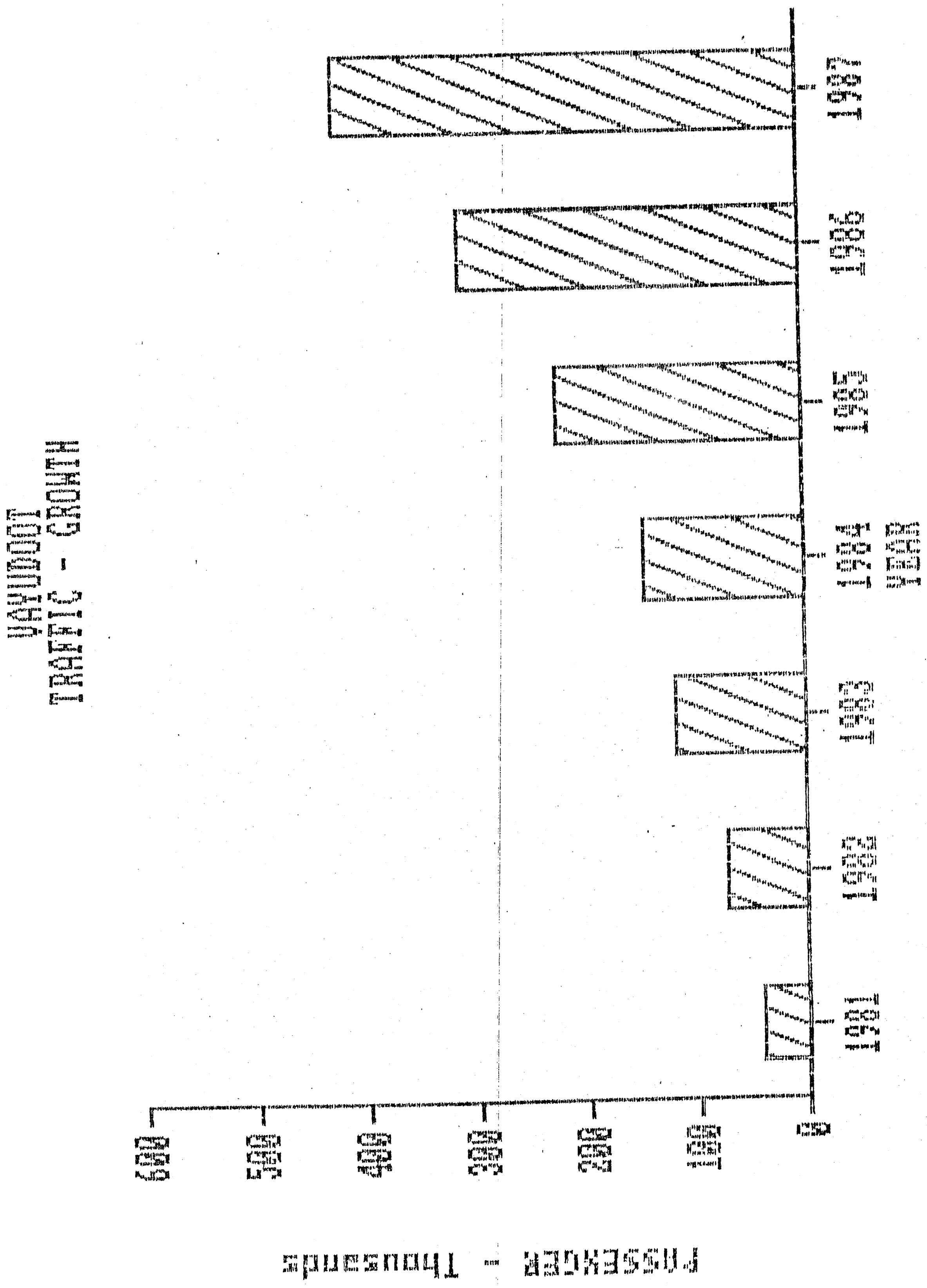


Fig 4: Vayudoot - Traffic Growth.

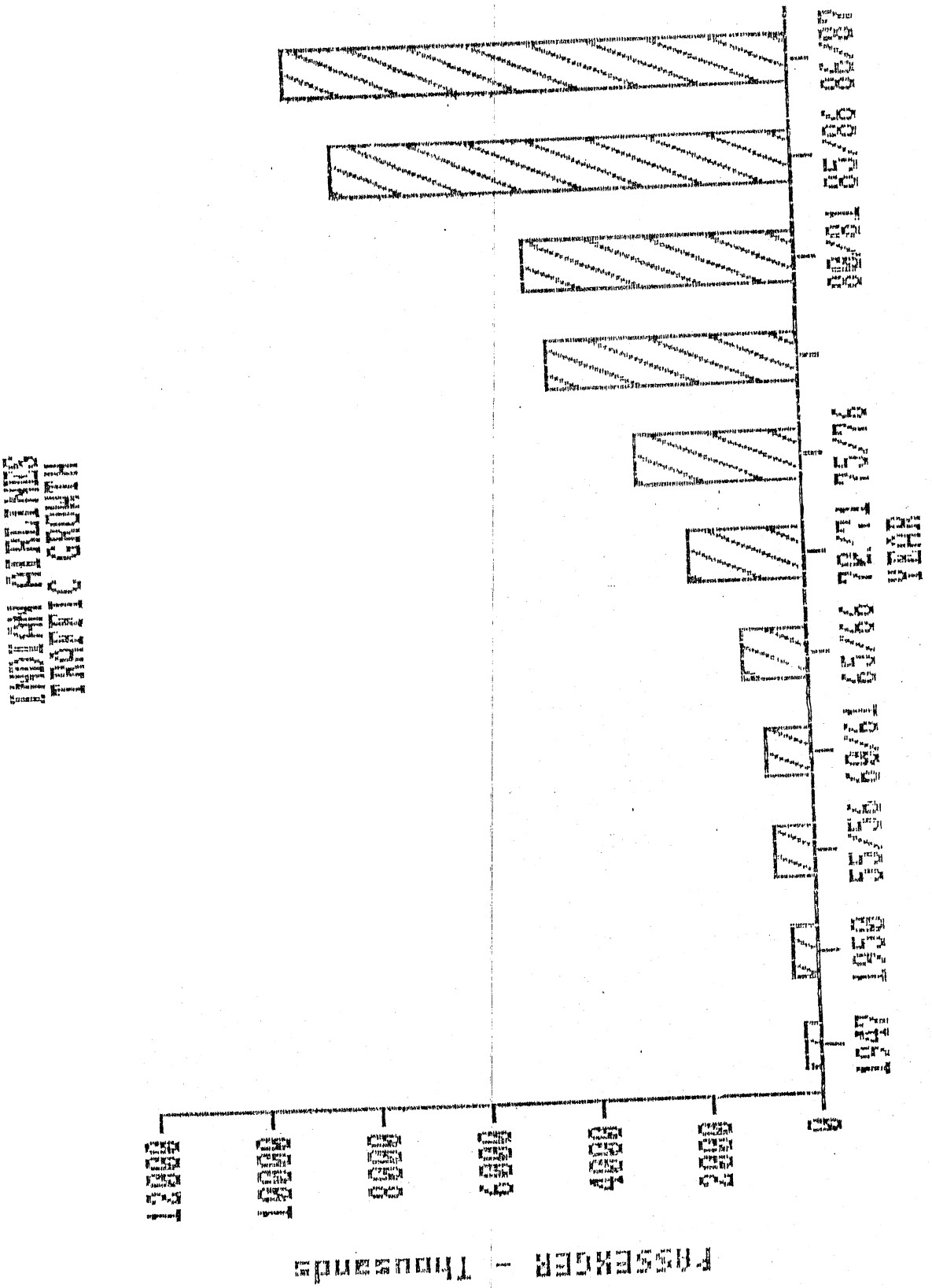
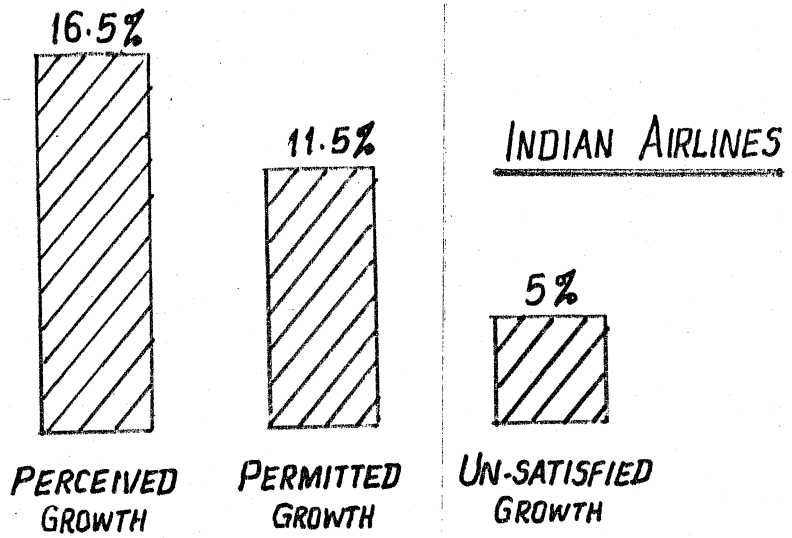
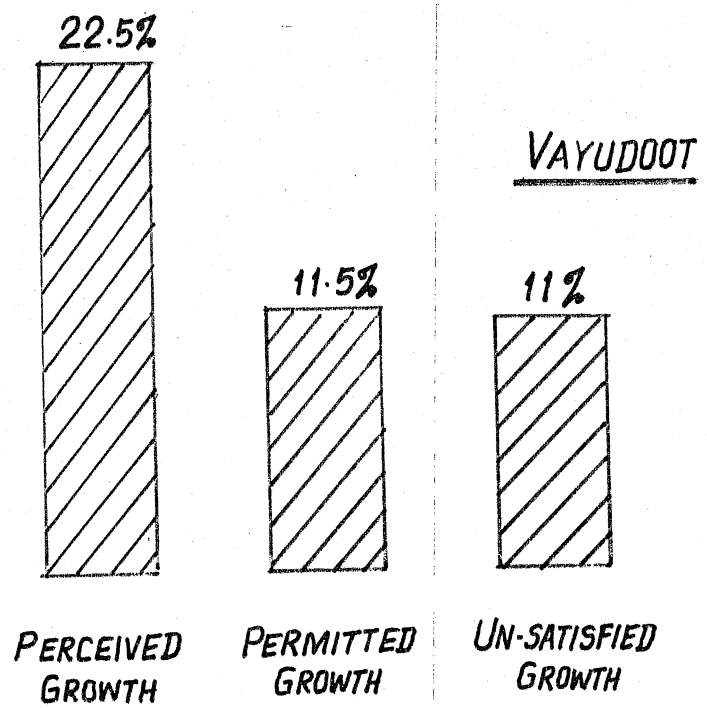
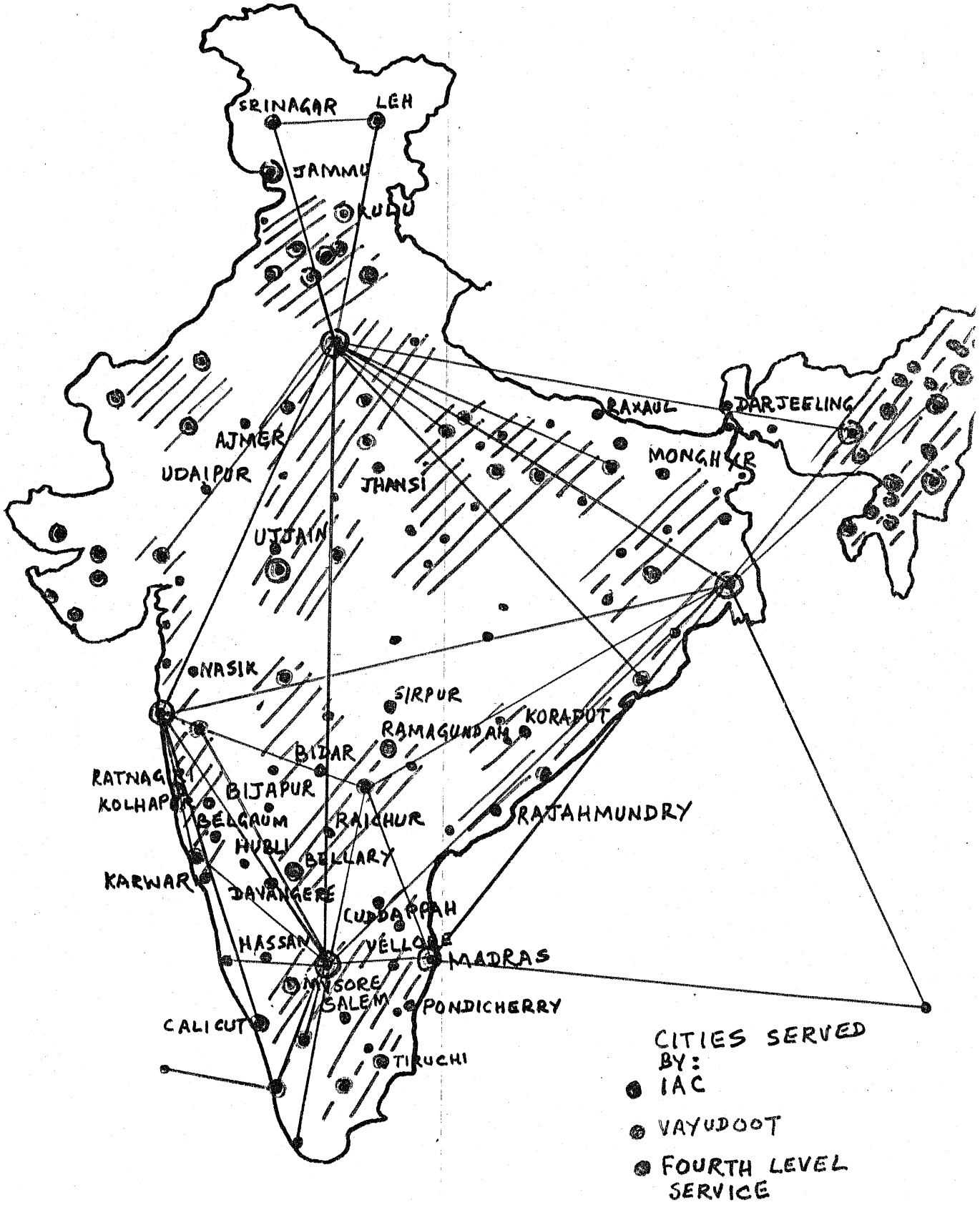


