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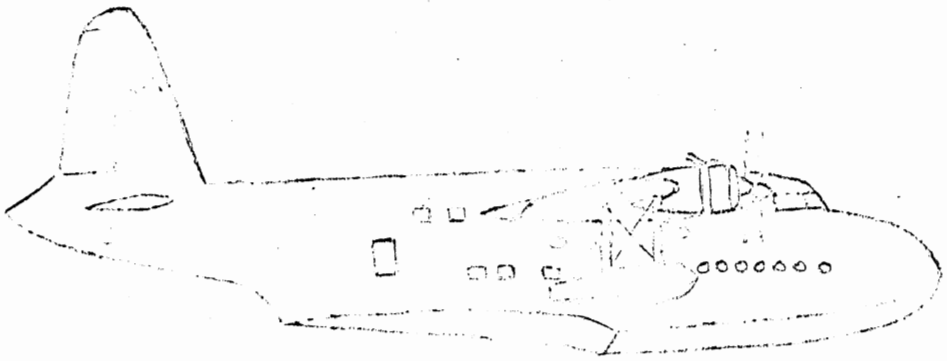
ANTILLES AIR BOATS, LTD.

TORTOLA B.V.I.



Operations Manual (Incorporating Approved Flight Manual)

SANDRINGHAM S-25

Manual Ref: AAL - FM/S-25

Effective: 23rd June 1975

ANTILLES AIR BOATS, LTD.

SANDRINGHAM S.25

RECORD OF AMENDMENTS

REV. #	SECTION	PAGE	DATE	SIGNATURE
1	3	App. 1	4-27-76	[signature]

RECORD OF AMENDMENTS

PAGE NUMBER	DATE	SIGNATURE

OPERATIONS MANUAL
(incorporating Approved Flight Manual)

Document Number AAL-FM/S25.

for the

SHORT S.25 SANDRINGHAM

Serial No. ~~ML/814~~ JM715

VP-LVE

This manual has been approved provisionally as the manual referred to in Certificate of Airworthiness No. 5.

Date: 6th May, 1975

By Authority of the GOVERNOR,
TORTOLA, BRITISH VIRGIN ISLANDS.

No entries or endorsements may be made in Sections 1 and 5 of the above manual except in the manner and by persons authorised for that purpose.

If this Flight Manual is lost, the Director of Civil Aviation, should be informed at once, the associated Certificate Number being quoted. Any person finding this Flight Manual should forward it immediately to the Director of Civil Aviation, Windward and Leeward Islands, Directorate of Civil Aviation, P O Box 1130, St John's Antigua W.I.

CONDITIONS OF ISSUE

1. This Manual is issued to each pilot endorsed for Sandringham S.25 aircraft as a guide to the correct discharge of his duties in all phases of S.25 operations. It provides both technical and practicable information of value during flight and must therefore be carried at all times when operating Company aircraft.

2. Each pilot endorsed for S.25 aircraft is expected as part of his duties to be thoroughly conversant with its contents.

3. This Manual is issued to pilots for their own personal use and must not be transferred from one to the other without the approval of the Operations Manager, Antilles Air Boats Ltd.

4. From time to time, amendments will be issued to cover each Manual. These amendments must be attended to without delay, and the covering amendment page completed as indicated.

5. This Operations Manual incorporates the requirement for an Approved Flight Manual. As such, Sections 1 and 5 cannot be amended without the prior apporval of the Director of Civil Aviation. However in addition, copies of all amendments to any section should be sent to the Director of Civil Aviation and the Civil Aviation Authority, after they have been issued.

6. As this Manual is the result of considerable effort and cost on the part of the Company, its value will have to be forfeited in the event of avoidable loss or damage.

