"The Straight Word"

British Aerospace ATP

I. FLIGHT PROCEDURES:

COCKPIT PREPARATION

1		Batteries	On, 23 V minimum
1		Nav Lights	On
	2	Avionics Fan Master	On
1		Flight Instrument Switch	On
1	2	Altimeters	Set QNH
	2	Trims	Set for Takeoff
	2	Fuel Totalisers	Zero

BEFORE START

	2	Cabin Altitude Controller	Set
1		Condition Levers	Off
1		Power Levers	Ground Idle
1		Parking Brake	Apply
1		Engine Start Master	On
1		Electrical Panel	Checked, on Emergency
1		Anti-Collision Light	On

ENGINE START

These are the items to be repeated for each engine start. The Captain will always start the engines, and the First Officer will monitor. The normal start sequence is 2-1.

1		"RIGHT SIDE?"	
	2	"RIGHT SIDE CLEAR"	
1		Start Left	Engage
1		"RIGHT ENGINE ENGAGED, START TIMING"	
	2	Timer	Start
	2	"TIMING"	
	2	"10%"	
1		Condition Lever	Feather
	2	"ITT ALIVE"	
	2	"OIL PRESSURE ALIVE"	
	2	"RED LIGHT OUT"	

	2	“STARTER DISENGAGED”	
	2	“ITT BELOW 400°”	
1		Condition Lever	Min
	2	Engine Bleed Valve	On
	2	Engine Pack Valve	On
1		Generator	Check, then On

Once both engines are started:

1		Engine Start Master	Off
1		GPU	Disconnect
1		“START COMPLETE”	

RUN UP

The run-up shall be made before the first flight of the day, just after engine start. The following autofeather test should be repeated for each engine:

1		“AUTOFEATHER CHECK, LEFT SIDE”	
1		AC Wild Transfer	Arm
1		Power Rating Selector	Takeoff
	2	EEC Engine Test	Depress both
	2	“RELEASING LEFT”	
	2	EEC Engine Test	Release left
1		“RIGHT SIDE UPTRIM”	
1		“LEFT FEATHER PUMP ON”	
1		“LEFT GENERATOR OFF-LINE”	
1		“TRANSFER ON-LINE”	
	2	Power Rating Selector	Max Cntgcy, Int Cntgcy, T/o
	2	“POWER SELECTOR CHECKED”	

AFTER START

The Captain will call for the After Start flow, and then for the After Start check.

1		Nosewheel Steer Switch	On
1		Hydraulic Panel	Check
1		Electrical Panel	Set
1		GPU	Off & removed
1		CWP	Clear
1		Power Rating Selector	Takeoff
1		Trims	Zero
	2	Dump Valve	Closed
	2	ECS Panel	Set
	2	De-Icing Systems	Set
	2	Fuel Pumps	All On
	2	Auto-Ignition	Arm
	2	Flaps	Set
1	2	EFIS	Set

If a pushback is necessary, do not forget to turn the nosewheel steering Off and to release the parking brake before starting the manoeuvre.

If a powerback is necessary, turn the oil coolers to Open. Select 15-20% reverse thrust. Use only shallow steering angles and no brakes.

TAXIING

Taxiing is done by the Captain.

1		Taxi Light	On
1		Parking Brake	Release
1		Brakes	Check
1	2	Flight Instruments	Check
1		"VSI AND AIRSPEED READING ZERO"	
1		"HORIZON IS STEADY AND ERECTED"	
1		"COMPASS IS READING XXX°"	
	2	"RIGHT SIDE CROSS-CHECKED, NO FLAGS"	
1		Brake Temperature	Monitor hottest brake

BEFORE TAKE-OFF

The Captain will call for the Before Takeoff flow, and then for the Before Takeoff check.

1		Landing Lights	On
1		Flight Controls	Check rudder
1		Hydraulic Panel	Check
1		Electrical Panel	Check
	2	ECS Packs	Off
	2	Gust Lock	Release
	2	Flight Controls	Check ailerons & elevator
	2	Transponder	On & set
	2	Continuous Ignition	As required

Then, once the takeoff clearance is received:

	2	Condition Levers	Max

AFTER TAKE-OFF

Power is initially applied by the Captain, then the First Officer trims the power levers to EEC torque and checks the engine gauges for proper reading. The callouts and items during the ground roll go as follows:

1		"SET POWER"
	2	"POWER SET, AUTOFEATHER ARMED"
	2	"AIRSPEED ALIVE"

	2	“80 KNOTS”	

At 80 KIAS, whoever is PF takes rudder control of the airplane. The Captain keeps his hand on the steering in order to counteract any unwanted movement.