Fig 2: Indian Airlines - Traffic Growth.

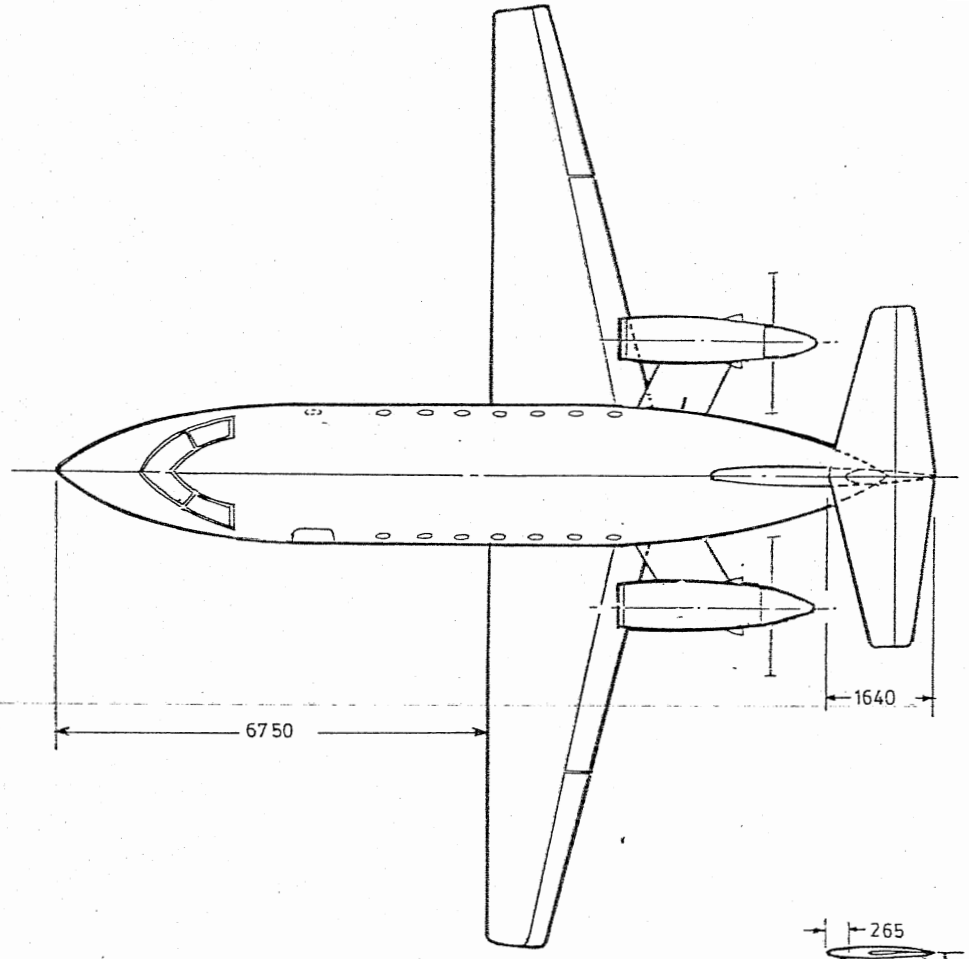

16.5%
11.5%
INDIAN AIRLINES
5%
PERCEIVED GROWTH
PERMITTED GROWTH
UN-SATISFIED GROWTH

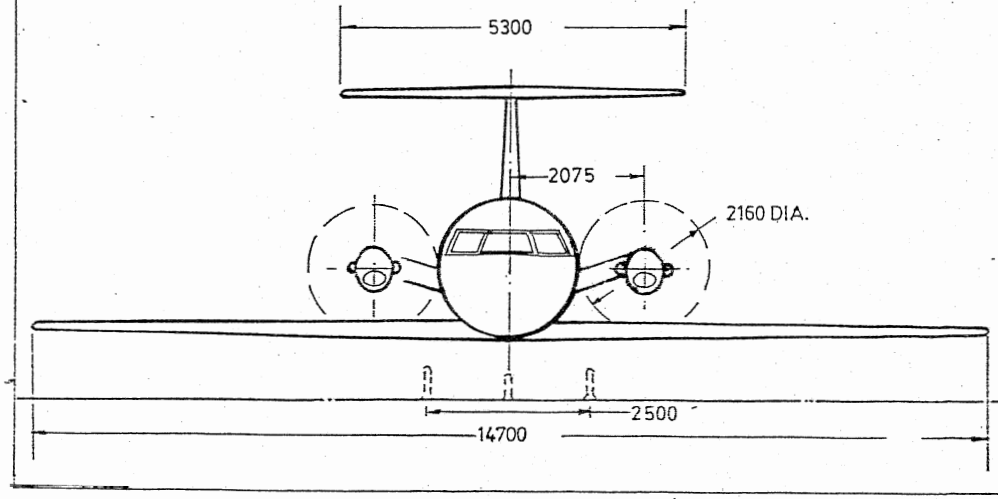

22.5%
VAYUDOOT
11.5%
11%
PERCEIVED GROWTH
PERMITTED GROWTH
UN-SATISFIED GROWTH

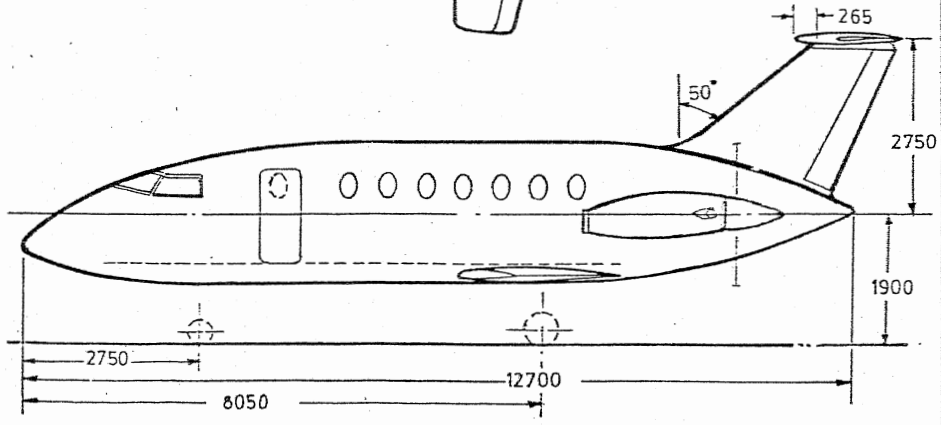
INDIAN AIRLINES & VAYUDOOT NETWORKS



3-VIEW DRAWING
NAL - LTA

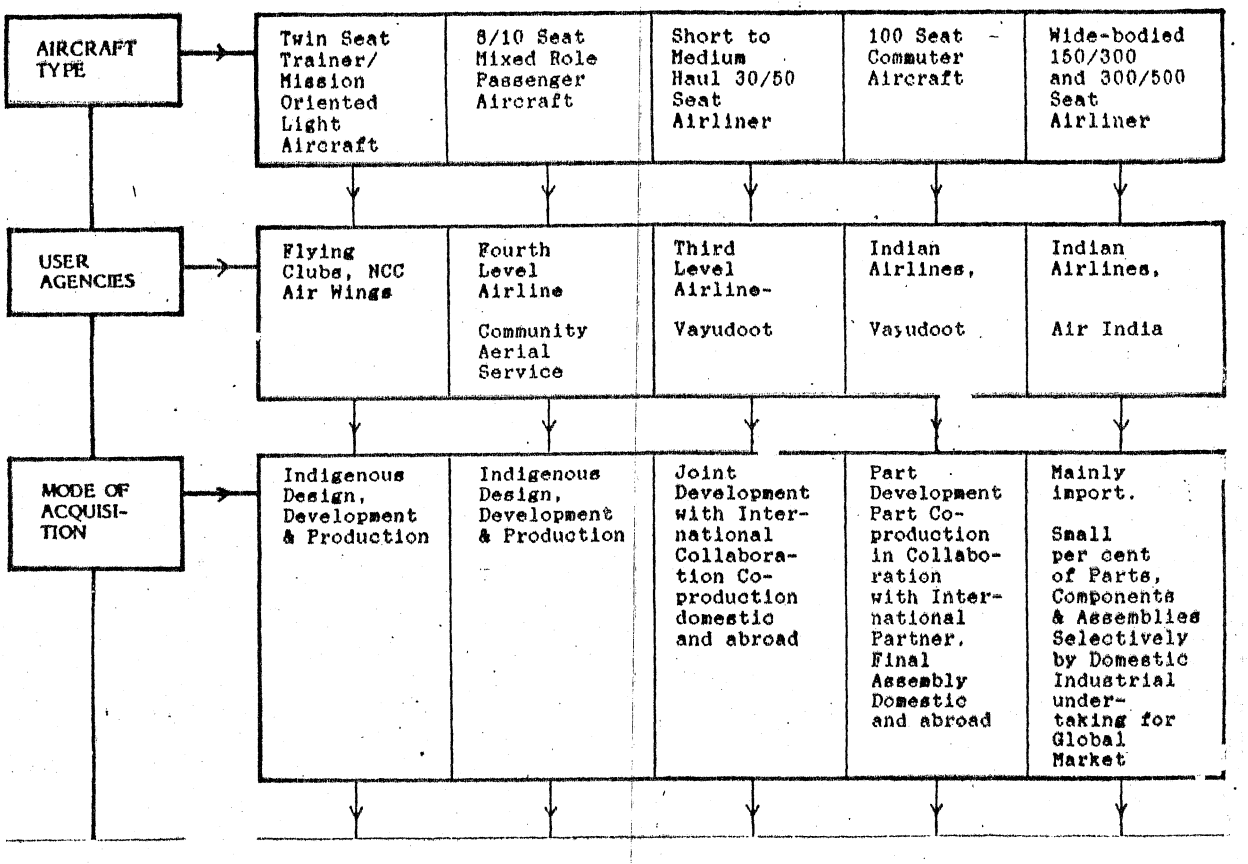






STRATEGY TO MEET REQUIREMENTS

AIRCRAFT CAPACITY	STRATEGY FOR PROCUREMENT
☆ UPTO 50 PAX	INDIGENOUS DEVELOPMENT, PRODUCTION
☆ 100 - 150 PAX	CO-DEVELOPMENT, CO-PRODUCTION
☆ 200 - 300 PAX › 300 PAX	IMPORT WITH OFFSET ARRANGEMENT TO REDUCE FOREIGN EXCHANGE OUTGO