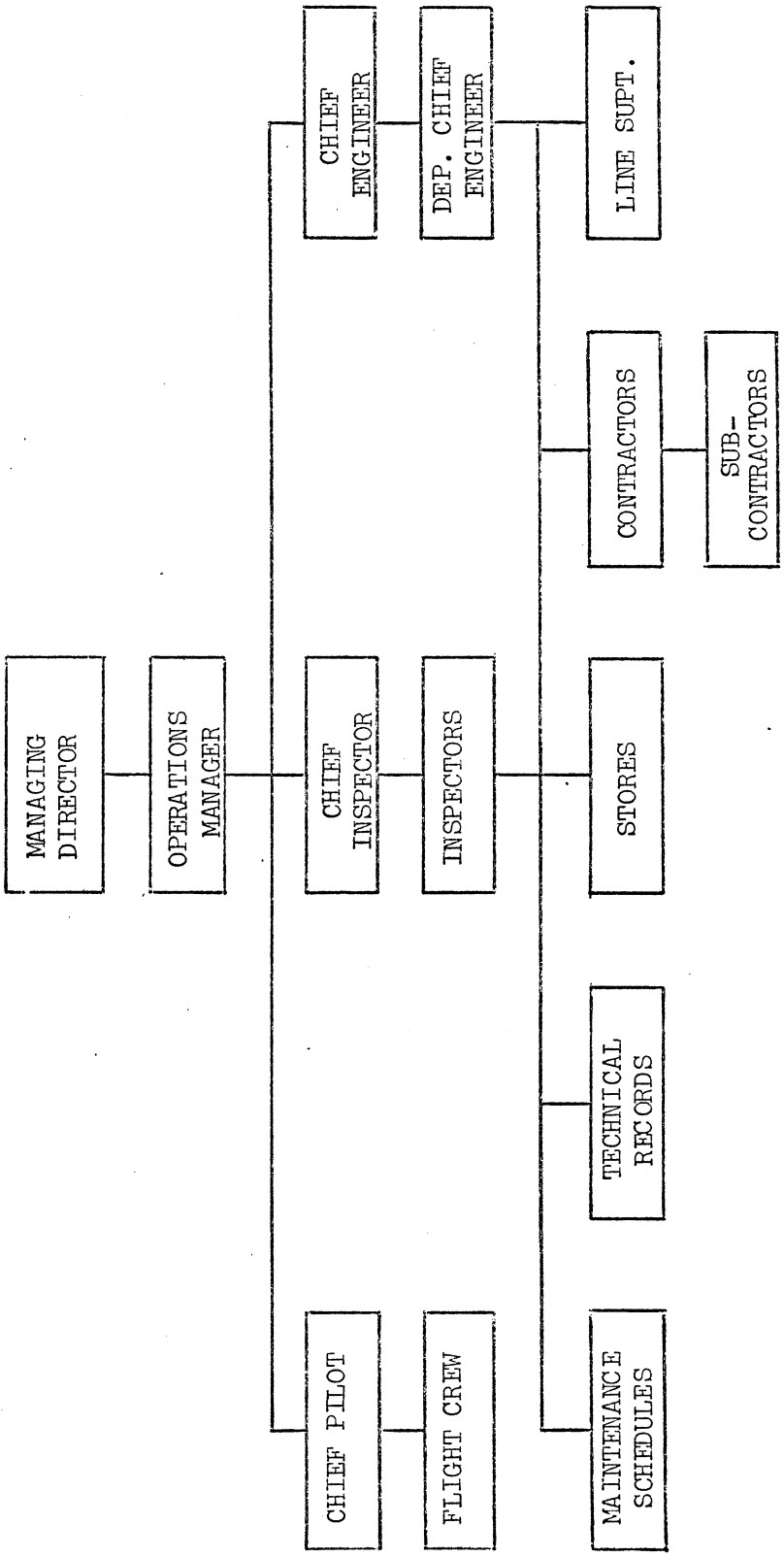
7. The distribution of this document and its amendments is the responsibility of Antilles Air Boats Ltd., Operations Department to which it must be returned when no longer required, and to which all inquiries should be addressed.

	ANTILLES AIR BOATS LTD. SANDRINGHAM S.25	MASTER INDEX

18/1/75

ANTILLES AIR BOATS LTD.

ORGANISATION CHART



ANTILLES AIR BOATS LTD.

SANDRINGHAM S.25

NOTICE TO ALL MEMBERS OF OPERATING CREW

All operating crew, including every person acting as Commander, Pilot, Navigator, Radio Operator, Flight Engineer, Steward or Hostess shall comply with all directions, instructions and procedures contained in the Company's Flight Operations Manual. If in emergency during flight, the person in command deems it necessary for the safety of the aircraft and personnel to take action which is not in accordance with the provisions of this Manual, he must furnish, immediately on landing, a full report of the circumstances.

Where members of the operating crew fail to comply with any such direction, instruction or procedure, they may incur the following penalties:

(1) Suspension or cancellation of licenses and certificates pursuant to Article 54 of the Colonial Air Navigation Orders.

(2) Prosecution for contravention of the Colonial Air Navigation Orders under Article 75.

(3) Disciplinary action under the Company regulations, including the power to dismiss instantly any member of the staff for non-observance of the Colonial Air Navigation Orders or the requirements of this Operations/ Flight Manual.

ANTILLES AIR BOATS LTD.

PILOT BULLETIN #1

S.25 Weight Limitation

Effective immediately, and until further notice, the maximum All Up Take-off Weight of S.25 aircraft will be limited to 57,000 lbs.

The maximum Landing Weight remains unchanged.

C.F. Blair
R.N. Gillies
D.F. Schell

1.1 GENERAL

This aircraft is certified in the Transport category.
Operation is permitted in icing conditions, night flying and under instrument conditions when the required equipment is installed and operative.

