



# ***NASA Glenn Research Center Flight Operations***





# NASA Glenn Flight Operations Aircraft

## Twin Otter DHC-6



## Two Learjets



## S-3B Viking



## T-34 Mentor





# Learjet Model 25



## Lear 25 Aircraft Data

<b>Wingspan</b>	<b>35 ft 8 in (10.84 m)</b>
<b>Length</b>	<b>47 ft 7 in (13.18 m)</b>
<b>Height</b>	<b>12 ft 3 in (3.73 m)</b>
<b>Powerplants</b>	<b>General Electric CJ-610-6, axial-flow turbojet engines</b>

## Lear 25 Aircraft Crew / Performance Data

<b>Pilots</b>	<b>2</b>
<b>Researchers</b>	<b>1-4</b>
<b>Cruise Speed</b>	<b>350 KIAS (.82 MACH)</b>
<b>Range</b>	<b>@ 1,200 Nautical Miles</b>
<b>Ceiling</b>	<b>45,000 ft</b>
<b>Gross Weight</b>	<b>15,000 lb</b>
<b>Useful Load</b>	<b>@ 6,500 lb*</b>

\* Fuel/Crew/Research Equipment and other restriction may apply



# Learjet Model 25 Right Side



Right Port/Instrument Mount



9.75" X 10.5" Opening



Inside Right Windows



Inside Right Window Close Up



IR Quartz Window Available



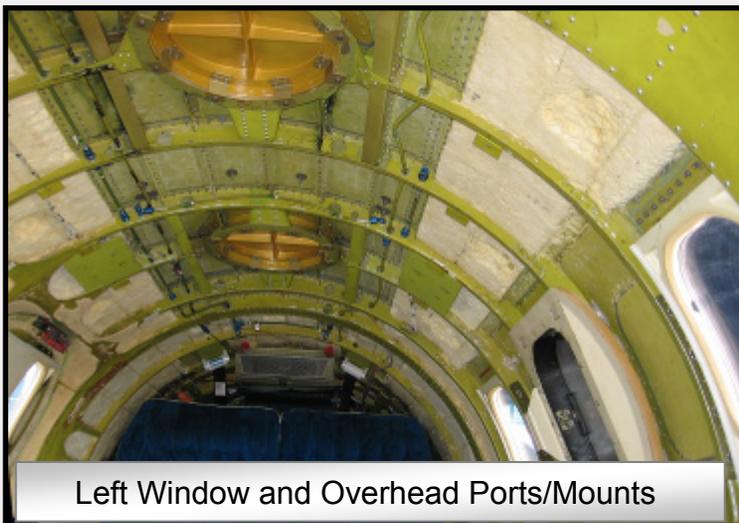
# Learjet Model 25 Left Side Photos



Left Windows



Motorized Sliding Door