AIRCRAFT TYPE
Twin Seat Trainer/ Mission Oriented Light Aircraft
8/10 Seat Mixed Role Passenger Aircraft
Short to Medium Haul 30/50 Seat Airliner
100 Seat Commuter Aircraft
Wide-bodied 150/300 and 300/500 Seat Airliner
USER AGENCIES
Flying Clubs, NCC Air Wings
Fourth Level Airline
Community Aerial Service
Third Level Airline-
Vayudoot
Indian Airlines,
Vayudoot
Indian Airlines,
Air India
MODE OF ACQUISI-TION
Indigenous Design, Development & Production
Indigenous Design, Development & Production
Joint Development with Inter-national Collabora-tion Co-production domestic and abroad
Part Development Part Co-production in Collabo-ration with Inter-national Partner. Final Assembly Domestic and abroad
Mainly import.
Small per cent of Parts, Components & Assemblies Selectively by Domestic Industrial under-taking for Global Market

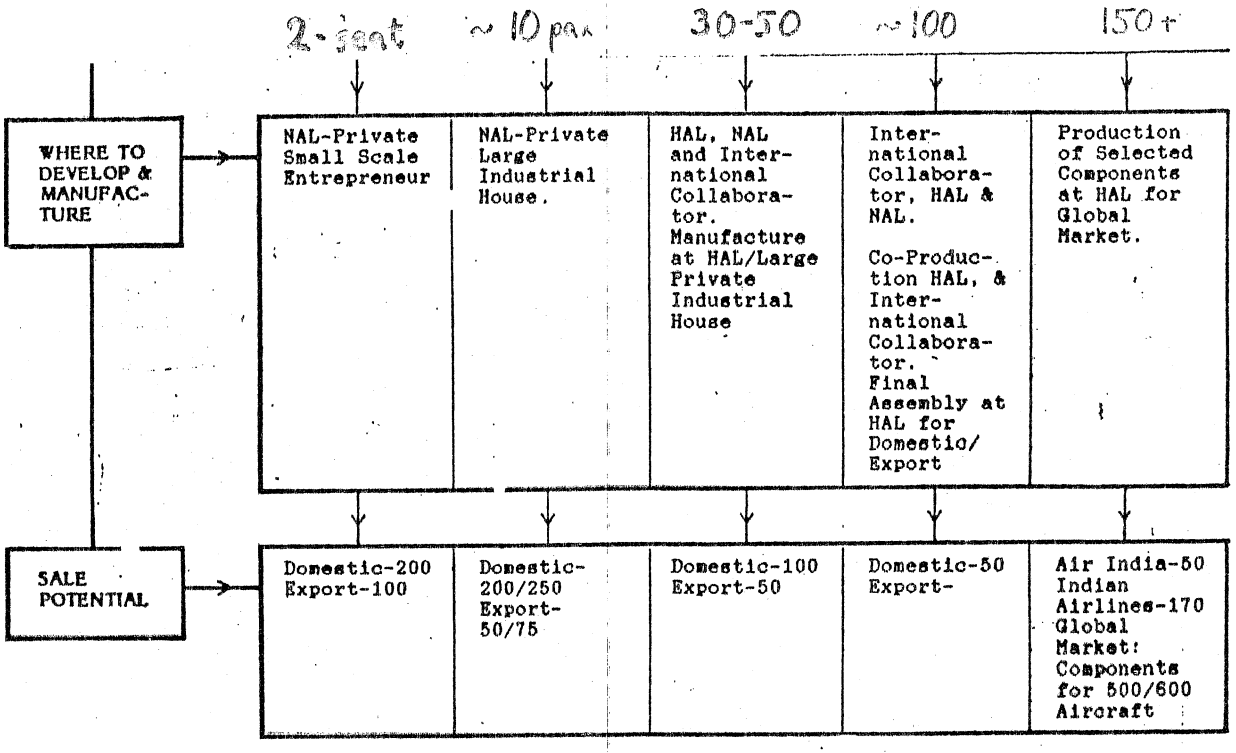
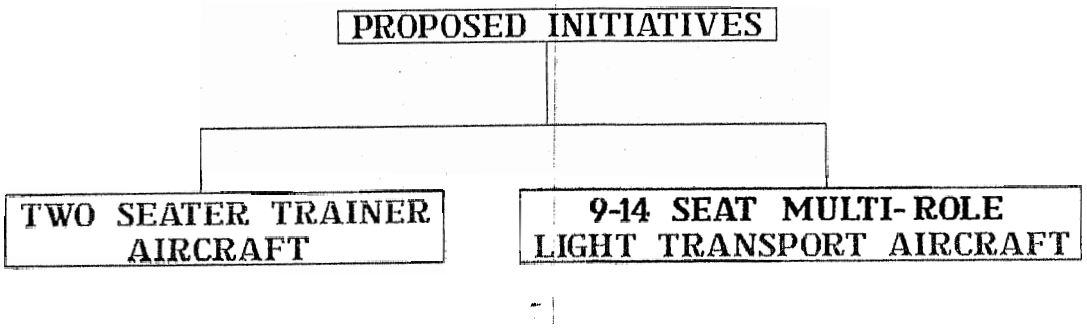
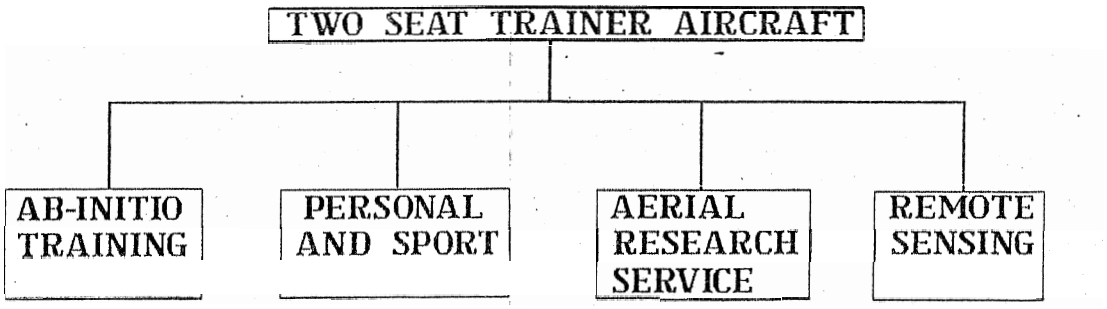


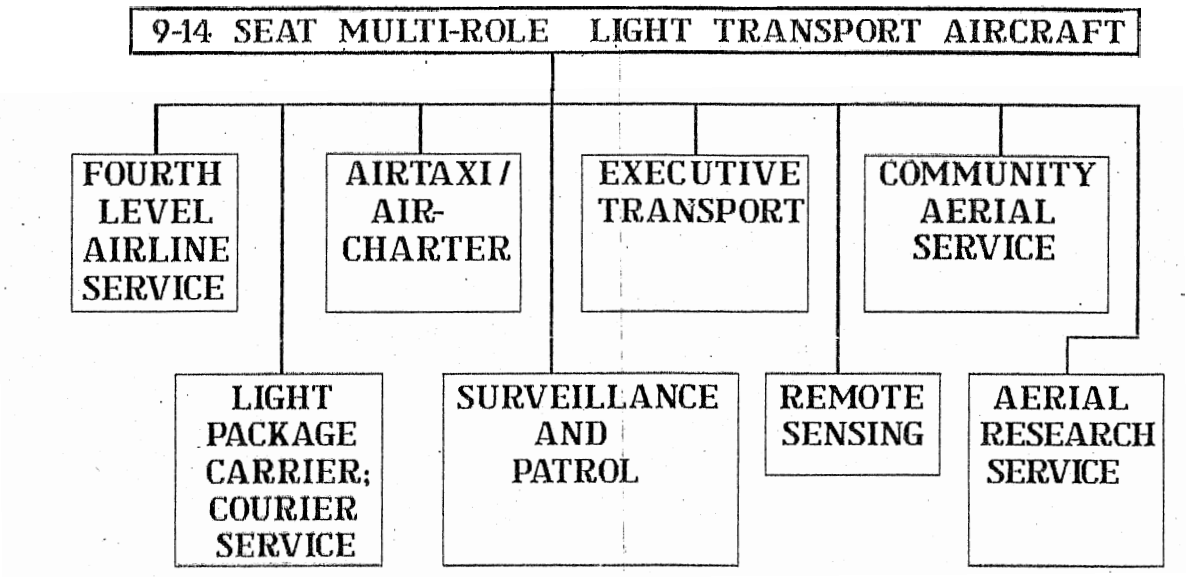
Fig 0: Civil Aviation Programme Policy.