	PNF	“V1”	
	PNF	“ROTATE”	
	PNF	“POSITIVE RATE”	
PF		“GEAR UP”	
	PNF	Landing Gear	Up

Upon passing 400 ft and not below ____ KIAS:

	PNF	“400 FT”	
PF		“SET CLIMB POWER, FLAPS 7”	
	PNF	Power Rating Selector	Climb
	PNF	ECS Packs	On
	PNF	Flaps	7°
	PNF	“SPEED CHECKED, FLAPS 7 SELECTED”	

Then, upon reaching 1500 ft and not below 140 KIAS:

	PNF	“1500 FT”	
PF		“FLAPS UP, CONDITION LEVERS TO 85%”	
	PNF	Flaps	0°
	PNF	“SPEED CHECKED, FLAPS UP”	
	PNF	Condition Levers	85%
	PNF	Prop Sync	On
	PNF	“CONDITION LEVERS SET TO 85%”	
PF	PNF	Altimeters	Set Standard

A climb speed of 180 KIAS shall be taken for normal climb. Maximum rate climb speed is 150 KIAS, but a minimum of 160 KIAS shall be kept in icing conditions. The “After Takeoff Checks” are then performed by the PNF.

Passing FL80 in the climb:

PF		“CONDITION LEVERS TO 82,5%”	
	PNF	Condition Levers	82,5%

And passing FL100 in the climb:

1		Landing & Taxi Lights	Off
	2	Pressurisation	Check

CRUISE

Three minutes after the aircraft has taken a level attitude:

PF	“SET CRUISE POWER”

	PNF	Power Rating	Cruise
	PNF	Power Levers	Cruise Torque

DESCENT

	PNF	Cabin Altitude Controller	Set Field Elevation + 500
	PNF	Oil Temperatures	Check > 45° prior to icing

APPROACH

These actions are done when passing through the transition level in the descent.

	PNF	Continuous Ignition	As required
PF	PNF	Altimeters	Set QNH
	PNF	Fuel Crossfeed Lever	Check Closed.
	PNF	Logo Lights	On

BEFORE LANDING

Holding speed is 150 KIAS, or 160 KIAS in icing conditions, achieved with _____ % torque. The normal arrival technique calls for the following steps:

- Flaps 7° on localizer intercept.
- Undercarriage down & flaps 15° on glideslope intercept.
- Vat + 20.
- Flaps 20° anytime on the glideslope.
- Flaps 29° optional, only when visual.

Theses actions are asked by the PF to the PNF. A speed of 170 KIAS shall be maintained in the approach environment, this being achieved with ____% torque. The required power setting to maintain Vref varies with weight, but normally stands around 28 to 30%. Once stabilized on final approach, the following actions are completed:

	PNF	Landing Lights	On
	PNF	Propeller Synchrophaser	Off
	PNF	Condition Levers	100%
	PNF	Power Rating	Takeoff
	PNF	ECS	Packs & Bleeds Off

PF		"CONDITION LEVERS TO MAX, BEFORE LANDING CHECKS"	
	PNF	Condition Levers	Max

The "Before Landing Checks" are then performed by the PNF.

If necessary, the go around manoeuvre is made by pitching up, applying power and retracting one notch of flaps.

LANDING ROLL

After passing 80 KIAS in the landing roll, the Captain will take control of the airplane. Once passing 60 KIAS decelerating:

1		"PROPS & LOCKS"	
	2	Gust Lock	On
	2	Condition Levers	Min

Finally, after the runway has been cleared, the Captain will call for After Landing flows and checks:

1		Landing Lights	Off
1		Brake Temperatures	Check
	2	Flaps	0°
	2	Continuous & Auto Ignition	Off
	2	Oil Coolers	As required
	2	Transponder	Standby
	2	Dump valve	Open
	2	ECS Packs	On
	2	Fuel Pump Switches	Outers Off
	2	De-Icing Systems	Off

ENGINE SHUTDOWN

When the aircraft is in its parking position:

1	Generators	Off
1	Condition Levers	Feather

Then, after 20 seconds:

1	Condition Levers	Off

A normal shutdown of the rest of the systems is then performed.

II. SYSTEMS DESCRIPTION:

FLIGHT CONTROLS

Conventional surfaces, operated mechanically.
Mechanical trims.