Left Window and Overhead Ports/Mounts



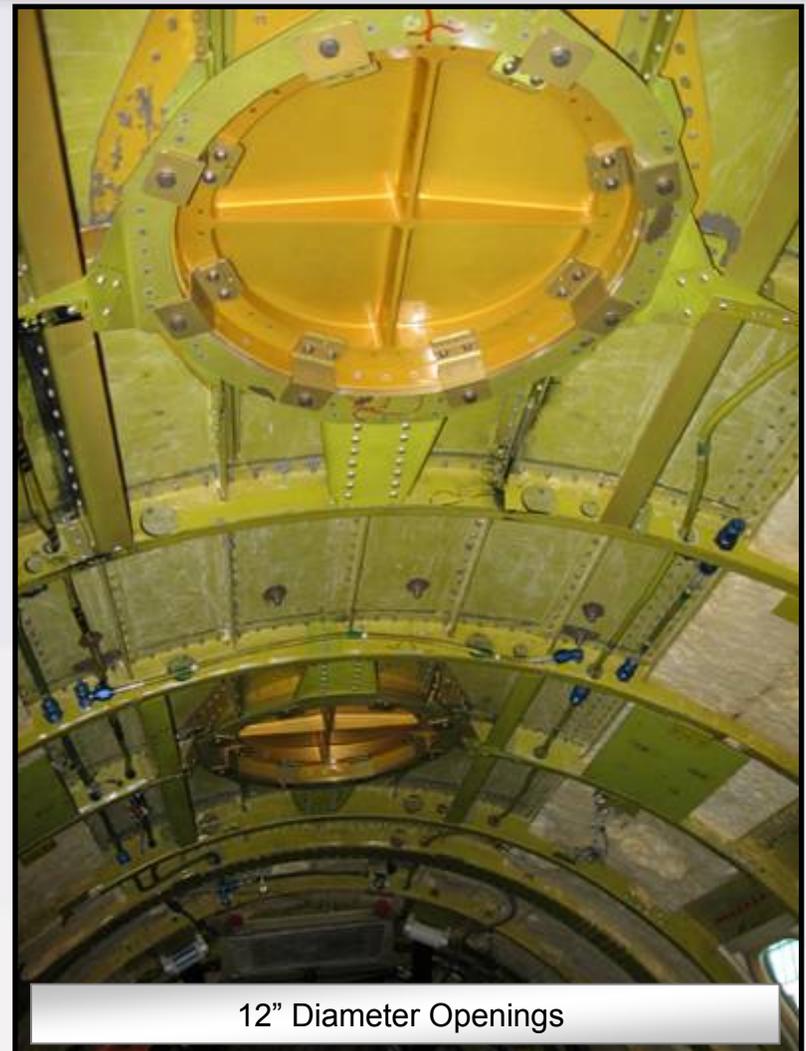
13.5" X 10.5" Opening



Door Operational in Flight



# Learjet Model 25 Viewports



12" Diameter Openings



Close Up of View Port/Instrument Mount



# Learjet Model 25 Right Side Fuselage Pod



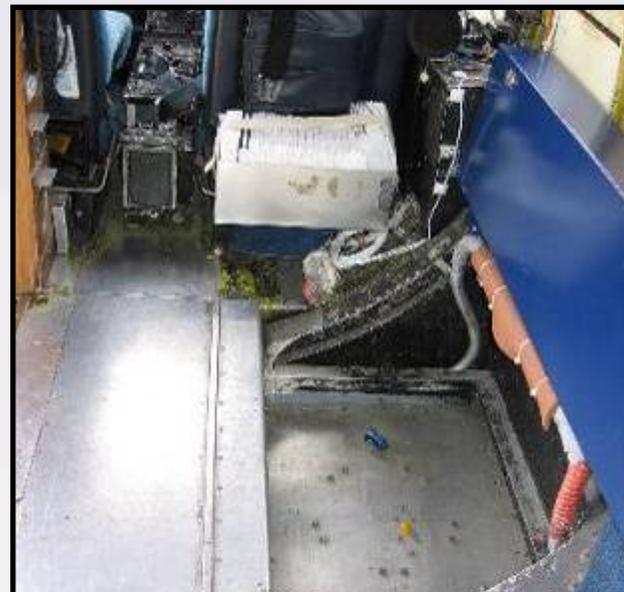
Second Pod Available on Door Side



View Port/Instrument Mount 22" X 19"



View Port/Mount From the Inside



Cabin Access to Viewport/Instrument Mount



# Learjet Model 23



## Lear 23 Aircraft Data

Wingspan	35 ft 8 in (10.84 m)
Length	43 ft 3 in (13.18 m)
Height	12 ft 3 in (3.73 m)
Powerplants	General Electric CJ-610-4 Turbojet Engines

## Lear 23 Aircraft Crew / Performance Data

Pilots	2
Researchers	1-4
Cruise Speed	350 KIAS (.82 MACH)
Range	@ 1,200 Nautical Miles
Ceiling	41,000 ft
Gross Weight	13,500 lb
Useful Load	@ 2,500 lb*

\* Fuel/Crew/Research Equipment and other restriction may apply



# Learjet Model 23



View Port/Instrument Mount 22" x 19"



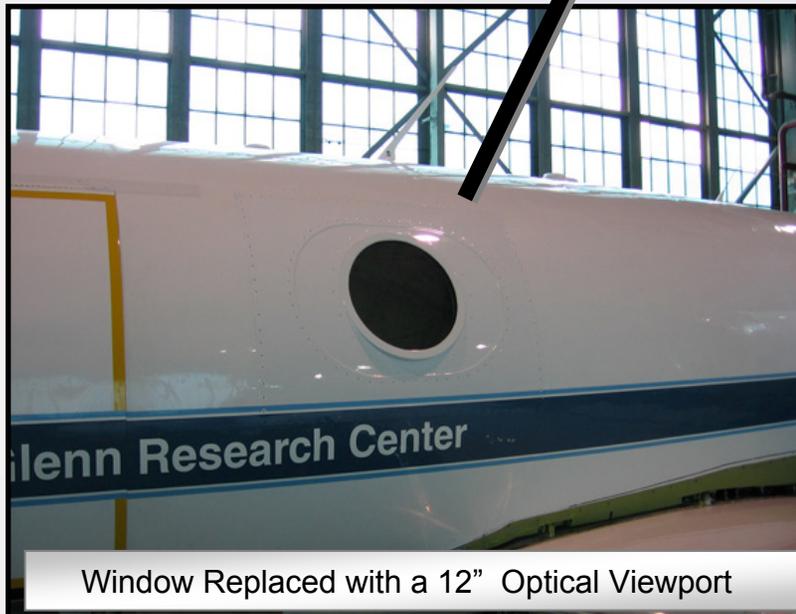
Aft Scanner Mount/Instrument mount 18.5" x 10" Opening