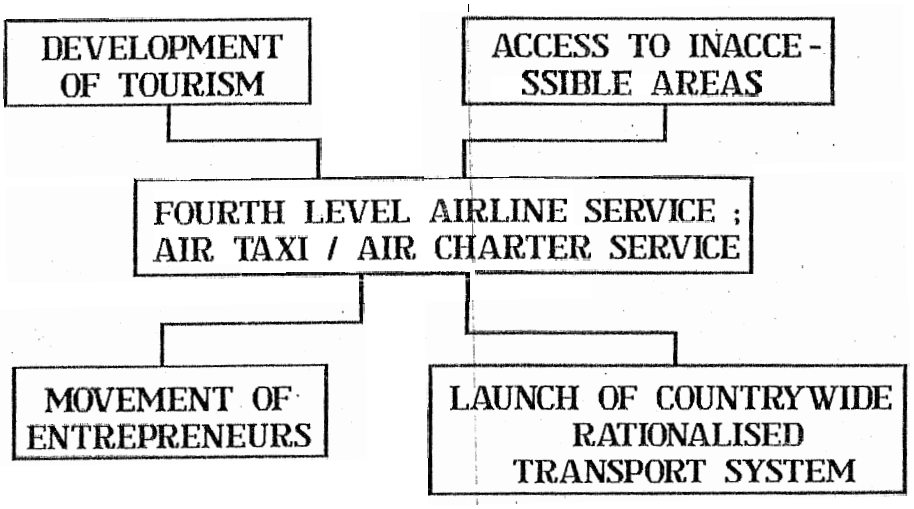
SCALE OF INVESTMENTS REQUIRED FOR DEVELOPMENT AND PRODUCTION

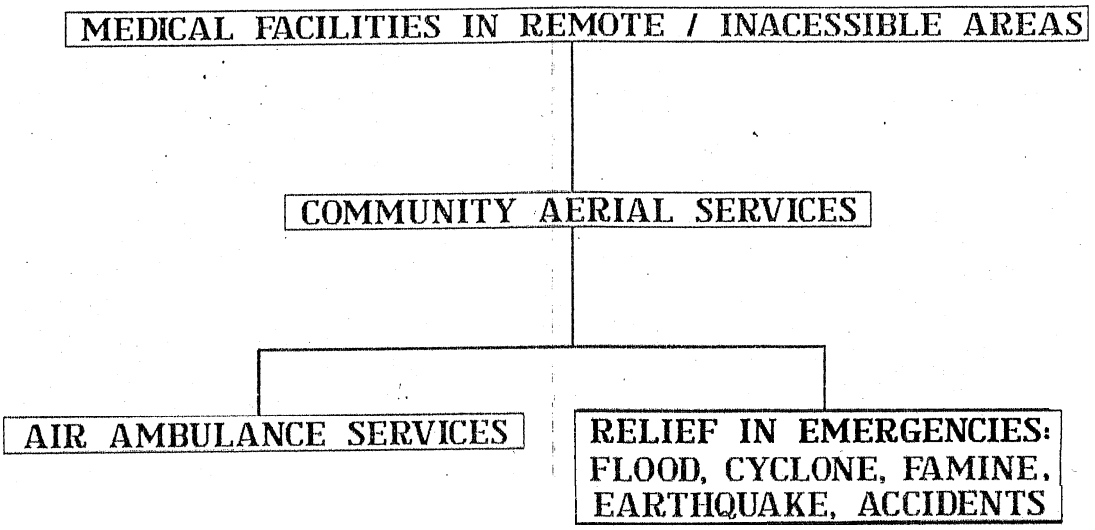
AIRCRAFT TYPE	INVESTMENT, Rs. in Crores	
	DEVELOPMENT	PRODUCTION
AB-INITIO 2-SEAT TRAINER	0.5 - 1.0	1.5
9-14 SEAT MULTI-ROLE LIGHT TRANSPORT AIRCRAFT (NAL)	50	150
30-50 SEAT COMMUTER AIR-CRAFT (NAL + INDIAN CO.)	120	400
100-150 SEAT MEDIUM HAUL AIRCRAFT (CO-DEVT., CO-PRODN.)	350	600
MORE THAN 200 SEATS	---	OFFSET (?)


PROPOSED INITIATIVES
TWO SEATER TRAINER AIRCRAFT
9-14 SEAT MULTI-ROLE LIGHT TRANSPORT AIRCRAFT


TWO SEAT TRAINER AIRCRAFT
AB-INITIO TRAINING
PERSONAL AND SPORT
AERIAL RESEARCH SERVICE
REMOTE SENSING


9-14 SEAT MULTI-ROLE LIGHT TRANSPORT AIRCRAFT
FOURTH LEVEL AIRLINE SERVICE
AIRTAXI / AIR-CHARTER
EXECUTIVE TRANSPORT
COMMUNITY AERIAL SERVICE
LIGHT PACKAGE CARRIER; COURIER SERVICE
SURVEILLANCE AND PATROL
REMOTE SENSING
AERIAL RESEARCH SERVICE


DEVELOPMENT OF TOURISM
ACCESS TO INACCE-SSIBLE AREAS
FOURTH LEVEL AIRLINE SERVICE ; AIR TAXI / AIR CHARTER SERVICE
MOVEMENT OF ENTREPRENEURS
LAUNCH OF COUNTRYWIDE RATIONALISED TRANSPORT SYSTEM


MEDICAL FACILITIES IN REMOTE / INACESSIBLE AREAS
COMMUNITY AERIAL SERVICES
AIR AMBULANCE SERVICES
RELIEF IN EMERGENCIES: FLOOD, CYCLONE, FAMINE, EARTHQUAKE, ACCIDENTS

SPECIFICATIONS

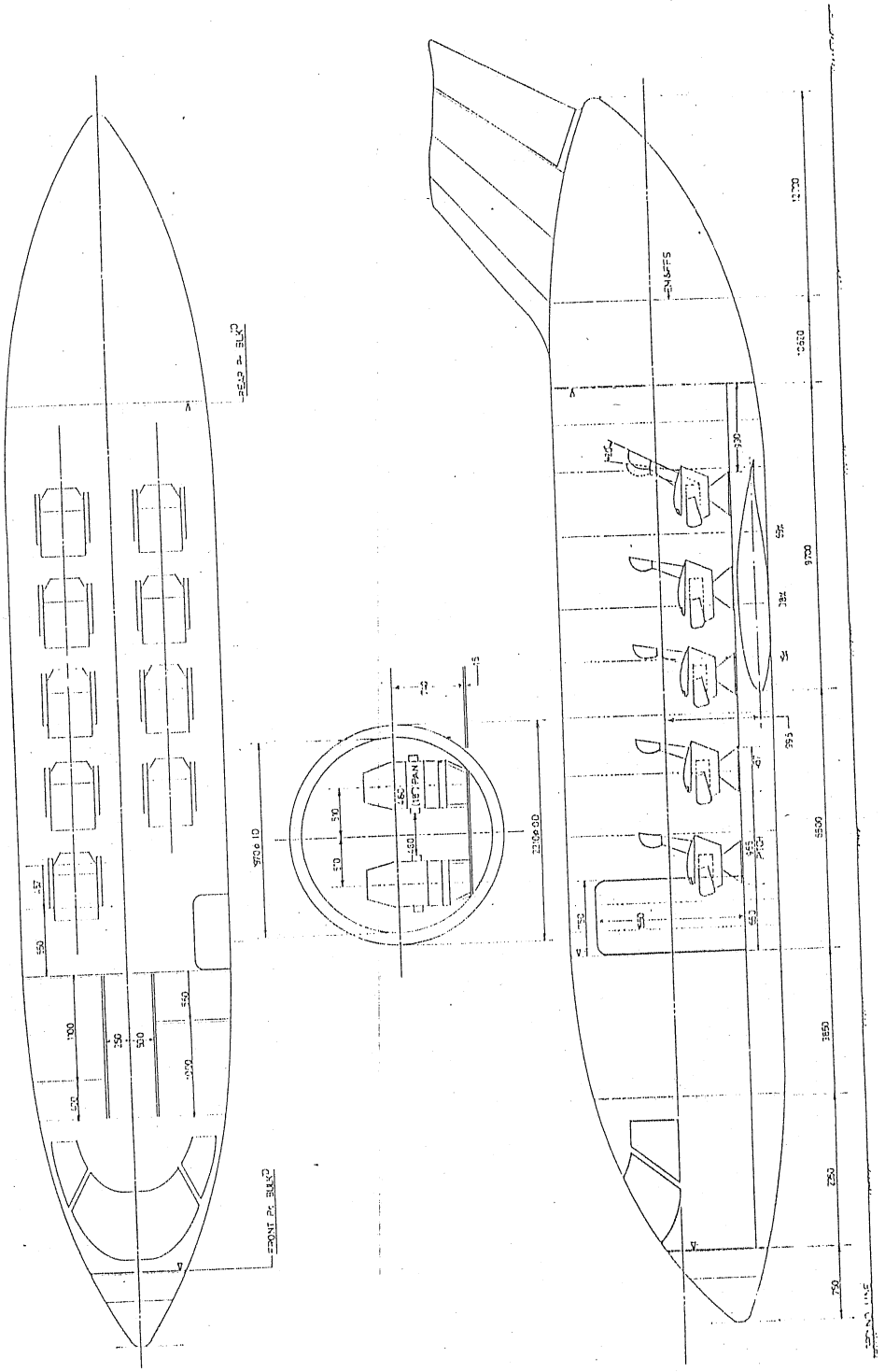
- Cruise speed : 550 kmph - 650 kmph (300 kts - 350 kts)
- Cruise altitude : 7 km - 11 km (25,000 ft - 35,000 ft)
- Specific range : 3.2 km/kg (0.8 nmpp)
- Take-off distance to clear 15m height : 600m, ISA, SL
- Landing distance from 15m height : 600m, ISA, SL
- Multi-role capability : 9 pax standard version
  14 pax commuter version
  6 pax executive version
  6 stretcher air ambulance version
  Light package carrier version
  Remote sensing platform
  Aerial research vehicle
- Max take-off weight : 5700 kg
- Range with IFR reserves: 2000 km for the standard version with full payload
- Endurance : 4 to 5h
- Operability from semi-prepared runways
- Operability from hot and high altitude airfields
- Cabin comfort comparable to that of regional aircraft
- Low cabin noise

LIGHT TRANSPORT AIRCRAFT : DESIGN PHILOSOPHY

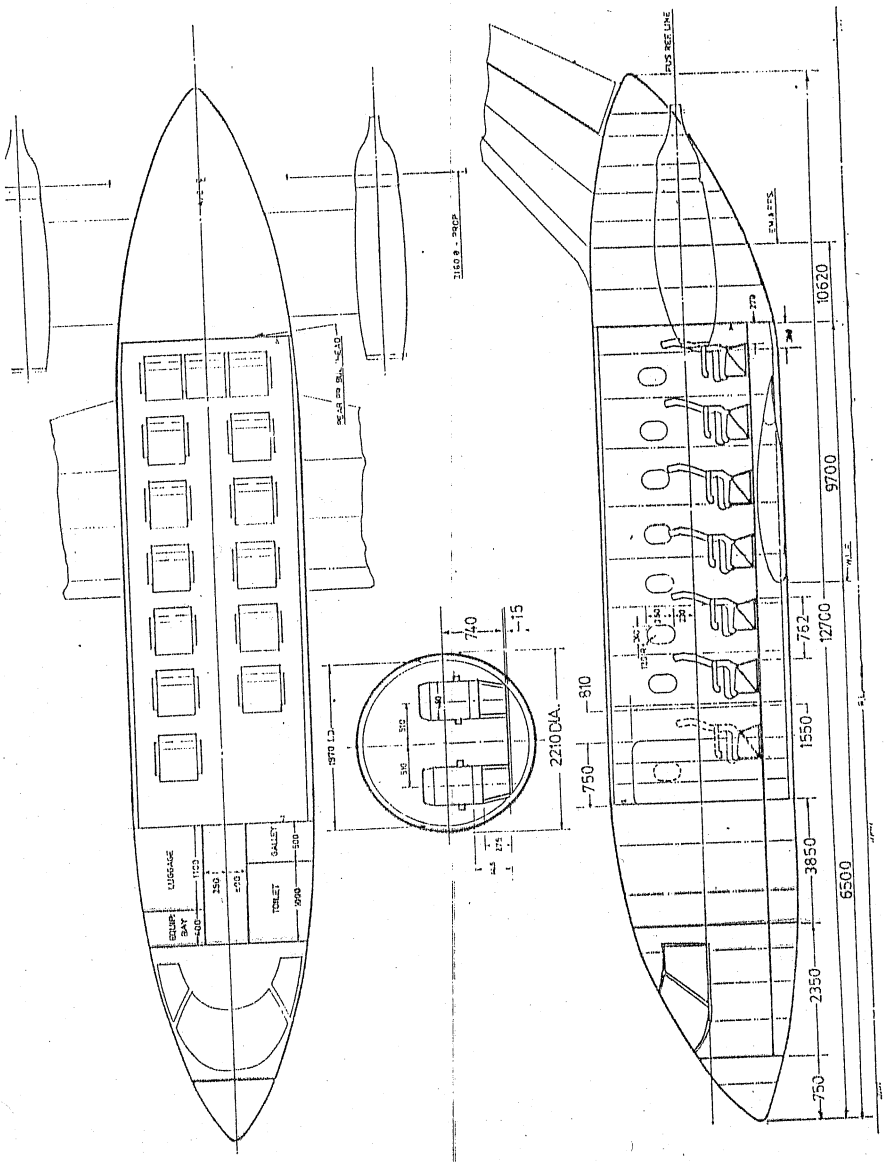
- ☆ LEVEL OF TECHNOLOGY COMMENSURATE WITH REQUIREMENTS
- ☆ NO TECHNOLOGY WILL BE OBTAINED FROM FOREIGN SOURCES
- ☆ TECHNOLOGY EITHER AVAILABLE IN N.A.L. OR OTHER ORGANISATIONS WITHIN THE COUNTRY CONSIDERED
  USE OF WELL PROVEN POWER PLANT
- ☆ SYSTEM / SUBSYSTEM DEVT. NOT PLANNED ; ONLY WELL PROVEN, OFF - THE - SHELF ITEMS CONSIDERED
- ☆ SIMPLICITY OF DESIGN
- ☆ RELIABILITY AND MAINTAINABILITY
- ☆ LOW OR NO RISK OPERATION
- ☆ LOW DEVELOPMENT COST
- ☆ DESIGN TO CONFORM TO F.A.R. PART 23 WITH APPLICABLE AMENDMENTS