1.2 WEIGHT LIMITATIONS

1.2.1 MAXIMUM ALL-UP Take-Off Weight: 59,000 lbs.

1.2.2 MAXIMUM Landing Weight (at sea level): 56,000 lbs.

1.2.3 MAXIMUM Intensity Floor Loading:

(1) Passenger Cabins 150 lbs. per square foot
(2) Cargo Compartments 70 lbs. per square foot

1.2.4 MAXIMUM Weight for each Cargo Compartment:

(1) Compartment No. 1 2,250 lbs.
(2) Compartment No. 2 880 lbs.
(3) Compartment No. 3 1,120 lbs.

1.2.5 MAXIMUM Zero Fuel Weight: 49,000 lbs.

1.3 CENTRE OF GRAVITY LIMITATIONS:

In inches aft of zero datum and % MAC. The zero datum is the extreme nose of the fuselage. The aircraft datum is 359 inches aft of the nose.

A. U. W.	FORWARD LIMIT	AFT LIMIT
59000	29.2% MAC	34.2% MAC
56000	29.2% MAC	34.2% MAC
54000	29.2% MAC	34.2% MAC
35000	30.2% MAC	33.7% MAC

This aircraft must be loaded in accordance with approved loading charts and data (see Section 10).

1.4 SPEED LIMITATIONS:

1.4.1 Maximum never exceed speed 200 knots (VNE)

1.4.2 Maximum normal operating 165 knots (VNO)

1.4.3 Maximum with full flaps extended 110 knots (VFE)

1.4.4 Maximum with flaps 2/3rds extended 115 knots

1.4.5 Maximum with flaps 1/3rd extended 120 knots

1.4.6 Maximum in severe turbulence 120 knots

1.5 FLIGHT CREW LIMITATIONS:

A minimum crew of Captain, First Officer and Flight Engineer is required for all operations on the water and in the air.

1.6 ALTITUDE RESTRICTIONS:

Maximum normal operating altitude 10,000 feet.
For altitudes in excess of 10,000 feet, oxygen must be carried in accordance with C.A.N.O. Fifth Schedule, Section 5, Scale K (1).

1.7 SMOKING RESTRICTIONS:

Smoking is not permitted during:

a) refuelling operations or within 50' of any refuelling equipment.
b) whilst the aircraft is taxying or moving on the water.
c) whilest the aircraft is moored.
d) whenever within 50' of the aircraft.

Smoking is permitted in Sandringham aircraft both on the flight deck and in the cabins whilst in flight, but only with the permission of the Captain.

1.8 TAXYING LIMITATIONS:

Care must be taken when taxying in unfamiliar or unswept waters.
It is a Company requirement that prior to operating into an unfamiliar area, a chart of adequate scale showing soundings of the operating area be studied by the Captain and carried by him on that particular operation.

Draught at 59,000 lbs. = 5'0"
" " 54,000 lbs. = 4'8"

1.9. CRITICAL CROSS WIND LIMITATION:

The maximum cross wind component is 15 knots.

1.10. POWER PLANT LIMITATION AND SPECIFICATIONS.

1.10.1. General;

The engines installed are twin row 14 cylinder air cooled Pratt & Whitney R1830-90D, equipped with Hamilton Standard paddle blade propellors and Stromberg PD.F5 carburettors.

1.10.2. H.P. Ratings

Take Off.	1200 BHP. $\pm$ 2½%.
Max Continuous.	1050 BHP.
Normal Climb.	800 BHP.
Normal Cruise.	600 BHP.

1.10.3. Operating Limitations:

INSTRUMENT.	MIN.	MAX.	DESIRED.
Cyl Head Temp. °C.			
Ground Run.	100.	232.	-
Pre T/O.	100.	200.	120/170.
Take-Off.	120.	260.	200/232.
Climb.	120.	232.	200/220.
Cruise.	120.	232.	180/200.
Three Engine. (M.E.T.O).	-	260.	-
Three Engine. (Normal).	120.	232.	-
Oil Pressure. lbs/sq.in.			
Ground Run.	80.	100.	80/90.
Take-Off.	80.	100.	80/90.
Rated Power.	80.	100.	80/90.
Cruise.	65.	95.	75/95.
Idling Min.	15.	-	-

1.10. POWER PLANT LIMITATION & SPECIFICATIONS (Cont'd).

1.10.3 Operating Limitations: (cont'd).

INSTRUMENT.	MIN.	MAX.	DESIRED.
Oil Temp. °C.			
Ground Run.	40.	70.	-
Pre T/O.	40.	70.	-
Take-Off.	40.	85.	65/80.
Climb.	40.	85.	65/80.
Cruise.	40.	80.	65/75.
Three Engine.(M.E,T.O)	-	85.	-
Three Engine.(Normal)	-	85.	70/80.
Fuel Press. lbs/sq.in.			
Ground Run.	15.	19.	16/18.
Pre T/O.	15.	19.	16/18.
All other cond's.	15.	19.	16/18.
Carb Air Temp. °C.	Pre-heat of 25°C under any cond of O.A.T.	35°C.	FULL-COLD. or 32°C in icing cond.
Vacuum Pressure.	3.75"Hg.	4"Hg.	4.25"Hg.