# Learjet Model 23

New Modification – 12” Optical Window



Window Replaced with a 12” Optical Viewport



Cabin Access to Operate Imaging Equipment



## *Past and Current Programs*





# Learjet Research Capabilities

<b>Electrical Power Configuration #1</b>	<b>115 Volts AC 60 Hz: 7.5 amps</b>
	<b>115 Volts AC 400 Hz: 15 amps</b>
	<b>28 Volts DC: 80 amps</b>
<b>Electrical Power Configuration #2</b>	<b>28 Volts DC: 250 amps</b>
<b>Electrical Power Configuration #3</b>	<b>115 Volts AC 33 amps (LJ25 only)</b>
<b>View Ports/Mounts (Optical Glass)</b>	<b>Top – Lear 25, Two (2) 12” Ports</b>
	<b>Bottom – Lear 23 and 25</b>
	<b>Sides – Lear 23 and 25</b>
<b>Internal Capacity</b>	<b>Standard Racks Mount to Seat Rails</b>





# S-3B Viking



## S-3B Viking Aircraft Data

<b>Wingspan</b>	<b>Unfolded – 68 ft 8 in (20.93 m) Folded – 29 ft 6 in (9.00 m)</b>
<b>Length</b>	<b>49 ft 5 in (Tail Folded)</b>
<b>Height</b>	<b>22 ft 9 in (6.93 m)</b>
<b>Powerplants</b>	<b>Two General Electric TF34-400B Turbofans</b>

## S-3B Viking Aircraft Crew / Performance Data

<b>Pilots</b>	<b>1 – 2</b>
<b>Researchers</b>	<b>2 – 3</b>
<b>Cruise Speed</b>	<b>450 KIAS (.79 MACH)</b>
<b>Range</b>	<b>@ 2,300 Nautical Miles</b>
<b>Ceiling</b>	<b>40,000 ft</b>
<b>Gross Weight</b>	<b>52,500 lb</b>
<b>Useful Load</b>	<b>@ 25,000 lb*</b>

\* Fuel/Crew/Research Equipment and other restriction may apply



# S-3B Viking Research Capabilities

Electrical Capacity	115 Volts AC 60 Hz: 21 KVA
	115 Volts AC 400 Hz: 33 amps
	28 Volts DC: 500 amps
External Capacity	2 Wing Mounts Two (2) External Sensor Pods
	Two (2) Heated Bomb Bays Approximately 28" width, 90" length, 25" high Aft Sensor Area
Internal Capacity	Avionics Bay Approximately 75" width, 90" length, 36" high





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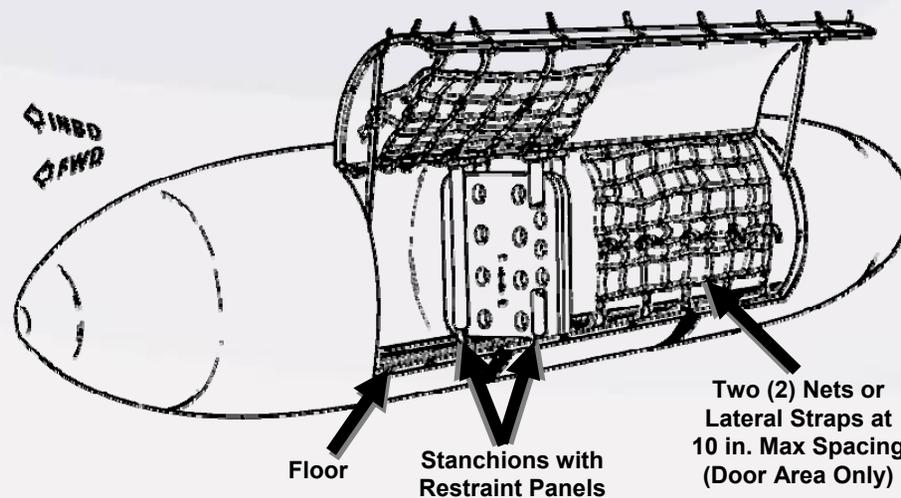