TECHNOLOGY FEATURES

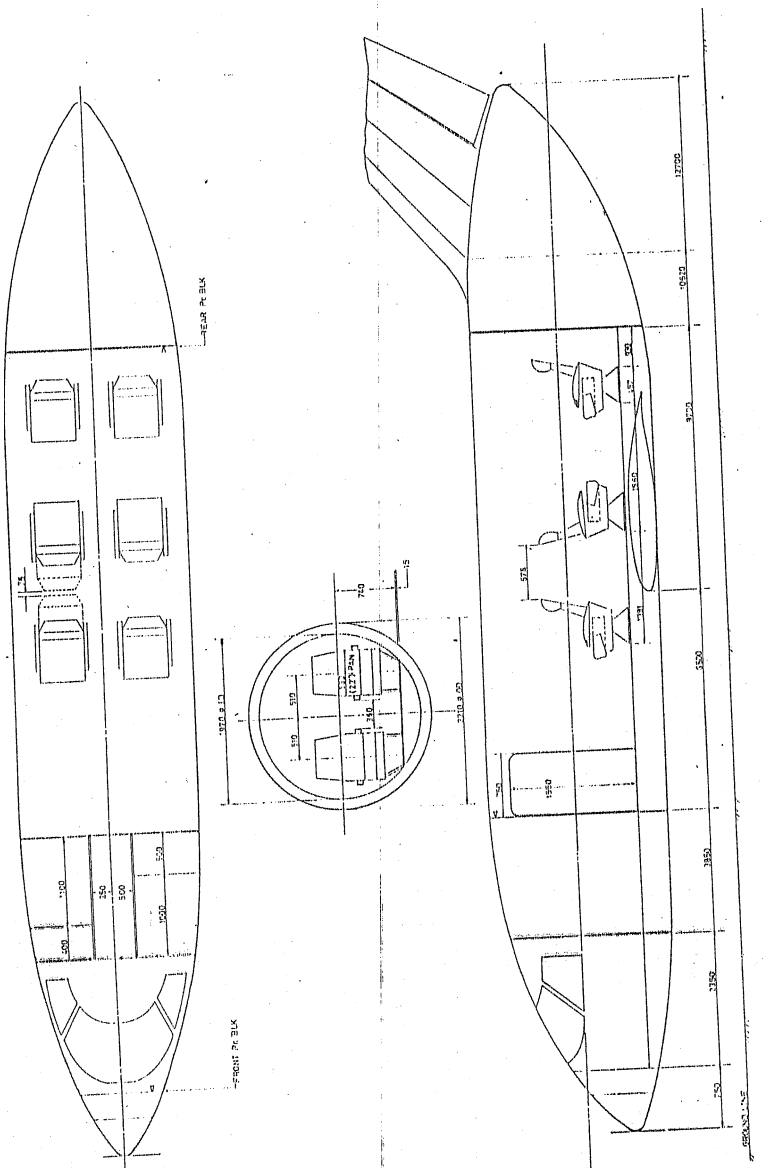
- AERODYNAMICS
  - Natural Laminar Flow Wing
  - Low Drag Fuselage
  - Efficient High Lift System
- MATERIALS
  - Carbon firbre empennage, control surfaces, flaps
  - Composite access hatches, doors, etc.
- PRODUCTION TECHNOLOGY
  - Integrally milled wing skin
  - Super plastic forming/diffusion bonding
- POWER PLANT
  - Aft fuselage mounted turbo prop engines
  - Efficient 6-bladed variable pitch pusher propeller