1.10.4. Fuel Limitations.

1. Maximum fuel quantity 2438.4 US gallons with six tanks fitted. Fuel press warning lights operate at 11½ lbs.sq.in, and approximately 45 gallons of fuel remains unusable.
   Maximum fuel quantity with trailing edge tanks fitted is 2552 gallons.

2. Fuel Grade for normal operations is 100 - 130 Octane.

3. There are two methods of cross feeding fuel , one is by means of the wing root balance cocks. (These must be Off during T/O.) The other is by means of the electric fuel booster pumps.
   NOTE. No facilities for dumping of fuel is provided.

1.10 POWER PLANT LIMITATIONS AND SPECIFICATIONS: (CONT.)

1.10.5 Oil Specification:

Aeroshell W100
Maximum capacity 4 tanks each 34.5 gallons (6.5 being airspace).
Normal oil quantity 4 tanks each 28 gallons = 112 gallons total.

1.10.6 Hydraulic Fluid Specification:

Aeroshell No. 1

1.10.7 Propeller Specification:

Hamilton Standard 23E50, with type 6519A-12 blades.
Pitch Settings: Low Pitch 19 degrees, High Pitch 90 degrees.
Constant speed range: 1200-2700 RPM.

1.10.8 Prohibited Engine Speeds:

Cruise between 1900 and 2050 RPM and below 1700 RPM is not permitted.

1.10.9 Maximum Power Settings:

CONDITION	B.H.P.	MIXTURE	B.M.E.P.	RPM	INS. H.G.	MAX. C.H.T.	MAX. OIL TEMP.
Take-Off	1200	Auto-Rich	192	2700	48"	260°C	85°C
Rated Power (M.E.T.O.)	1050	Auto-Rich	177	2550	41"	260°C	85°C
Cont. Climb							
S/L - 3000'	800	Auto-Rich	150	2300	35"	232°C	85°C
3000'-6000'	"	Auto-Rich	to	2300	34"	232°C	85°C
Above 6000'	"	Auto-Rich	155	2300	33"	232°C	85°C
Max. Lean Mixture Cruising	700	Auto-Lean	144	2100	32"	232°C	80°C
Desireable Lean Mixture Cruising	560 to 620	Auto-Lean	118 to 128	2050 to 2100	28" to 31"	180°C to 200°C	80°C

1.11 HEATING SYSTEM LIMITATION:

Temporarily rendered inoperative.

1.12 FUELING PRECAUTIONS:

The attention of all personnel is directed to the necessity for observing extreme caution during aircraft refuelling operations.

The following restrictions will therefore apply to all such operations:

1) Smoking will not be permitted on, or within 50 feet of any aircraft during refueling.
2) The fuel will be of the approved 100/130 octane rating and will be free from contamination.
3) Where fuel is obtained from drums or any other container or tanker not equipped with approved filtering equipment, a chamois filter unit must be used.
4) Testing of radio or electrical equipment is forbidden during refuelling and until such time thereafter as required by the Captain or Flight Engineer.
5) Ground wires from the hose nozzle to the wing grounding points will be attached during all fuelling operations.
6) Fuelling on any one particular side will not be continued beyond the point where the heel of the float on that side is totally submerged.
7) Power boat engines will not be operated within 50 feet of the aircraft.
8) Only the necessary crew will be permitted aboard the aircraft during refuelling.

1.13 MAXIMUM PERMITTED INSTRUMENT ERRORS:

1.13.1 Air Speed Indicators:

Range	Error
40 - 100 kts.	+-2 kts.
100 - 200 kts.	+-3 kts.

1.13.2 Altimeters:

Altitude (Feet)	Error + (Feet)
0	30
500	50
1000	75
1500	75
2000	100
3000	100
4000	100
6000	100
8000	150
10000	150

	ANTILLES AIR BOATS LTD. SANDRINGHAM S.25.	SECTION: 2. INDEX

2.0 SCHEDULE OF PERMISSIBLE UNSERVICEABILITY S25IV.

2.0.1 Conditions and Terms:

The schedules contained herein define the degree of unserviceability permitted for accessory, instrument and radio equipment on Sandringham S25 aircraft, the conditions under which the unserviceability may be applied and the terminology associated with the application of the procedure.