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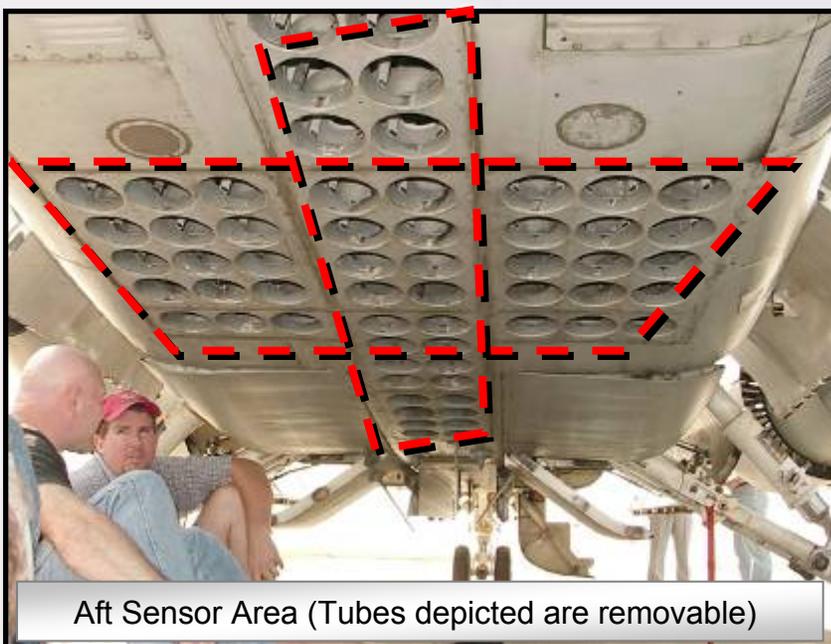
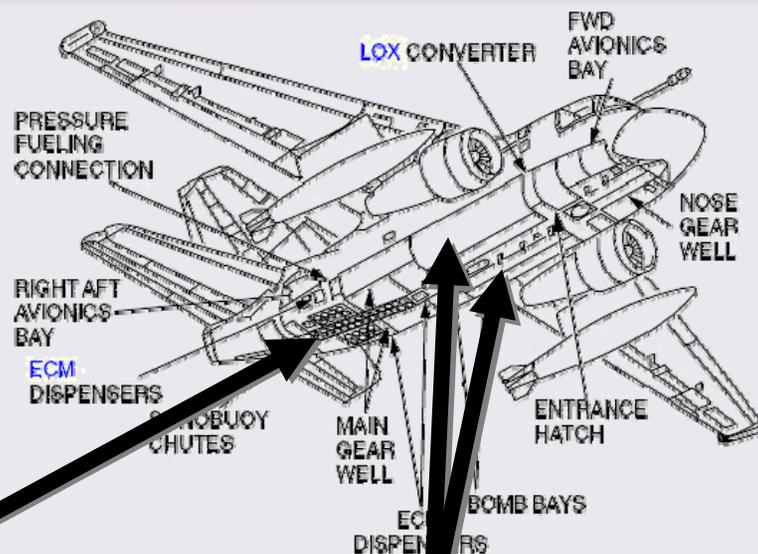
External Sensor Pod





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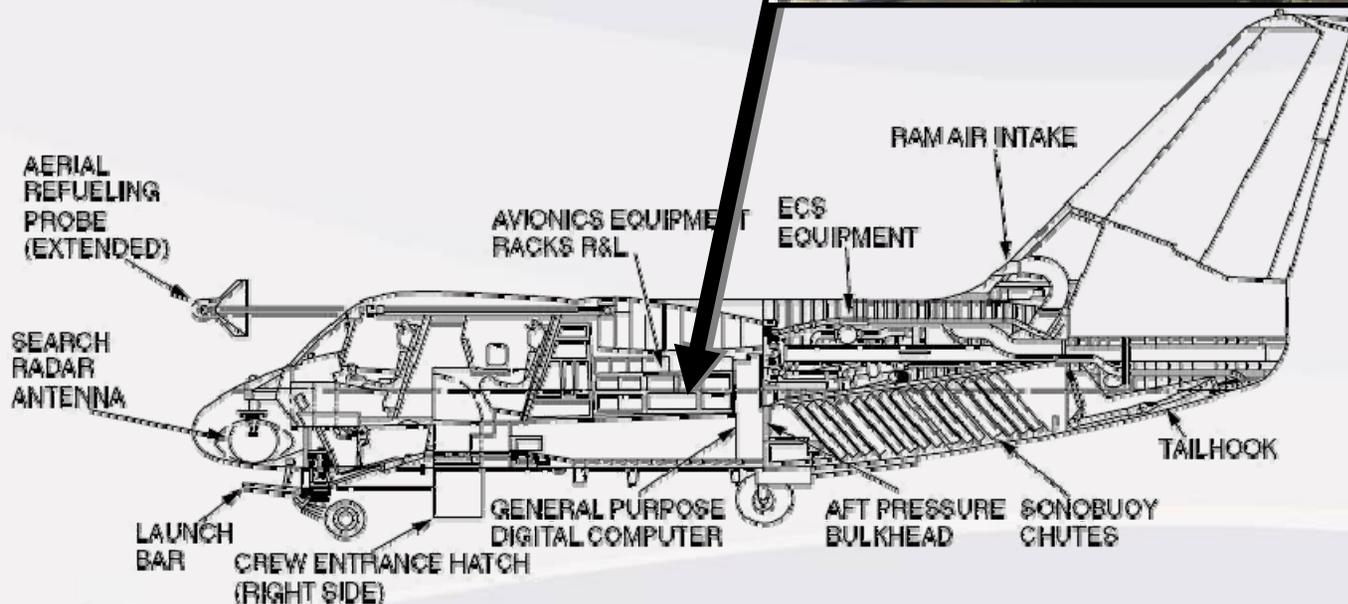
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# S-3B Viking Research Capabilities