A Standby Control System (SCS) is provided in case of cable break for all 3 axis. If control surfaces position differs with control wheel / pedals position by more than 25%, the SCS kicks in. The 'SCS' amber CWP comes on, along with an amber 'Engaged' light on the centre overhead panel, and the autopilot motors will actuate the control surfaces.

Another backup is provided in case of control jam of the aileron and elevator only. In case of an aileron or elevator jam, pull the Aileron or the Elevator Disconnect Handle, as appropriate. The 'SCS' amber CWP comes on, along with an amber 'Split' light on the centre overhead panel. If a left surface has jammed, the right pilot only can fly using the autopilot motors to actuate the right control surface. If a right surface has jammed, either pilot can fly using the normal cable to actuate the left control surface only.

ENGINES & PROPELLERS

Two Pratt & Whitney Canada PW126 or PW126A, 2653 shp each. PW126A has increased contingency power time limitations.

Engine limitations (PW126):

- Torque : As per EEC.
- Propeller : 101% (cont), 115% (15 mn).
- Nh & Nl : ~100% (cont), ~102% (int ctgy), ~103% (max ctgy).
- ITT : 800-830°C (2,5 mn), 830-840°C (20 s), 840-950°C (5 s).

Engine power ratings (PW126):

- Max Contigency: 830°C ITT, 2,5 mn max single-engine.
- Int Contigency: 800°C ITT, continuous single-engine.
- Takeoff: 760° ITT, 5 mn max.
- Climb.
- Cruise.

Ignition is provided by two igniters on each engine. The autoignition system (optional) should be Armed during flight. When torque drops below 69%, ignition goes on. The "Continuous Ignition" green PBSI will then go On.

Inertial separation is built in the engine inlet.

The propellers are controlled by three governors: one primary (standard type) and two secondary (standard overspeed and MFC restrictor). They are fully reversible, and have a ground and a flight idle pitch controlled by a squat switch. They are equipped with a dual autofeathering device (EEC+AFU) which will actuate in case torque drops below 25% on one engine while the power levers are forward and the Takeoff Rating is selected – both autofeather devices are armed automatically in that configuration.

FUEL SYSTEM

Two fuel tanks in the following configuration:

- Mains : 2 x 711 ImpGal (2 x 2582 Kg)
- Total : 1422 ImpGal (5164 Kg)
  = 6470 litres

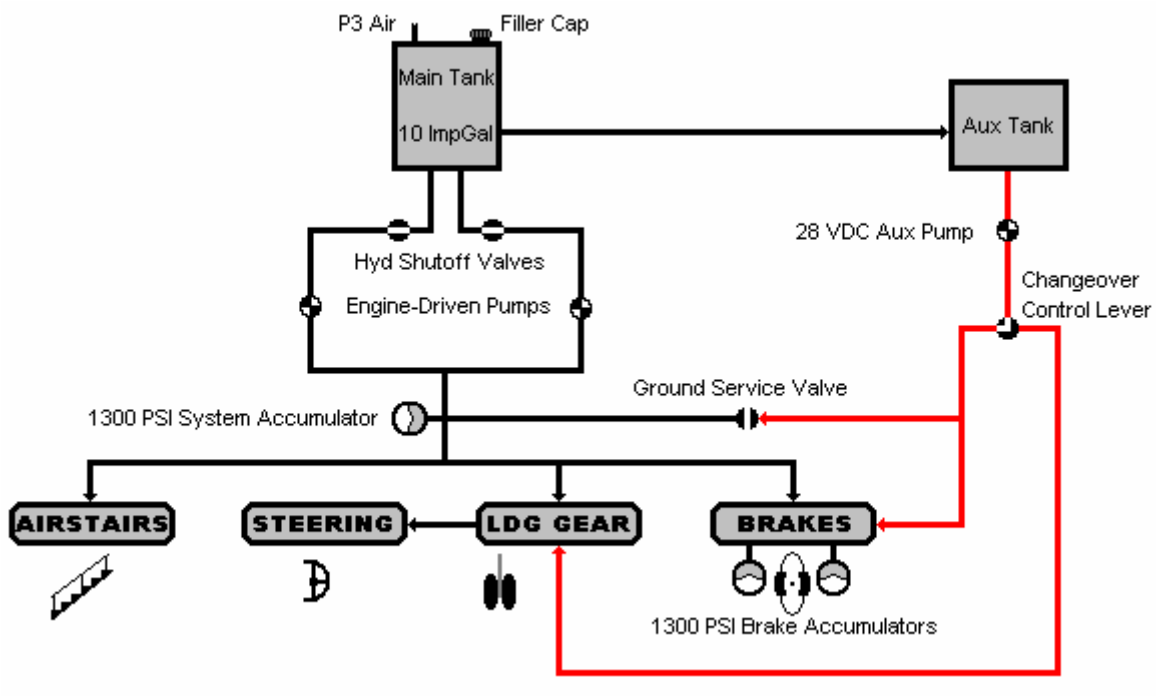
Each engine feeds from its main tank via a motive-flow pump driven by the engine-driven HP pump. In case the motive-flow pump fails, two electrical LP Boost Pumps on each side can be turned On. The engine-driven HP fuel pump has no backup in case of failure.