It is to be clearly understood that the advantages of this schedule may only be taken when all reasonable action to rectify the faults has been carried out. It must also be understood that the schedules define the maximum period that an aircraft can be flown with the amount of unserviceability, however, every effort must be made to effect rectification at the earliest available time.

Suitable annotation is to be made in Part 11 of the Trip Record by the LAME before the aircraft is cleared for further flight.

The schedule defines the category under which the particular defect may be deferred and the trip record entry clearing the aircraft for further flight must indicate the conditions under which it is deferred.

2.0.2 Items may if permitted by the schedule be deferred as follows;-

Category 1 - to be rectified at main base, San Juan.
Category 2 - to be rectified at next port of call. (In the case of Category 2 item, spares will be carried on the aircraft.)

2.1 GENERAL CONDITIONS TO BE OBSERVED

2.1.1 Indicating System: Where reference is made to the indicating system, i.e. fuel quantity indicating system, Carburettor Air Temperature indicating system, it comprises the complete indicating system, including indicator and the gauge, transmitter, transmitting medium and any mechanical linkages required to operate the system.

2.1.2 Engine Instrumentstion: Notwithstanding the amount of unserviceabilty of instruments permitted by the respective schedule, no one engine is to be operated with more than one unserviceable instrument otherwise the value of the secondary instrument cross reference would be nullified.

2.1.3 Unserviceable Instruments: Where an aircraft is to be operated with an unserviceable instrument under the conditions listed in the following table that instrument shall be either prominently placarded "UNSERVICEABLE" or shall be removed from the aircraft.

2.1. GENERAL CONDITIONS TO BE OBSERVED (CONT'D)

2.1.3. (cont'd)

NOTE: Where an instrument is removed from an aircraft under the above conditions care must be taken to ensure that its removal does not effect the functioning of the remaining instruments.

2.2. ITEMISED CATEGORIES

2.2.1. AIRFRAME

COMPONENT OR SYSTEM	VFR CONDITIONS	IFR	NIGHT FLYING	CATEGORY.
Cockpit Windows	LH serviceable under all conditions.			
Direct Vision Panels	RH minor cracking acceptable(Localise cracks)			1
Side Windows	Minor cracking acceptable (Localise cracks)			1
Deflectors	Acceptable inoperative or missing under all conditions.			1
Passenger Windows	Minor cracking acceptable (Localise cracks)			1
Passenger Chairs	Must be strictly serviceable for each chair occupied.			1
Safety Belts	- do -	- do -	- do -	1
Auto Pilot	Acceptable inoperative providing H6B A/H serviceable.			1
2.2.2. ELECTRICAL				
Generators (4 Off)	1 U/S	1 U/S	1 U/S	1
Inverters (2 Off)	1 U/S	1 U/S	1 U/S	2
Nav. Lights.	U/S	Beacon U/S	Beacon U/S	1
Landing Lights	U/S	Essential	Essential	1
Flap Motor	U/S Under all conditions(provided handwinding gear serviceable).			1
Cabin Lighting	U/S	U/S (Provided emergency lighting serviceable).		1
Fuel Pressure Warning Lights.	U/S under all conditions (subject to fuel pressure gauges serviceable.			1
Instrument Lighting	1 System U/S either normal or emergency functional.			1
Flap warning Lts.	U/S providing Indicator serviceable.			
Windscreen wipers	F/O's	F/O's	F/O's	1

2.2.3. INSTRUMENTS

COMPONENT OR SYSTEM	VFR CONDITIONS	IFR	NIGHT FLYING	CATEGORY
Carb. Air Temp. (4 Off)	2 U/S	1 U/S	1 U/S	1
Cyl Head. Temp (4 Off)	1 U/S	1 U/S	1 U/S	1
Outside Air Temp(3 Off)	1 U/S	1 U/S	1 U/S	1
Flap position indicator	U/S under all conditions (provided warning lights serviceable).			1
Aircraft clocks (2)	1 U/S	1 U/S	1 U/S	1
Fuel contents gauges (6)	1 U/S	Any gauge provided tank concerned has been dipped prior to T/O.		1
Vacuum Gauge	U/S	Essential	Essential	1
Ammeter (4)	1 U/S (provided voltmeter serviceable)			1
Fuel Pressure Gauges (4)	1 U/S (provided warning lamps serviceable			1
Directional Gyro (2)	1 U/S	1 U/S	1 U/S	1
Artificial Horizon H6B (2)	F/O's providing Auto Pilot A/H serviceable			1
Artificial Horizon (2)	U/S providing H6B's serviceable.			1
RPM Indicator (8)	1 U/S	1 U/S	1 U/S	1
MAP Gauges (8)	1 U/S	1 U/S	1 U/S	1
Altimeters (3)	1 U/S (Captain's & F/O's must be serviceable)			1
Rate of Climb (2)	1 U/S	1 U/S	1 U/S	1
C4A Compass (2)	U/S providing Magnetic B16 serviceable.			1