## Funded Instrumentation Upgrades

Meteorological	Imaging	A/C Aerodynamics
<b>Droplet Sizing</b>	<b>Wing Stereo Camera System</b>	<b>V, <math>\alpha</math>, <math>\beta</math>, Altitude</b>
– FSSP	<b>Tail Video</b>	<b>Accels, Rates, Attitude</b>
– OAP-200X 1-DC	<b>Over Wing Video</b>	<b>Control Surface Positions</b>
– OAP-260X 1-DC	<b>35mm Stills</b>	<b>Pilot Force / Hinge Moment</b>
– OAP-2DC-Grey	<b>Hi-8 Video</b>	<b>N1</b>
<b>Liquid Water Content</b>		<b>Fuel Flow (Mass)</b>
– CSIRO-King		<b>GPS Position</b>
– Nevzorov LWC/TWC		
<b>Rosemount Ice Detector</b>		
<b>Temperature</b>		
– Total, Static, Dew Point		





# Twin Otter DHC-6



## Twin Otter DHC-6 Aircraft Data

Wingspan	65 ft
Length	60 ft (Including Nose Boom)
Height	19 ft 6 in (6.9 m)
Engines	Pratt and Whitney PT6A-20
Propellers	Hartzell Model HC-B3

## Twin Otter DHC-6 Aircraft Crew / Performance Data

Pilots	1-2
Researchers	1-3
Cruise Speed	140 Knots
Range	@ 400 Nautical Miles
Ceiling	16,000 ft
Gross Weight	11,000 lb
Useful Load	@ 5,500 lb*

\* Fuel/Crew/Research Equipment and other restriction may apply



# Twin Otter DHC-6 Research Capabilities

Electrical Capacity	115 Volts AC 60 Hz: 16 amps
	115 Volts AC 400 Hz: 15 amps
	28 Volts DC: 80 amps
External Capacity	Five (5) External Hard Wing Mounts + Various Small Instrument Mounts
Internal Capacity	Three (3) Internal Research Hardware Locations
	Front Section, Main Fuselage, Rear Fuselage
	Overhead Hatch
	Picture Window