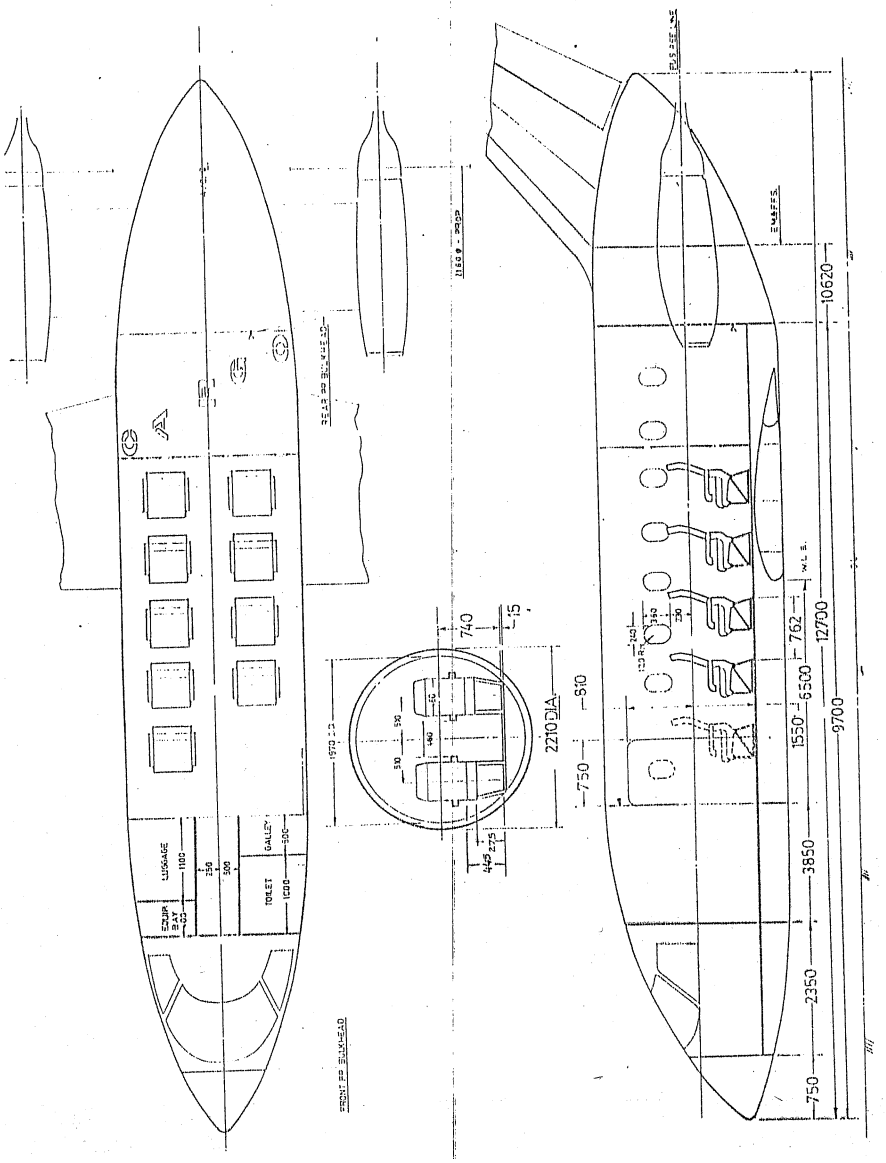
Cabin Layout - 9 Seat Version



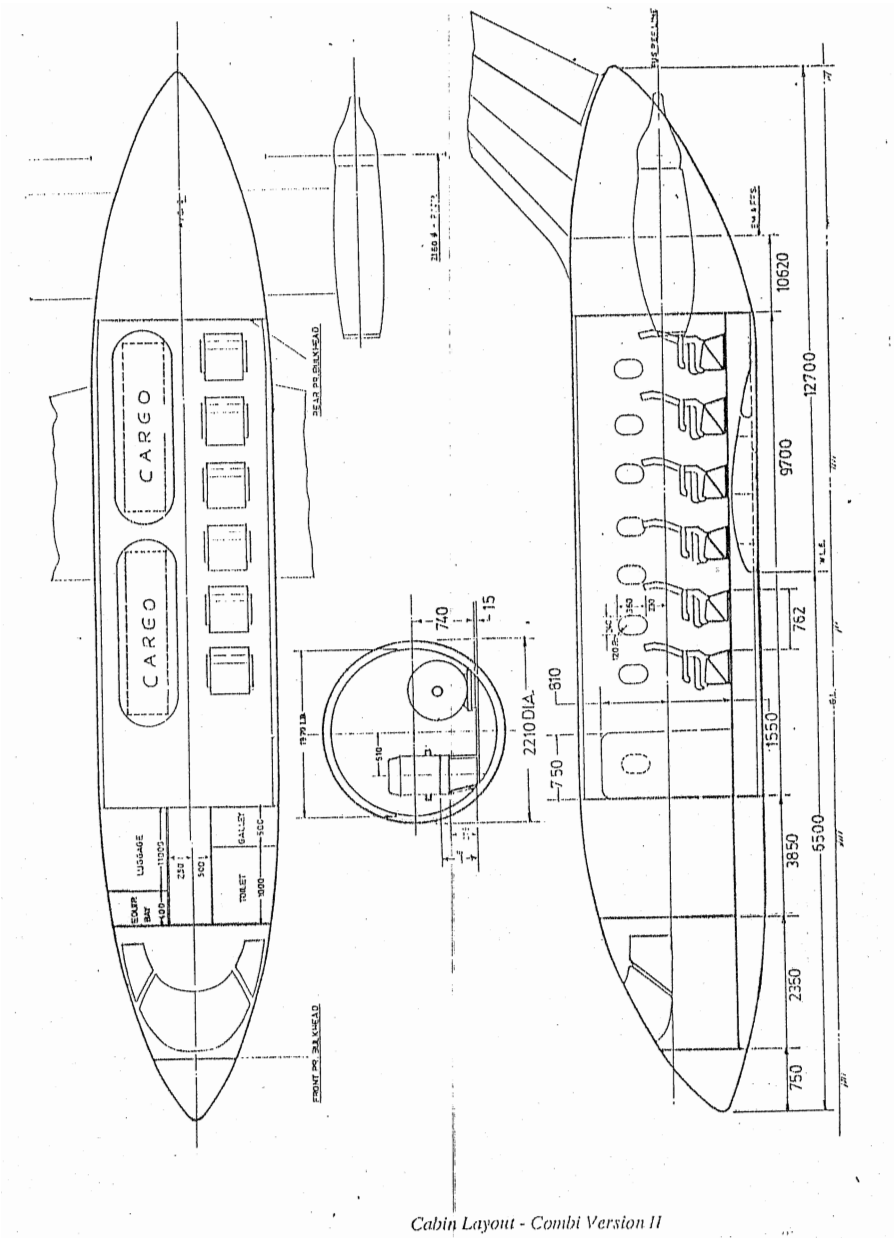
Cabin Layout - 14 Seat Version



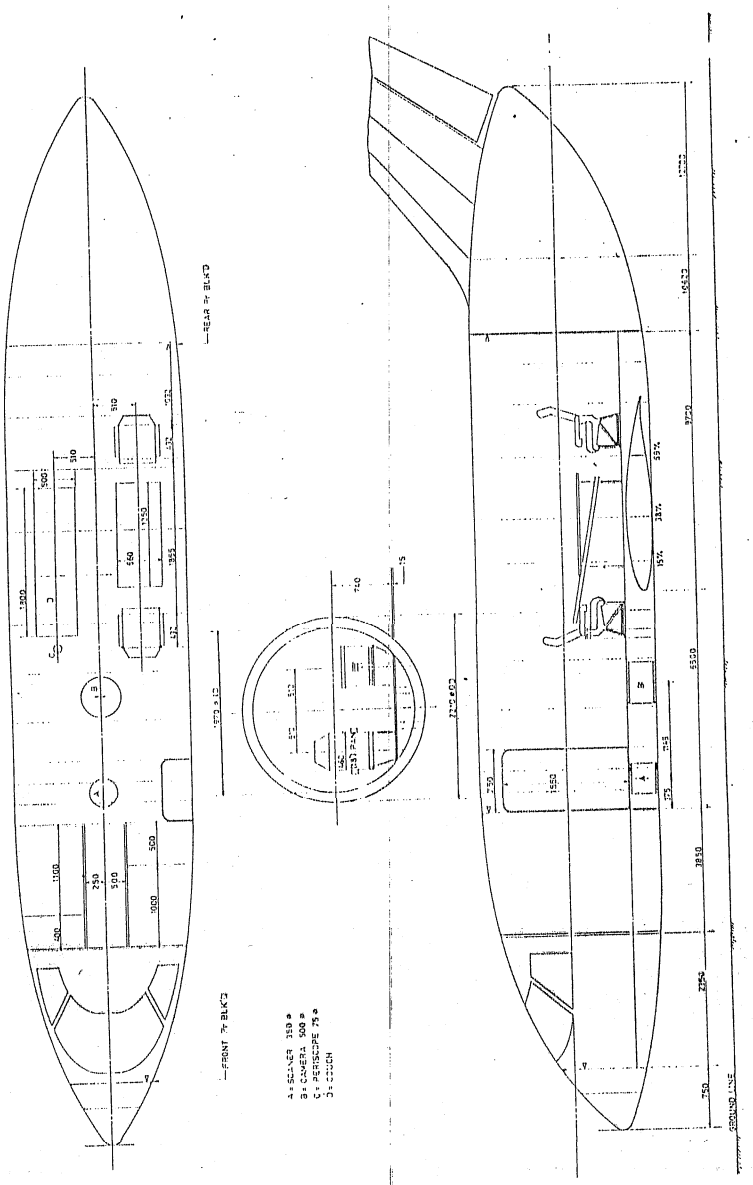
Cabin Layout - Executive Version



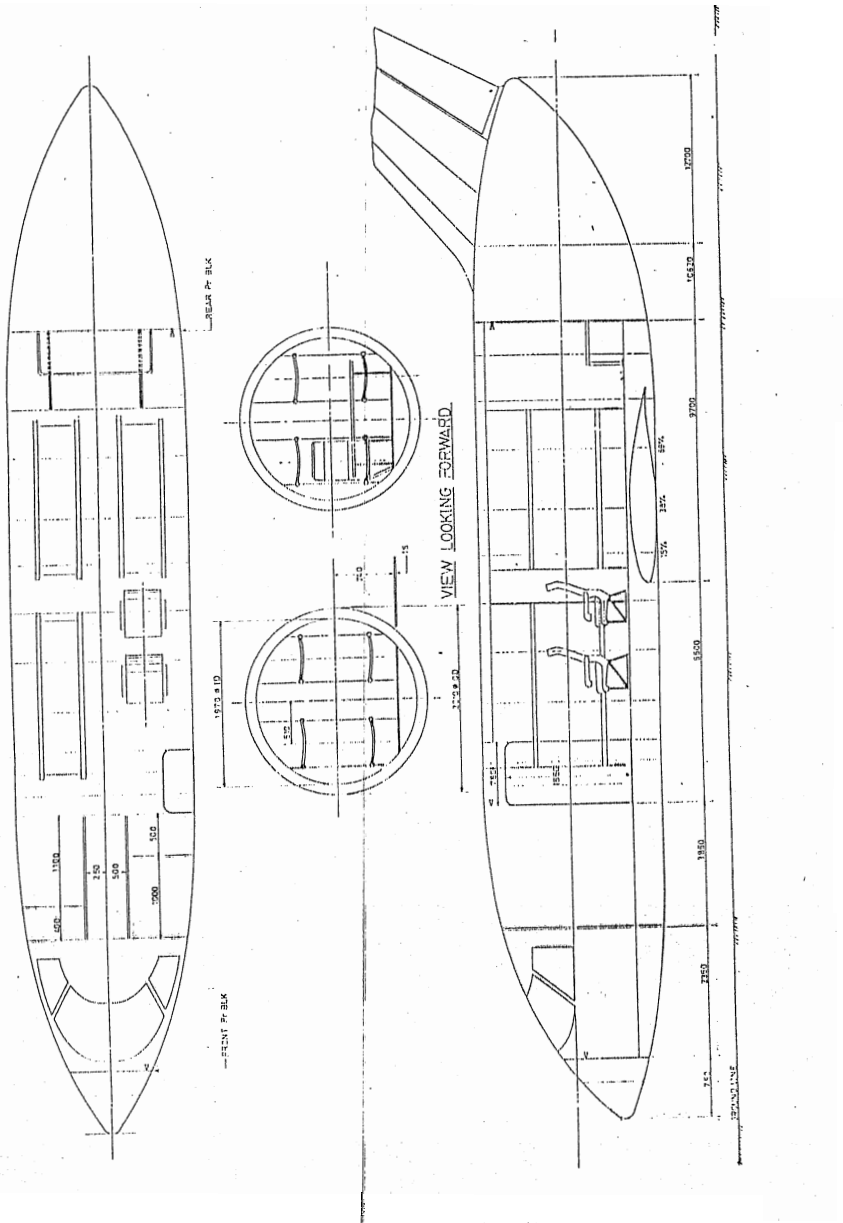
Cabin Layout - Combi Version I



Cabin Layout - Combi Version II

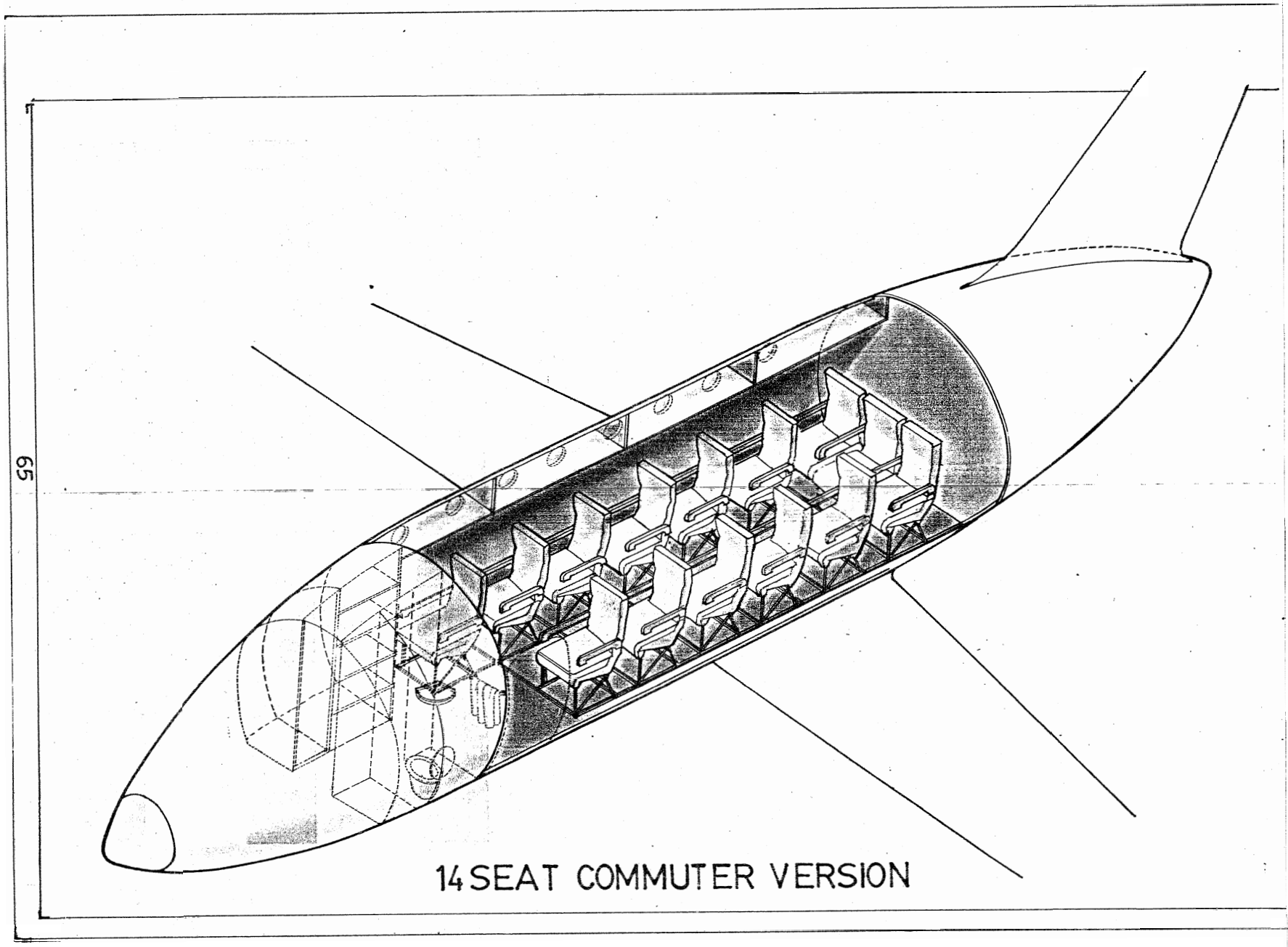


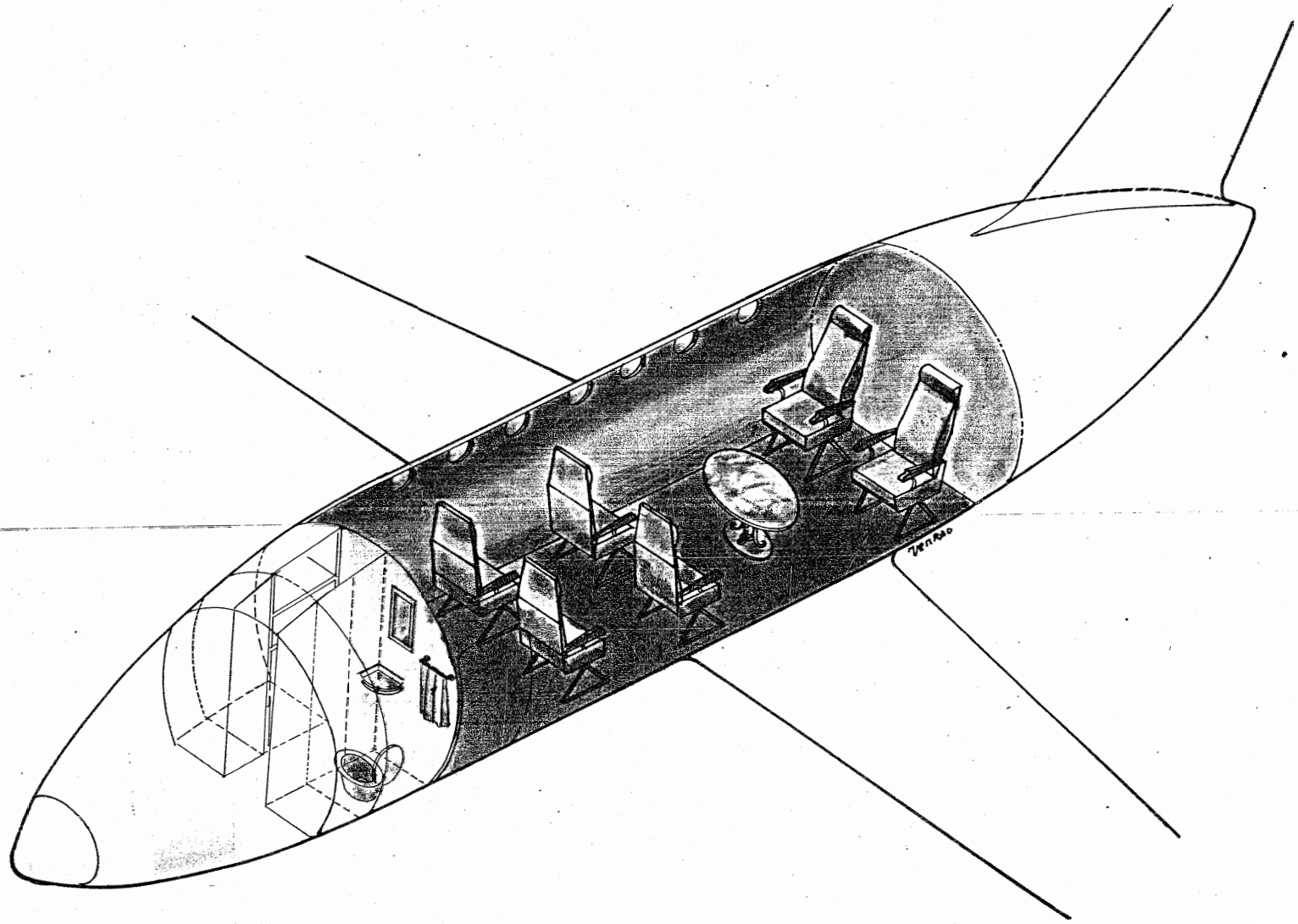
Cabin Layout - Remote Sensing Version



Cabin Layout - Air Ambulance Version

9 SEAT STANDARD VERSION


65
14 SEAT COMMUTER VERSION



6 SEAT EXECUTIVE VERSION

LEADING PARTICULARS OF AIRCRAFT

(9 PAX + 1 Crew Standard Version)

MAX. T.O. WEIGHT	: 5616 kg
EMPTY WEIGHT	: 3506 kg
MAX. PAYLOAD	: 783 kg
MAX. FUEL	: 1100 kg
PAX CABIN VOLUME	: 18 m^3
LUGGAGE COMP. VOL.	: 1 m^3

WING AREA	: 25.55 m^2
WING SPAN	: 14.7 m
ASPECT RATIO	: 8.5
WING LOADING	: 220 kg/m^2

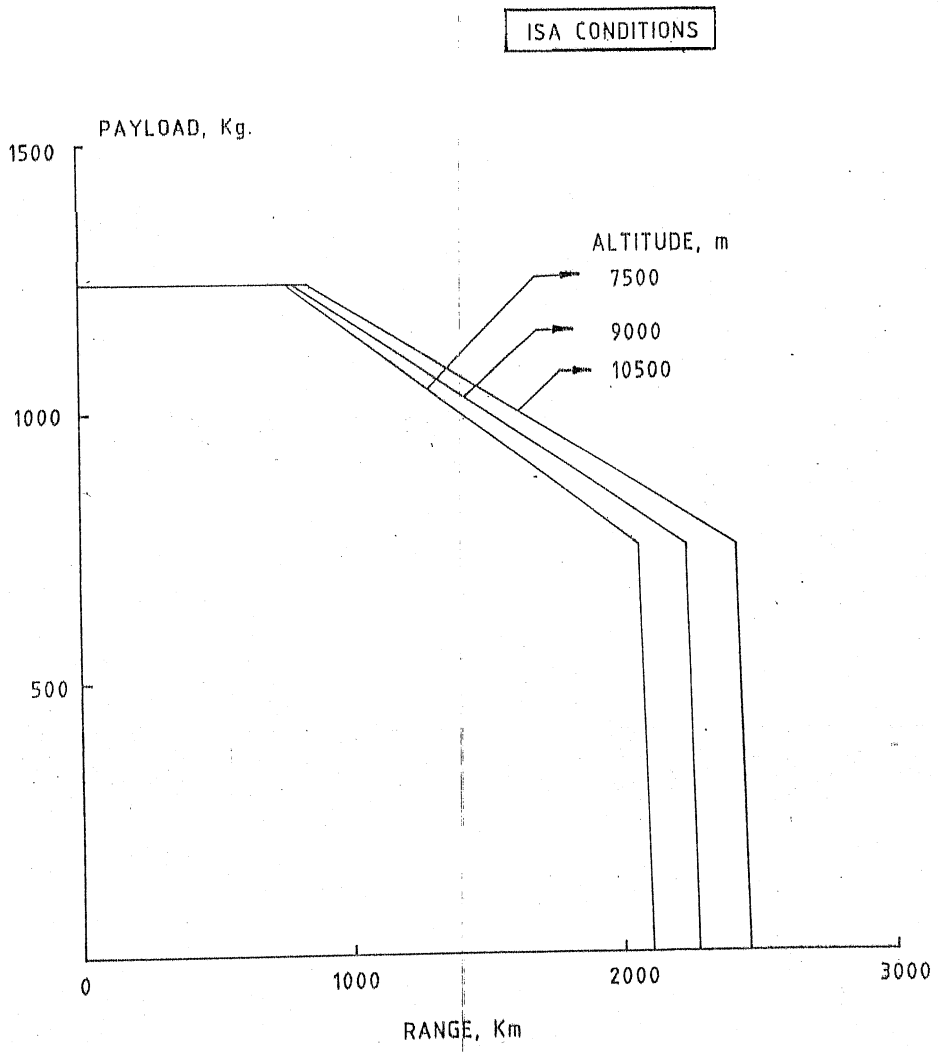
POWER PLANT	: 2 x 850 SHP TURBO-PROPS
PROPELLER	: 2.16 m DIA, 6-BLADED PUSHER

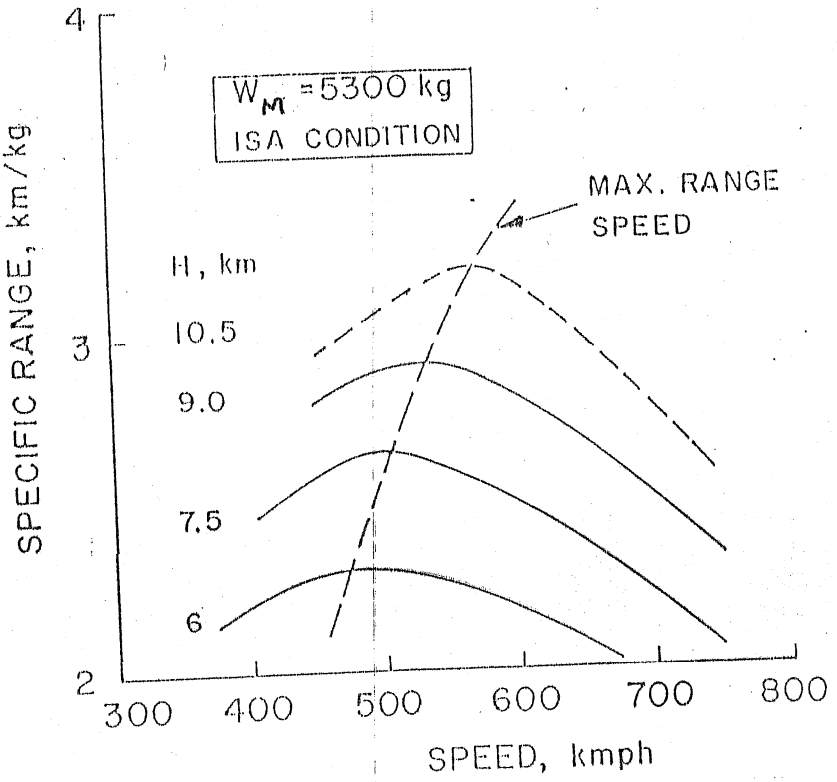
COMPARISON OF LTA WITH EXISTING EXISTING AIRCRAFT

(PERFORMANCE)

AIRCRAFT	MAX. CRUISE SPEED Kmph	MAX. RANGE Km	RANGE WITH MAX. PAYLOAD Km	T.O. DIST. m	LANDING DIST. m
BEECH B200	533	3146	876	786	867
BEECH STARSHIP	644	3631	1435	628	963
DORNIER 228	424	3034	1245	655	518
PIPER CHEYN. 400	641	4038	-	680	622
PIAGGIO AVANTI	740	3400	-	762	762
NAL-LTA (std. ver.)	700	2500	2500	540	590
NAL-LTA (comm. ver.)	700	2500	1000	540	590