2.2.4. ENGINES

Vacuum Pumps (2)	1 U/S	Essential	Essential	1

2.2. ITEMISED CATEGORIES

2.2.5. RADIO

COMPONENT OR SYSTEM	VFR CONDITIONS	IFR	NIGHT FLYING	CATE-GORY
HF Communication (2) units	1 Transmitter & associate receiver serviceable	As for VFR subject to requirements of Note 1 below.		
VHF (1 Unit)	No unservice-ability per-mitted except as authorised by A.T.C.	No unservice-ability per-mitted.		
DME	Must be ser-viceable for entry into Sydney	No unservice-ability per-mitted.		
Radio Compasses (2)	1 U/S	1 U/S (Subject to ATC clearance)	1 U/S	
VOR	U/S	U/S (Subject to ATC clearance)	U/S	1
Marker	U/S	U/S	U/S	1
Microphones	1 U/S under all conditions.			
Head Sets	1 U/S under all conditions.			
P/A System	U/s under all conditions.			
Cabin Tape Recorder	U/S under all conditions.			

NOTE:

2.3. MAINTENANCE MANUAL EXTRACT

2.3.1. For the information of Aircraft Captains the following extract from the Companys' Maintenance Manual is reproduced for information.

DEFINITION:

The term "test flight" means the flying of an aircraft exclusively for the purpose of assessing the satisfactory completion of maintenance or to determine the necessity for maintenance, either of which can be satisfactorily determined only during flight of the aircraft.

PROCEDURE:

The basic procedure for the conducting of test flights is the same, irrespective of the reason for the flight. One person shall be responsible for coordinating the whole operation and for authorizing the test flight. This person is responsible for insuring that all work documents relative to the aircraft to be test flown have been completed and properly certified in accordance with the requirements of the Maintenance Manual. He shall normally be a nominated Maintenance Coordinator as described in the Maintenance Manual or Senior Company Maintenance personnel employed in a supervisory capacity, and will have full knowledge of the background of events leading up to the requirement for a test flight.

After satisfying himself that all relevant work documents have been completed and properly certified, the Coordinator will sign the Maintenance Certification in Section 1 of the Part 2 Trip Record/Technical Log. He will also make an entry in Section 2 Mechanical Log to the effect that a test flight is required and for what reason, e.g. "test flight authorized, required due to elevator change". Signed L.A.M.E. A Pre-Flight Inspection (Form 1) must be completed by an appropriate L.A.M.E. and the Pre-Flight Certification in the Certificate signed, but a Maintenance Release cannot be issued prior to a test flight.

The L.A.M.E. delegated to cover the test flight as an observer is responsible for insuring that all necessary test documents are carried aboard the aircraft. These are: Trip Record Part 1, Trip Record Part 2/Technical Log (certified and authorized as above), Fuel and Oil Dockets, Test Flight Check Sheets Parts 1 and 2 (Form 12).

CLEARANCE AFTER TEST FLIGHT:

After the test flight has been completed, the pilot must certify the test flight check sheets (Form 12). All defects listed by the flight crew must be rectified and certified by appropriately licensed or authorized A.M.E.'s, the words "test flight completed" must be entered in the action taken section of the Mechanical Log of the Part 2 Trip Record/ Technical Log and certified by the Coordinator. Following this action, the aircraft is cleared for normal operations subject to completion of the Pre-Flight Inspection and issue of a Maintenance Release.

Should the initial test flight prove unsatisfactory and the test pilot requires a re-test, or should re-test be considered necessary after further adjustment or rectification the words "re-test required" must be entered and certified in the Mechanical Log of the Part 2 Trip Record/Technical Log on the next vacant page by the pilot or authorized L.A.M.E. All defects listed on the initial test flight must be rectified and certified by appropriately licensed or authorized A.M.E.'s before the aircraft can be cleared for re-testing.

APPROVAL FOR TEST FLIGHTS:

Where the Certificate of Airworthiness has expired or there is no Certificate of Airworthiness, an aircraft shall not be flown for test purposes unless cleared for flight by the relevant parts of the A.N.O. including the second schedule and BCAR Section "A".

CONDITIONS REQUIRING TEST FLIGHTS:

Listed below are the circumstances which determine when test flights must be carried out for Company operated aircraft:

1) Double engine change.

2) Flying control surface change (see note).

3) Wing flap change (see note).

4) At any time that is considered necessary following repair, replacement, modification or conversion which may affect the aircraft's operation or flight characteristics.