Crossfeed is achieved by feeding an engine from its opposite tank. The Crossfeed lever is located on the left side of the centre console.

The engine shutdown system ensures that any fuel left in the lines is blown back to the tanks after cutoff.

Maximum fuel imbalance is 100 Kg for takeoff and 400 Kg in flight.

HYDRAULIC SYSTEM



The hydraulic system is normally run by two engine-driven pumps. It allows for landing gear, power steering, brake and airstairs operation.

Normal system pressure is 2450 psi. The hydraulic tank (MIL-H-5606 fluid) is located in the right aft wing root, and feeds the auxiliary tank. A 1300 psi system accumulator located in the nosewheel well dampens pressure in the system. Two other accumulators of the same capacity are located in the same area and to provide brakes pressure (1800 psi minimum for start).

A 28 VDC auxiliary pump permits:

- Brake operation when Changeover Lever is pushed in,
- Landing gear lowering when Changeover Lever is pulled out,
- Power steering and airstairs operation when the Ground Service Valve is open – ground only.

ELECTRICAL SYSTEM

115 VAC frequency-wild system:

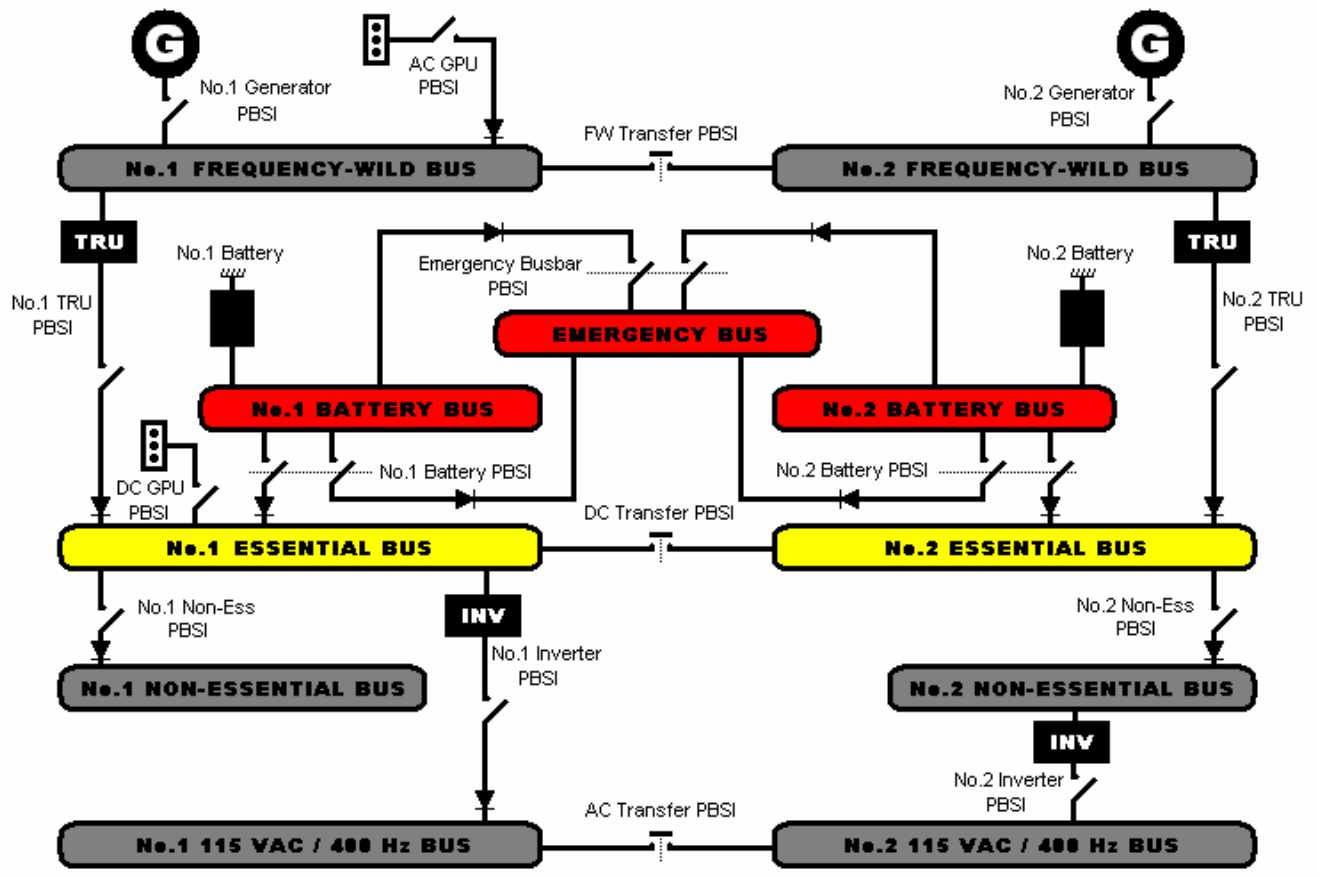
- Two 130-amps generators.