# Twin Otter DHC-6 Research Capabilities

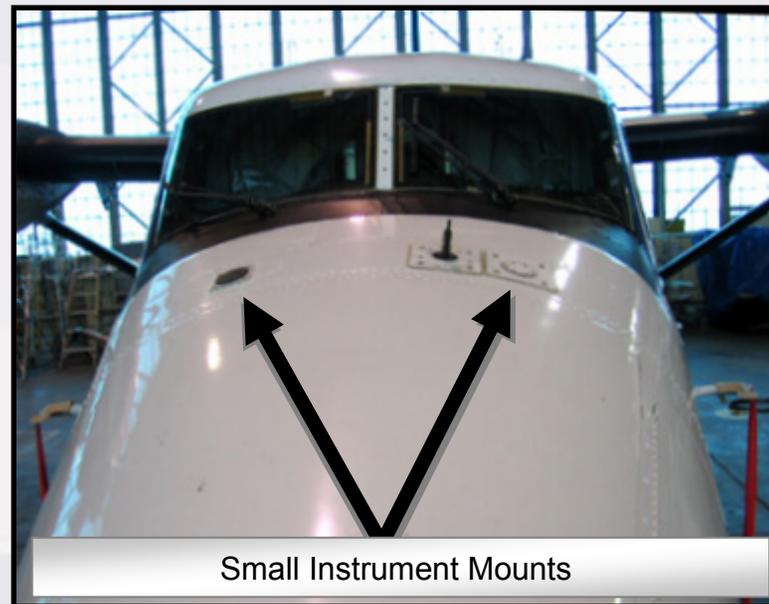
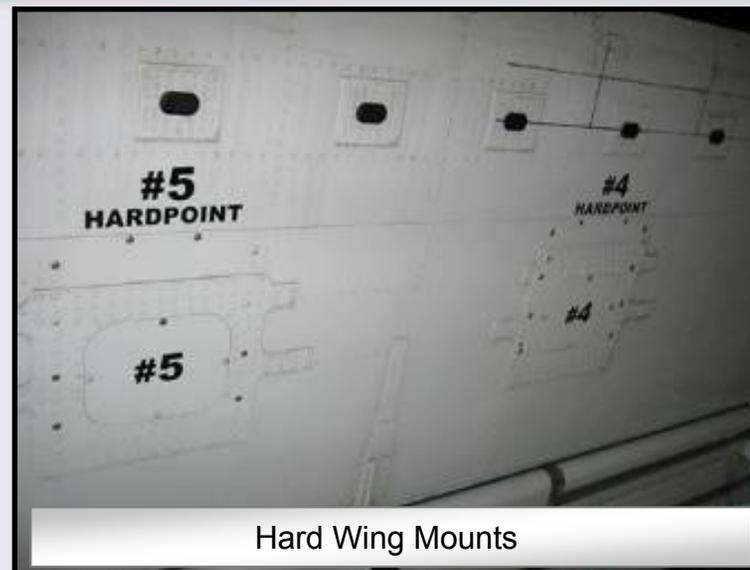
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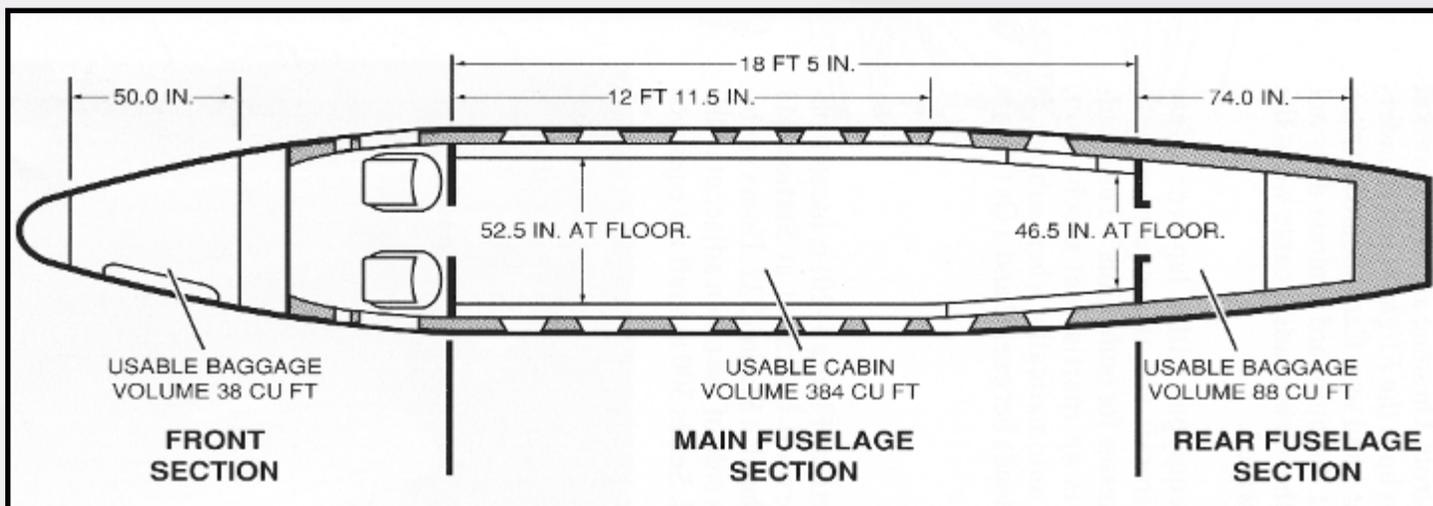
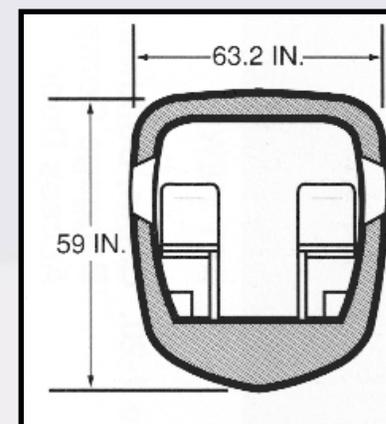
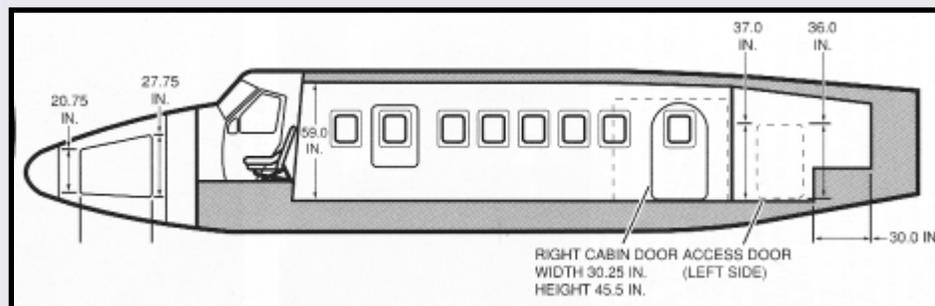
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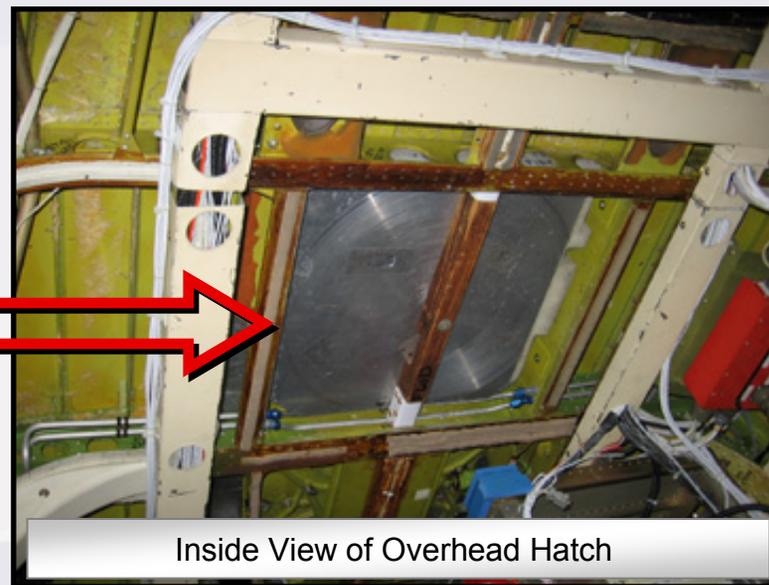