NOTES: * All performance at ISA conditions
* Range with IFR reserves
* Take-off distance to clear 50ft obstacle; Max. T.O. wt.
* Landing distance from 50ft; Max. landing wt.


ISA CONDITIONS
PAYLOAD, Kg.
1500
1000
500
ALTITUDE, m
7500
9000
10500
0
1000
2000
3000
RANGE, Km



Specific Range

TRIP PERFORMANCE

	CRUISE SPEED Kmph	DISTANCE km	FLIGHT LEVEL km	BLOCK TIME hr	BLOCK FUEL kg
BOMBAY AURANGABAD	475	352	6.0	0.78	191
BANGALORE	475	480	6.0	1.05	246
GOA	500		7.5	0.995	231
BANGALORE	530	840	9.0	1.65	347
BOMBAY	575		10.5	1.55	325
BOMBAY	530	1148	9.0	2.23	454
DELHI	575		10.5	2.08	421
MADRAS	530	1342	9.0	2.60	520
CALCUTTA	575		10.5	2.42	481
BANGALORE	530	1850	9.0	3.56	693
DELHI	575		10.5	3.30	640

NOTES: 9 PAX, 1 CREW, 950 Kg FUEL

NAL - INDUSTRY PARTNERSHIP MODEL

- Joint sector company (A) to be registered under section 25 of Companies Act for 'No Profit'

  - Equity participation by all partners
  - Customs duty exemption available since company is 'Non-Profit Making'
  - Transfers technology to production Company in consideration for payback of development expenditure

- Separate joint sector company (B) registered for series production and marketing

  - Same partners as earlier section 25 Company
  - Development expenditure (repaid to Company A) to be recovered through amortization
  - Part of profit which Company B makes on sale of aircraft utilised to fund development of variants, new aircraft, advanced projects and R&D by Company A.