28 VDC system:

- Two 250-amps TRU fed by 115 VAC frequency-wild system.
- Two 37-amp-hour NiCad batteries in the nose.

115/26 VAC, 400 Hz system:

- Two inverters fed by 28 VDC system.



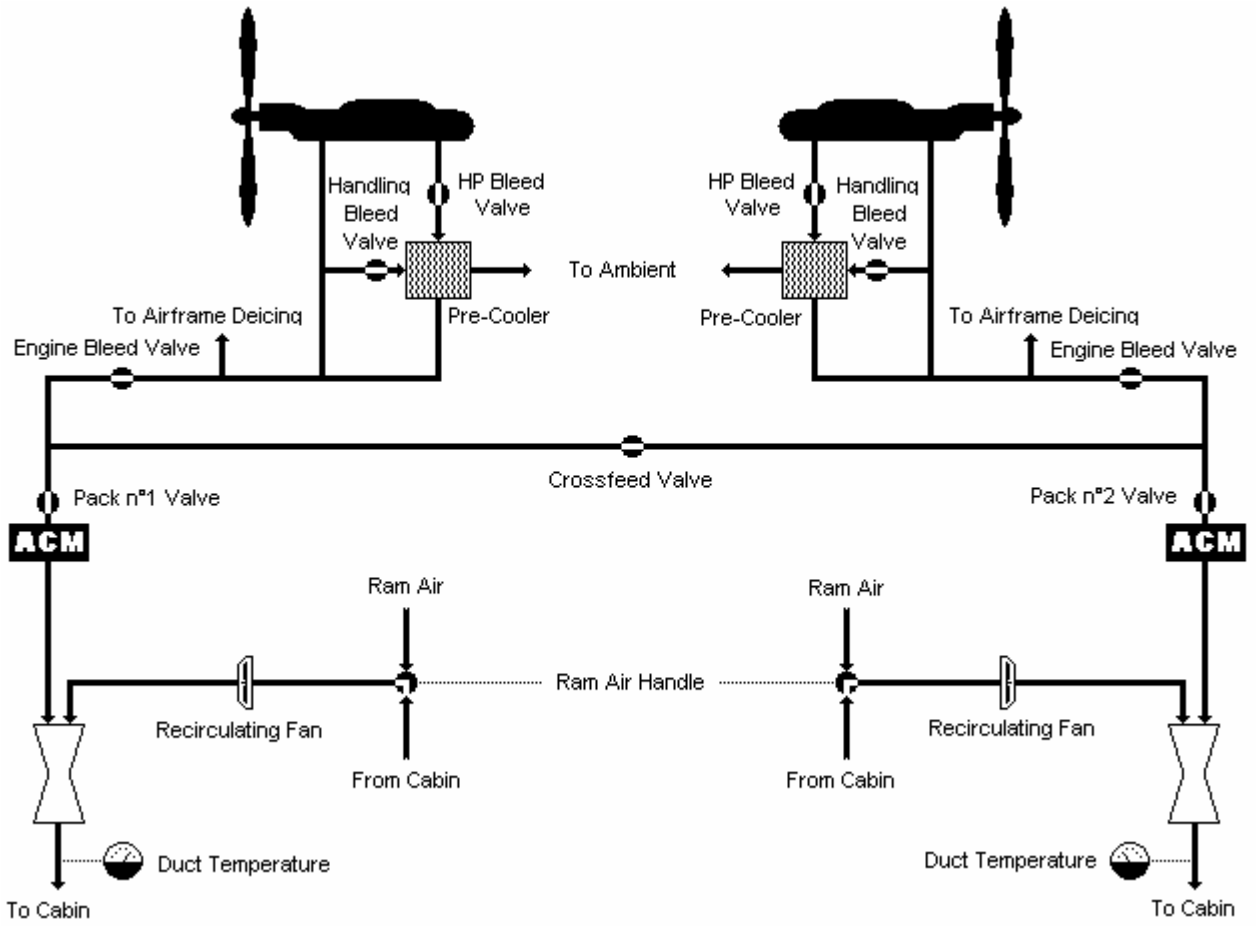
Note: on some aircraft, the n°2 inverter is powered directly from the n°2 Essential Bus. Hence it will no be shed if the Lo Volt red light comes on.