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Outside View of Overhead Hatch 18" X 17.25"



Inside View of Overhead Hatch



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# Twin Otter DHC-6 Research Capabilities

## *Current Installation – Looking Forward*



Rack #1 Video Suite



Rack #2 Data Acquisition



Standard Racks Reconfigured to Meet Customer Needs



# Twin Otter DHC-6 Research Capabilities

## Available Instrumentation Suite

Meteorological	Imaging	A/C Aerodynamics
<b>Droplet Sizing</b>	<b>Wing Stereo Camera System</b>	<b>V, <math>\alpha</math>, <math>\beta</math>, Altitude</b>
– FSSP	<b>Tail Video</b>	<b>Accels, Rates, Attitude</b>
– OAP-200X 1-DC	<b>Over Wing Video</b>	<b>Control Surface Positions</b>
– OAP-260X 1-DC	<b>35mm Stills</b>	<b>Pilot Force / Hinge Moment</b>
– OAP-2DC-Grey	<b>Hi-8 Video</b>	<b>Prop RPM, Torque</b>
<b>Liquid Water Content</b>		<b>Fuel Flow (Mass)</b>
– CSIRO-King		<b>GPS Position</b>
– Nevzorov LWC/TWC		
<b>Rosemount Ice Detector</b>		
<b>Temperature</b>		
– Total, Static, Dew Point		





# T-34C Mentor



## T-34C Mentor Aircraft Data

<b>Wingspan</b>	33 ft 4 in (10.60 m)
<b>Length</b>	28 ft 6 in (8.75 m)
<b>Height</b>	9 ft 7in (2.92 m)
<b>Powerplants</b>	Pratt & Whitney Canada PT6A-25 Turboprop, 550shp

## T-34C Mentor Aircraft Crew / Performance Data

<b>Pilots</b>	1
<b>Researchers</b>	1
<b>Cruise Speed</b>	240 KIAS
<b>Range</b>	550 Nautical Miles
<b>Ceiling</b>	30,000 ft
<b>Gross Weight</b>	4,400 lb
<b>Useful Load</b>	@ 1,400 lb*

\* Fuel/Crew/Research Equipment and other restriction may apply



# T-34C Mentor Research Capabilities

Electrical Power	Engineering Complete, modification funding needed
Projects	GLESM – Camera Mounted to Baggage Door



Fuselage Research Pod (Available Late 07)



Small Research Location



# T-34C Mentor Research Capabilities

Electrical Power	Engineering Complete, modification funding needed
Projects	GLESM – Camera Mounted to Baggage Door



Sensor Installed on Door Panel



Close Up View



# Aircraft Data Comparison

	 Learjet Model 23	 Learjet Model 25	 Twin Otter DHC-6	 S-3B Vikings	 T-34 Mentor
<b>Wingspan</b>	35 ft 8 in (10.84 m)	35 ft 8 in (10.84 m)	65 ft (19.8 m)	Unfolded – 68 ft 8 in (20.93 m) Folded – 29 ft 6 in (9.00 m)	33 ft 4 in (10.60 m)
<b>Length</b>	43 ft 3 in (13.18 m)	47 ft 7 in (13.18 m)	60 ft Including boom	Length (tail folded): 49ft 5in	28 ft 6 in (8.75 m)
<b>Height</b>	12 ft 3 in (3.73 m)	12 ft 3 in (3.73 m)	19 ft. 6 in. (5.9 m)	22ft 9in (6.93 m)	9 ft 7 in (2.92 m)
<b>Engines</b>	Two General Electric CJ-610-4 turbojets 2,850 lbs Thrust	Two General Electric CJ-610-6 turbojets 2,950 lbs Thrust	Pratt & Whitney PT6A-20 turboprop, 550 shp	Two General Electric TF34-400B turbofans 9,275 lbs (41.26kN) each	Pratt & Whitney PT6A-25 turboprop, 550 shp