FUNDING PATTERN

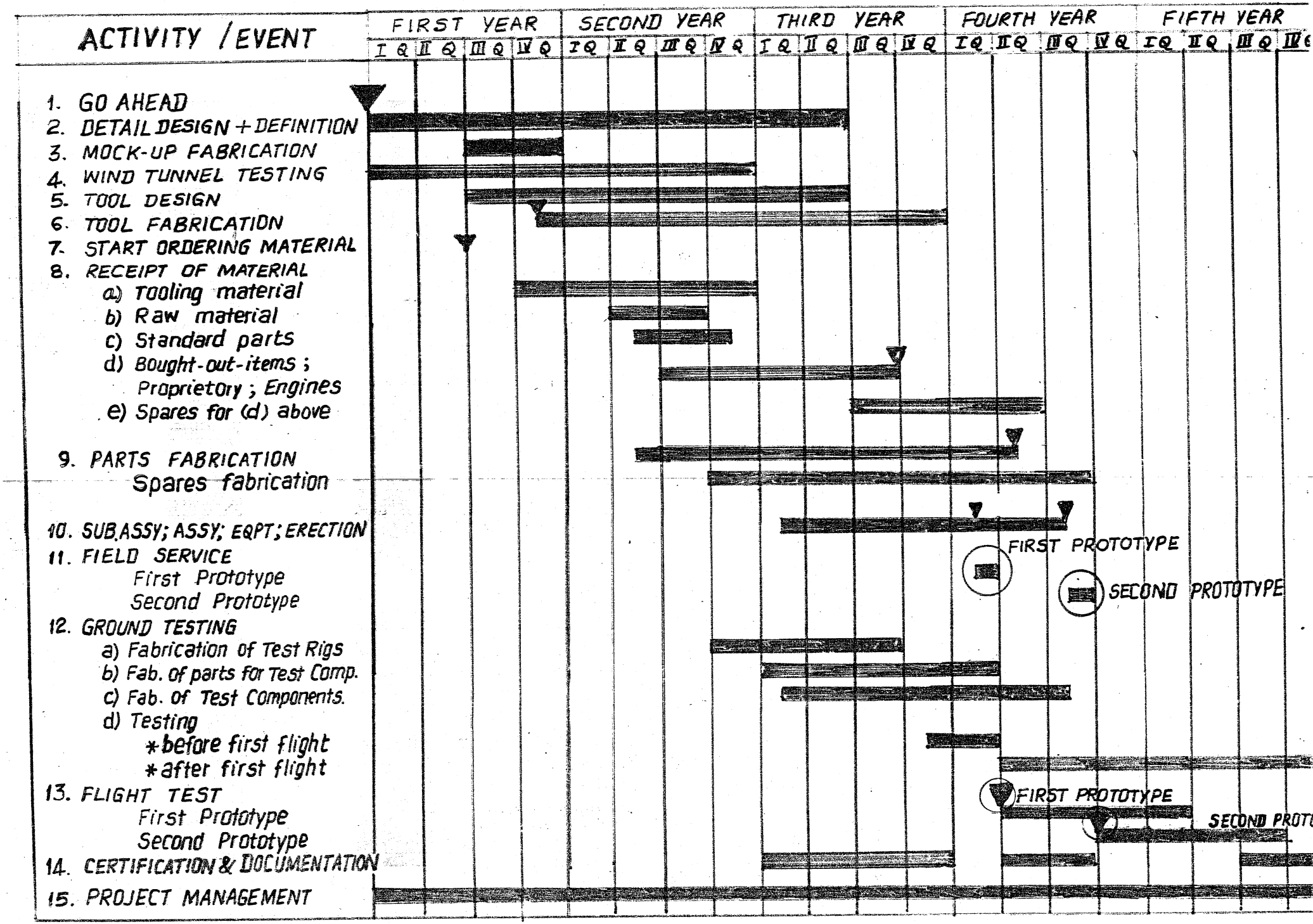
- Joint sector company under Section 25 of Companies Act for development

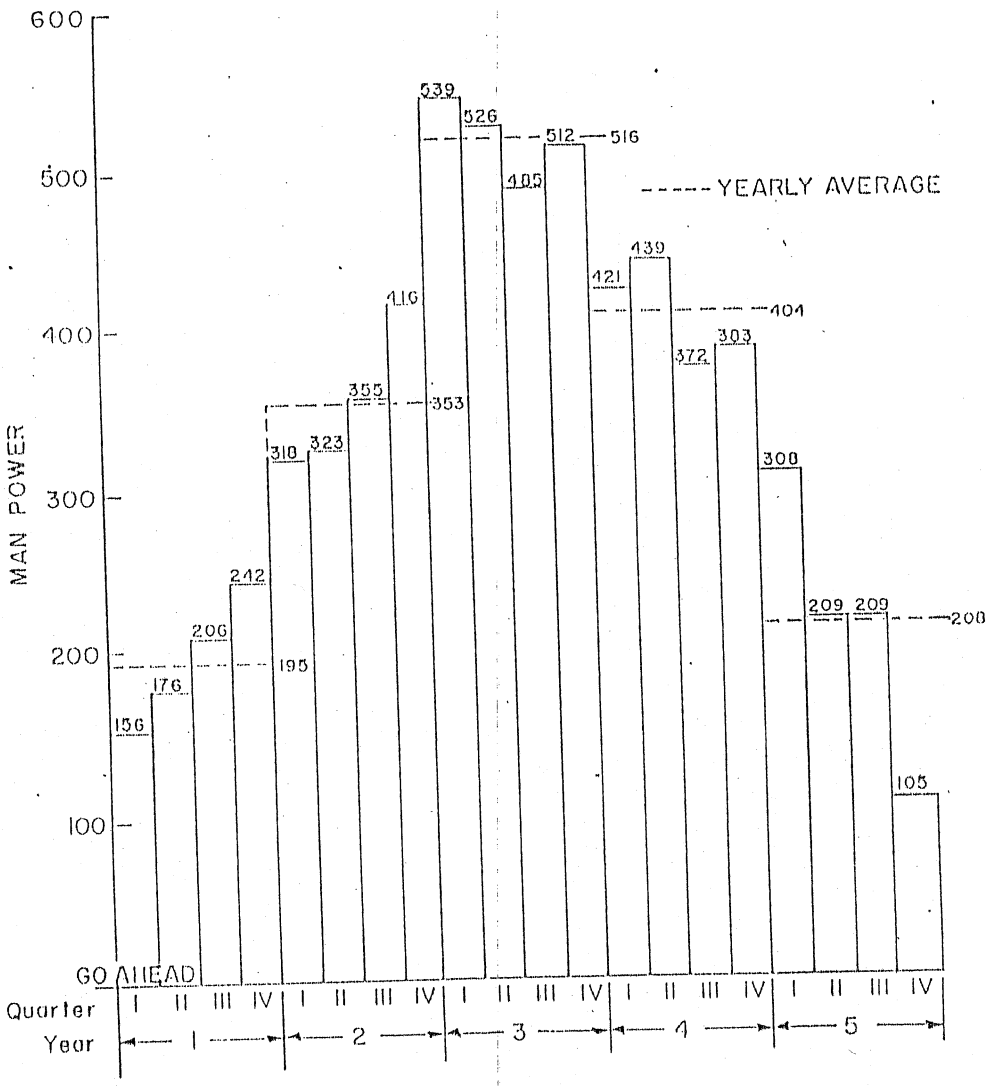
- Rs. 40 crores development funded by NAL/CSIR and Industrial Partner on 50-50 basis

- NAL/CSIR contribution available first as interest free grant

- Industrial Partner's contribution (from 3rd year) through borrowing from Financial Institutions under appropriate conditions (Debt: Equity Ratio and Interest)

- Production programme fully funded by Industrail Partner through equity, public subscriptions, borrowing from Financial Institutions under appropriate condition (Debt: Equity ratio and interest)


ACTIVITY / EVENT
FIRST YEAR
SECOND YEAR
THIRD YEAR
FOURTH YEAR
FIFTH YEAR
I Q II Q III Q IV Q
1. GO AHEAD
2. DETAIL DESIGN + DEFINITION
3. MOCK-UP FABRICATION
4. WIND TUNNEL TESTING
5. TOOL DESIGN
6. TOOL FABRICATION
7. START ORDERING MATERIAL
8. RECEIPT OF MATERIAL
a) Tooling material
b) Raw material
c) Standard parts
d) Bought-out-items ; Proprietory ; Engines
e) Spares for (d) above
9. PARTS FABRICATION
Spares fabrication
10. SUB.ASSY; ASSY; EQPT; ERECTION
11. FIELD SERVICE
First Prototype
Second Prototype
12. GROUND TESTING
a) Fabrication of Test Rigs
b) Fab. of parts for Test Comp.
c) Fab. of Test Components.
d) Testing
*before first flight
*after first flight
13. FLIGHT TEST
First Prototype
Second Prototype
14. CERTIFICATION & DOCUMENTATION
15. PROJECT MANAGEMENT
FIRST PROTOTYPE
SECOND PROTOTYPE
FIRST PROTOTYPE
SECOND PROTO



Total Manpower Requirement

FINANCIAL HIGHLIGHTS

DESIGN AND DEVELOPMENT	Rs. in Crores
o Capital	2.50
o Development	37.50
Total	40.00
o F.E. Content	13.40

NOTES:

Engines free of cost

Manpower (inhouse) : 510 for 5 years

SERIES PRODUCTION

PROJECT COST		Rs. in Crores
o Capital		30.00
o Tooling		16.00
o Production drawing & documentation		2.30
		48.30
o Working capital and Interest	: 95.00	
o Expenses	: 3.00	
		98.00
Total		146.30

FINANCING DESIGN AND SERIES PRODUCTION

		Rs. in Crores
o NAL's assistance		20.00
o Partner's share		
- Equity	: 27.00	
- Term loans	: 53.80	
- Working capital loan	: 37.50	
- Advance from customer	: 48.00	
		166.30
Total		186.30

NOTES

o Stabilised at 24 aircraft/year

o Manpower : Direct labour - 426

Others - 479

Total 905

UNIT PRICE (AVERAGE OF 99 AIRCRAFT

	Rs. in Lakhs	
o Direct material	419.00	(104.00)
o Labour overheads	147.71	
o Amortization	23.32	
o Sales overheads	10.00	
o Training, Tech. Assistance	10.00	
Total	610.03	
o Profit @ 10%	36.60	
	646.63	
o Excise duty @ 15.75%	101.84	(101.84)
	748.47	
or say	750.00	
o Sales Tax @ 8.8%	66.00	(66.00)
Total	816.00	(217.84)

NOTES

Figures in brackets represent duties and taxes

TABLE 12

OPERATIONAL COST OF 9 SEATER VERSION OF LTA

Item	1500 Hours per Year	1800 Hours per Year	2100 Hours per Year
1) Operational Cost,-Rs./hour			
Crew & engineers	400	333	285
Landing charges	60	60	60
Fuel	2419	2419	2419
Hanger charges	400	333	285
Insurance	1796	1496	1282
Depreciation	4490	3742	3207
Interest	2795	2330	1996
Maintenance	1270	1058	907
Other charges	500	417	357
Total - Rs./hour	14130	12188	10798
2) Utilization - Pax-km/hour	4950	4950	4950
3) Cost per pax-km, Rs.	2.86	2.46	2.18

Notes:

* Cruise speed 550 kmph
* Cruise altitude 7.5 km
* 600km stage length
* 100% load factor
* 1990 price level.

TABLE 13

OPERATIONAL COST OF 14 SEATER VERSION OF LTA

Item	1500 hours per year	1800 hours per year	2100 hours per year
1) Operational Cost, Rs./hour			
Crew & engineers	400	333	285
Landing charges	60	60	60
Fuel	2419	2419	2419
Hanger charges	400	333	285
Insurance	1818	1515	1299
Depreciation	4545	3788	3247
Interest	2828	2357	2020
Maintenance	1270	1058	907
Other charges	500	417	357
Total - Rs./hour	14240	12280	10879
2) Utilization pax-km/hour	7700	7700	7700
3) Cost per pax-km, Rs.	1.85	1.59	1.41

Notes:

* Cruise speed 550 kmph
* Cruise altitude 7.5 km
* 600km stage length
* 100% load factor
* 1990 price level.