PNEUMATIC SYSTEMS

The pneumatic system uses P2.5 or P3 bleed air regulated to 18 psi for the following functions:

- Airframe deicing.
- Hydraulic tank pressurisation.

A single engine can provide enough air for all these systems.



The system elects automatically whether to use only P2.5 (LP) or also P3 (HP) air in function of engine output. The HP Bleed PBSI should always be left On during normal operations, and the valve will open or close automatically. At low power settings, the HP Bleed Valve will be open, and HP air will be pre-cooled by P2,5 air coming from the Handling Bleed Valve (operated automatically to avoid compressor stall).

The HP Bleed & Engine Bleed Valves will automatically shut off in case any of overheat or excessive pressure in the system, triggering the “ECS” amber light on the CWP.

If a bleed line breaks, the amber Hot Air Leak PBSI will illuminate along with the “ECS” amber CWP. Pressing it will automatically isolate the leak by closing the appropriate valves.

ENVIRONMENTAL SYSTEMS

Pressurisation works off P2.5 or P3 air prepared by the pneumatic system. The maximum Δp of 5.5 psi allows flights up to FL250.

The bleed air is regulated in temperature and pressure by the Engine Bleed Valve. An ACM pack (Air Cycle Machine) on each side then cools the air to an acceptable temperature – some freighters are only provided with the left pack. The Pack Valve will automatically shut off in case any of overheat in the respective ACM, triggering the “ECS” amber light on the CWP.

A recirculating fan then draws the ACM conditioned air to the cabin, using either recirculated cabin air (Ram Air Handle pushed, pressurised flight) or ram air (Ram Air Handle pulled, unpressurised flight with Δp=0.5 psi). The Ram Air Handle is located on the copilot's seat right side.

The Crossfeed Valve may NOT be used to feed both packs from a single engine. Instead, it can be used in the unlikely case of a left engine failure and right pack failure. The Boost PBSI should instead be used, increasing the ACM output by 20% without increasing P2,5 or P3 demand.

Cabin temperature can be controlled automatically between 15 and 30°C by placing the temperature control knobs in Auto. Pulling and turning the knob down will provide manual control by directly operating the ACM Bypass Valve (20 seconds from fully open to fully closed (?)).

The oxygen system for the crew consists in one bottle located aside the captain's seat. The passengers are provided with 8 portable oxygen bottles (therapy sets) located in the aft overhead bins, that are supposed to be offered by the flight attendants after the completion of the emergency descent.

LANDING GEAR & WHEELS

The landing gear is operated by the hydraulic system. The uplocks and downlocks are hydraulic and mechanical. Landing gear position is indicated by a standard green/red lights arrangement and three independent mechanical indicators located on the cockpit doorstep and inboard of the engine nacelles. A landing gear safety switch prevents retraction on the ground, but an "Override" switch is provided.

A Gear Up Warning Horn sounds every time one of the throttle levers is pulled back (can be cancelled) and every time the wing flaps extends further than the 15° position (cannot be cancelled). The Warning Horn is inhibited for 2,5 minutes following a 20° flap takeoff. The green lights and Gear Up Warning Horn are independent systems.