5) At any time the performance of an aircraft, engines or radio equipment is in doubt and satisfactory test conditions cannot be simulated on the ground.

6) At any time that the Director of Civil Aviation may so desire.

NOTE: The removal and replacement of the same control surface or flap need not constitute reason for a test flight.

SPECIAL FLIGHTS:

For any special flights, the conditions of the Air Navigation Order must be followed. If there is any area of doubt, the Director of Civil Aviation should be contacted for advice.

NOTE: When a special flight is carried out with a Certificate of Airworthiness deemed to be suspended, no passengers or cargo can be carried on that flight.

PERMITS TO FLY:

There are two distinct and separate forms of "Permits to Fly":

1) A Permit to Fly, issued by the Director of Civil Aviation, in accordance with the A.N.O.

2) A Company Permit to Fly, Form 32.

The Director of Civil Aviation has delegated to the Officer of Antilles Air Boats Ltd. for the time being holding the appointment or performing the duties of Chief Engineer, the authority to permit special flights of aircraft that are maintained in accordance with the requirements of this Manual to proceed to a place where they can be restored to an airworthy condition in cases where the Certificate of Airworthiness of an aircraft is deemed to be suspended because of damage to or a defect in that aircraft.

Nothing in this delegation, however, shall derogate from the authority of the Captain of the aircraft to refuse to commence a flight if in his opinion there is any reason why he should not undertake the flight.

If there is any doubt about the legality of the flight, the Director of Civil Aviation should be contacted. It should be noted that a Certificate of Airworthiness, even though it might be restricted, is necessary for international flights.

CONDITIONS OF ISSUE OF THE PERMIT TO FLY (FORM 32):

a) The aircraft shall have a valid Certificate of Airworthiness at the time the damage or defect occurred.

b) Before the special flight is authorised, the delegate must obtain the advice of such specialist members of Antilles Air Boats Ltd. Technical Engineering staff as necessary to establish that the operation is safe.

c) The delegate must also obtain the agreement of the Operations Manager Antilles Air Boats Ltd. in assessing the effect on operations. The Operations Manager shall take due regard of all possible operational situations.

d) The pilot of the aircraft shall be supplied with complete details of the damage or defects affecting the aircraft and the effect which they may have on the airworthiness or operation of the aircraft.

e) In making his decision, the delegate shall ensure that he is aware of all defects and damage known to be in existence, and shall base

CONDITIONS OF ISSUE OF THE PERMIT TO FLY (FORM 32)....CONT:

his consideration on the overall effect of all such damage or defects.

f) The Permit to Fly will be issued by the delegate prior to the special flight of the aircraft which shall be operated subject to such limitations and conditions as specified within the document. The Permit shall not be valid beyond the time when the aircraft first arrives at its place of airworthiness restoration.

PROCEDURE:

When an aircraft has suffered damage or developed a defect beyond the scope of "Permissable Unserviceability" schedules or the damage or defect is of such a nature that the airworthiness is affected to any degree, then the delegate referred to in preceding paragraphs (in this case, the Chief Engineer) must be advised immediately. All particulars of the damage or defect must be submitted to the delegate by the Captain or Flight Engineer of the aircraft. If after consultation with the necessary authorities, as previously described, the Certificate of Airworthiness is deemed to be suspended the delegate may, after observing all the required procedures descri in "Conditions of Issue of the Permit to Fly", issue a Permit to Fly (Form 32) specifying all limitations and conditions to be observed during the flight.

Upon receipt of the Permit to Fly or notification of its existence and its entire contents (actual receipt of the document would be impossible at certain islands where the flying boat is the only means of direct transport) the engineer in charge or Flight Engineer will make an entry in the Mechanical Log Section of the Part 2 Trip Record/Technical Log stating the Permit serial number and all limitations and conditions to be observed during the flight.

Although a Maintenance Release cannot be issued for a special flight, it is still necessary that a pre-flight check be carried out before the initial and any enroute flights. The L.A.M.E. or flight engineer concerned will certify for completion of the pre-flight check in Section 4, Additional Work of the Trip Record Part 2/ Technical Log. He will also ensure that all defects or damage recorded on the current page of the Trip Record/Technical Log, other than that for which the special flight is authorised, have been cleared and that the yellow copy page of the Part 2 Trip Record/Technical Log remains at the port of departure.

A certificate of fitness for flight shall be issued in accordance with BCAR Section A4-4.

Form AABL 32 ANTILLES AIR BOATS LTD. Ser. No._____

PERMIT TO FLY

In accordance with the provisions of the delegation from the Director of Civil Aviation and Volume 1, Section 4 of the Maintenance Manual, authorisation is hereby granted for

Aircraft VP-_____to fly from_____to_____

where Rectification - Maintenance - or repairs can be carried out.