# Aircraft Crew/Performance Data Comparison

	 Learjet Model 23	 Learjet Model 25	 Twin Otter DHC-6	 S-3B Vikings	 T-34 Mentor
<b>Pilots</b>	2	2	1 – 2	1 – 2	1
<b>Researchers</b>	1 – 4	1 – 4	1 – 3	2-3	1
<b>Airspeed Range</b>	150-350 KIAS (.82 Mach)	150-350 KIAS (.82 Mach)	75-200 KIAS	140-450 KIAS (.79 Mach)	75-280 KIAS
<b>Range</b>	@ 1,000 Nautical Miles	@ 1,000 Nautical Miles	@ 400 Nautical Miles	@ 2,300 Nautical Miles	@ 550 Nautical Miles
<b>Ceiling</b>	41,000 ft +	45,000 ft +	16,000 ft	40,000 ft	30,000 ft
<b>Gross Weight</b>	13,300 lb	15,000 lb	11,000 lb	52,500 lb	4,400 lb
<b>Payload</b>	@ 2,800 lb*	@ 3,200 lb*	@ 3,600 lb*	@ 12,000 lb*	@ 400 lb*

*\* Fuel/Crew/Research Equipment and other restriction may apply*



# Research Capabilities Comparison

				
Learjet Model 23	Learjet Model 25	Twin Otter DHC-6	S-3B Vikings	T-34 Mentor
<p><b>Electrical Power</b>  <u>Configuration #1</u>            115 Volts AC 60 Hz: 7.5 amps            115 Volts AC 400 Hz: 15 amps            28 Volts DC: 80 amps</p> <p><u>Configuration #2</u>            28 Volts DC: 250 amps            Internal Capacity</p> <p><b>Internal Capacity</b>            Standard Racks Mount to Seat Rails</p> <p><b>View Ports (Instrument Mounts)</b>            Bottom            (22" x 19") Internal            (18.5" x 10") Aft External            Right Side (12") Internal</p>	<p><b>Electrical Power</b>  <u>Configuration #1</u>            115 Volts AC 60 Hz: 7.5 amps            115 Volts AC 400 Hz: 15amps            28 Volts DC: 80 amps</p> <p><u>Configuration #2</u>            28 Volts DC: 250 amps            Internal Capacity</p> <p><u>Configuration #3</u>            115 Volts AC 33 amps</p> <p><b>Internal Capacity</b>            Standard Racks Mount to Seat Rails</p> <p><b>View Ports (Instrument Mounts)</b>            Top (Two 12" ports)            Bottom (Two 22"x 19") Internal            Sides            Right (9.75" x 10.5) Internal            Left (13.5" x 10.5") Internal</p>	<p><b>Electrical Power</b>            115 Volts AC 60 HZ: 16 amps            115 Volts AC 400 Hz: 15 amps            28 Volts DC: 80 amps</p> <p><u>Configuration #2</u>            115 Volts AC 33 amps</p> <p><b>Internal Capacity</b>            Three (3) Internal Research Hardware Locations:            Front Section            Main Fuselage            Rear Fuselage</p> <p>Standard Rack Mounts            Overhead Hatch            Picture Window</p> <p><b>External Capacity</b>            Five External Wing Hard Mounts</p>	<p><b>Electrical Power</b>            115 Volts AC 60 HZ: 21 kVA            115 Volts AC 400 Hz:33 amps            28 Volts DC: 500 amps</p> <p><b>Internal Capacity</b>            Approximately 75" width            90" length            36" high</p> <p><b>External Capacity</b>            2 Heated Bomb Bays            28" Width            90" Length            25" High</p> <p>Aft Sensor Area            2 Wing Mounts</p> <p>External Pods            2 External Sensor Pods Attach to Wing Mounts</p>	<p><b>Electrical Power</b>            Engineering Complete, modification needs funding</p> <p><b>External Capacity</b>            Fuselage Research Pod (available 2009)</p>

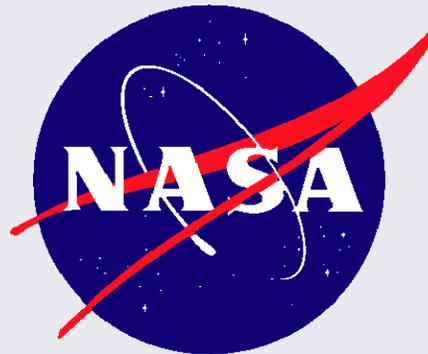


## *Outstanding In-House Capability!*

- Pilots
- Engineering
  - Mechanical
  - Electrical
- Maintenance
- Fabrication
  - Electrical
  - Mechanical



***Thank You!***



***NASA Glenn Research Center  
Flight Operations***

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