Emergency hydraulic gear extension is achieved by pulling the Landing Gear Changeover Selector Valve and turning On the Auxiliary DC Pump. Fluid is then routed from the auxiliary hydraulic tank to independent down lines – the normal Landing Gear Handle is completely bypassed. After the landing gear has been extended, the Changeover Selector Valve must be pushed back in, otherwise the brakes cannot be operated with the auxiliary pump.

Emergency gear release should be attempted only if the auxiliary gear extension is unsuccessful. A mushroom beside the copilot's seat will release the nosewheel uplock and two handles in the mid-cabin floor (passenger) or in the cockpit behind the pilots (freighter) will release the main gear uplocks. The aircraft should be accelerated to Vle to help the gear lock down by free-fall.

The multi-disc carbon brakes are operated by the hydraulic system, and incorporate an anti-skid device. Two brake accumulators are provided and can be pressurised by the main or auxiliary system – taxiing should not be attempted below 1800 psi. In case of a hydraulic leak in the brake lines, the affected circuit (inboard or outboard brakes) should be isolated.

NOSEWHEEL STEERING

The steering is driven by the hydraulic system through the landing gear down lines.

A Nosewheel Steering Select PBSI located on the left side console allows for turning the system Off; the system will work only with weight on wheels. The tiller will steer the nosewheel 47° each side of centre; the nosewheel is then free to caster from 47° to 179°. Beware of taxiing in reverse, as this may turn the nosewheel to an angle >179° and result in damage to the system.

WING FLAPS

The fowler wing flaps are electrically actuated. They have five positions: 0°, 7°, 15°, 20° and 29°. The last position may not be used with the autopilot on.

Emergency electrical flap motor on centre console (freighters only).

Emergency manual flap extension device under cabin floor.

FIRE WARNING & PROTECTION

The fire warning system consists of dual fire loops and a single landing gear bay overheat sensor on each side. A Fire Test tests the entire system and should turn on all the fire lights and fire bell. Loop continuity is continuously monitored, and an amber “Fail” light will illuminate should the system be unsafe. The applicable fire loop can then be isolated and the aircraft dispatched for flight with a single fire loop operative.

On passenger aircraft, both the forward and aft baggage holds are fitted with smoke sensors which illuminate an amber “Smoke” light on the attendant’s panel and on the cockpit CWP.

Each fire protection system is powered by its (hot) respective Battery Bus, and consists in two Shot PBSI and two halon bottles in each nacelle. A fire warning will arm the corresponding n°1 extinguisher and illuminate the red “Shot 1” light. The red or white light will indicate a discharged bottle, while the red “Shot 2” light should illuminate to indicate the n°2 extinguisher is armed. In case of a fire on the ground, both shots should be fired in sequence, while in the air a time delay of 45 seconds should be observed between firing the two shots.

Four manual fire extinguishers are provided for the occupants ; one (halon) is located in the cockpit, another (halon) in the left forward cabin storage, another (water) in the right middle overhead bin, and another (halon) in the left aft cabin storage.

The optional toilet is fitted with an automatic fire warning & protection device which discharges water in various areas of the toilet compartment.

ICE PROTECTION

The ice protection equipment includes:

- Engine & propeller deice: electrical, switch-actuated. “All On” should be pressed below +10°C and will cyclically heat the entire engine intake duct and the propeller. Otherwise, “Lip On” will illuminate automatically below +5°C and will continuously heat critical areas of the engine intake duct only. Any failure will turn the system Off and illuminate the amber “De-Icing’ light on the CWP – Timer Transfer is NOT allowed.

- Pitot & static deice: electrical, switch-actuated. Heat will automatically be set to low with weight on wheels, and to high while airborne. A failure of the pitot head heating element will illuminate the amber Off legend in the respective PBSI, and the amber “De-Icing’ light on the CWP – pitot mast heating may still be working.

- Windshield deice: electrical, switch-actuated, automatically maintains 35°C on all four front windows. Should be turned On only in icing conditions. The “Low” position applies a low power to the heating element; the “High” position applies more than twice that power. It should only be used after the windscreen has been heated at “Low” for at least 3 minutes. If the 35°C overheat sensor fails, the appropriate “Overtemp” light will flash; if the 50°C overheat sensor fails as well, then the system will turn heating off on the affected window and the “Overtemp” light will be illuminated continuously.

- Stall warning deice: electrical, switch-actuated by the Pitot Heater PBSI.

- Airframe deice: pneumatic off 18 psi air. The auto mode gives a full deicing cycle of 5 minutes in “Normal” and of 1 minute in “Heavy”. The manual mode is spring-loaded and inflates all A or B boots simultaneously every time the PBSI is pressed. Any failure will turn the auto mode Off and illuminate the amber “De-Icing’ light on the CWP – revert to manual mode.

The windshield wipers have Slow & Fast positions. The wipers should not be used without water on the windshield. A Washer button is provided on each side, and should not be pressed for more than 10 seconds per minute.

III. PERFORMANCE:

TAKEOFF

Normal takeoff: Takeoff Rating, Flaps 7°.

For a paved field at 2000 ft elevation, ISA + 20°C, no wind and MTOW, expect a TODR of _____ metres.

Short-field takeoff: Takeoff Rating, Flaps 15°.

For a paved field at 2000 ft elevation, ISA + 20°C, no wind and MTOW, expect a TODR of _____ metres.

Max performance takeoff: Takeoff Rating, Flaps 20°.

For a paved field at 2000 ft elevation, ISA + 20°C, no wind and MTOW, expect a TODR of _____ metres.

CLIMB

Normal climb: Climb Rating.

CRUISE

Normal cruise: Cruise Rating.

Expect to cruise at 250 KTAS, with a fuel consumption of _____ around FL200. For flight planning purposes, an overall consumption of _____ may be used.

LANDING

Normal landing: Flaps 20° & idle reverse.

For a paved field at 2000 ft elevation, ISA + 20°C, no wind and MLW, expect an LDR of _____ metres.

Short-field landing: Flaps 29° & max reverse on impact.

For a paved field at 2000 ft elevation, ISA + 20°C, no wind and MLW, expect an LDR of _____ metres.

N-1 PERFORMANCE

IV. WEIGHT & BALANCE:

LIMITATIONS

	Freighter	Passenger
MRW	52,350 lbs / 23,746 Kg	50,700 lbs / 22,999 Kg
MTOW	52,200 lbs / 23,678 Kg	50,550 lbs / 22,930 Kg
MLW	51,000 lbs / 23,133 Kg	49,050 lbs / 22,250 Kg
MZFW	48,000 lbs / 21,772 Kg	46,800 lbs / 21,230 Kg
Max Pax	-	72

Maximum Load Forward Baggage Hold	766 Kg
Maximum Load Aft Baggage Hold	1,055 Kg

USEFUL LOADS

APS Weight (bulk freighter, 2 crew)	13,185 Kg
Maximum Fuel Load (1422 Igal)	5,165 Kg
Maximum Useful Load	8,587 Kg
Full Fuel Useful Load	5,396 Kg

V. SPEEDS:

Vso =	__ KIAS	Vx =	___ KIAS
Vsi =	__ KIAS	Vy =	___ KIAS
Vmca =	__ KIAS	Vxse =	___ KIAS
		Vyse =	___ KIAS
Vfe/7° =	180 KIAS	Va =	170 KIAS @ MTOW
Vfe/20° =	150 KIAS	Vb =	175 KIAS
Vfe/29° =	140 KIAS	Vmo =	208 to 230 KIAS
Vlo/up =	150 KIAS		
Vlo/dn =	180 KIAS		

VI. POWER SETTINGS:

Phase	KIAS	Pitch	Torque	Prop	Configuration
Manoeuvering	170	+1,5°	50%	85%	Clean
30° Bank Turn	170	+1,5°	50%	85%	Clean
45° Bank Turn	170	+2,5°	65%	85%	Clean
60° Bank Turn	170	+4,0°	75%	85%	Clean
Downwind	160		40%	85%	Clean
Base	140		28%	100%	Lg Dn / Flap 20°
Short Final	Vref+10		20%	100%	Lg Dn / Flap 20°
(the same power settings should be used for flaps 15°, 20° or 29° landings)					
Initial Apc	170	+1,5°	50%	85%	Clean
1½ Dot GS	170		50%	85%	Lg Up / Flap 7°
1 Dot GS	160		50%	85%	Lg Dn / Flap 7°
½ Dot GS	150		50%	85%	Lg Dn / Flap 15°
GS Intercept	140		28%	85%	Lg Dn / Flap 15°
On the ILS	Vref+20		28%	100%	Lg Dn / Flap 20°

Steady MDA	Vref+20	50%	100%	Lg Dn / Flap 15°
SE Initial Apc	170	75%	100%	Clean
SE on the ILS	Vref+20	50%	100%	Lg Dn / Flap 20°