The following special circumstances shall apply and these together with the Serial No. of this permit are to be conveyed to the Captain before departure.

Period of Validity of Permit is_____Hours flying.

Any special limitations or conditions.

Signature:_____
Chief Engineer.

Form AABL 32 ANTILLES AIR BOATS LTD. Ser. No._____

PERMIT TO FLY

In accordance with the provisions of the delegation from the Director of Civil Aviation and Volume 1, Section 4 of the Maintenance Manual, authorisation is hereby granted for

Aircraft VP-_____to fly from_____to_____

where Rectification - Maintenance - or repairs can be carried out.

The following special circumstances shall apply and these together with the Serial No. of this permit are to be conveyed to the Captain before departure.

Period of Validity of Permit is_____Hours flying.

Any special limitations or conditions.

Signature:_____
Chief Engineer.

Operating Procedures	ANTILLES AIR BOATS LTD. SANDRINGHAM S.25	I N D E X

P R E F A C E

This section contains, in addition to the Normal Operating Procedures for the S.25, a general operating procedures appendix which contains operational instructions of a nature, which are applicable to all aircraft types.

Normal operations will be conducted in accordance with the general and specific instructions contained in this section.

Should the General and Specific Instructions conflict at any time, the General Instructions will take precedence unless there is a stipulation to the contrary.

General Operating Procedures:

1. Radio Checks
2. Aircraft Torches
3. Cockpit Lighting
4. Flight Clearances
5. Review of Take-off Procedures
6. Monitor of Air Speeds
7. First Officer's Take-off & Landing
8. Seat Belt & No Smoking Sign
9. Thunderstorms Avoidance
10. Use of P.A. System
11. Flight with Engine out (4 Engine Aircraft)
12. Altimeter Procedures
13. Tuning & Checking of Radio Aids.
14. Fire Warnings
15. Descent Procedures
16. Co-Pilot Monitor During Take-off & Landing
17. Maximum Angle of Bank
18. Turns After Take-off & Onto Final Approach
19. Use of Landing Lights.
20. Overweight and/or Heavy Landings
21. Lightning Strikes
22. Reporting Aircraft Unserviceability
23. Accident Reporting
24. Incident Reports
25. Action in the Event of a Bomb Scare

GENERAL OPERATING PROCEDURES

1. RADIO CHECKS:

All radio equipment including P.A. and Cabin Music must be checked prior to the first flight of the day. At outports, where this may not be possible, a check call must be made as soon as possible after becoming airborne, in order to establish communications, and check satisfactory operation of navigational equipment. At intransit ports the radio must be switched on, and checked for normal operation, during pre starting checks. During crew initial acceptance on first flight for the day, the F/O is required to check all radio equipment prior to the cockpit check. Particular attention must be given to checking the H/F on aircraft for which it is either the primary or secondary communication facility.
N.B. Aircraft fitted with dual V.H.F. operating on V.H.F. routes would not normally regard H/F as essential.

2. AIRCRAFT FLASHLIGHTS

A serviceability check of the aircraft flashlights located at each crew station forms part of the Captain's pre-flight inspection and unserviceability should be recorded in the Trip Record for rectification. Flashlights form part of the aircraft emergency equipment and shall only be removed from the container in an emergency situation. For normal operation it is required that crew members carry a Flashlight at all times while on duty.

3. COCKPIT LIGHTING:

Cockpit lighting must be suitably adjusted for all night take-offs and Landings. A combination of red and white lighting, when available, normally provides lighting suitable for both cockpit and external vision.

4. FLIGHT CLEARANCES:

All clearances must be noted in writing by the Co-Pilot and the significant feature of the clearance repeated by the Pilot. This repeat-back must be made prior to the acknowledgement being given to ground control. After acknowledgement is attended to, it is required that both pilots check and discuss the actual terms of the clearance (particularly in the case of a clearance by number) in order that each has a clear understanding of all aspects.

Any amendment in the clearance to the Flight Plan Level is to be noted on the face of the FlightPlan at the time when transferring to Control frequency to confirm departure tracking, etc.

5. REVIEW OF TAKE-OFF PROCEDURES

Prior to take off the Captain will ensure that his crew is alerted to any special consideration which may be a departure from the normal take-off procedures. e.g. Taking off into instrument conditions - etc. It is required that crew members maintain complete familiarity with the standard procedure for engine failure or fire on take-off. Captains are responsible for the periodic review of these procedures with crew members before take-off, and preferably prior to starting. This may be done at the commencement of a tour of duty and at such intervals as is considered desirable.

First Officers or Flight Engineers who have not taken part in this review for a protracted period must advise the Captain. This procedure is required to ensure -

1. (a) That the Captain has alerted himself to the considerations which may be involved, and

(b) to ensure that other crew members are conversant with standard procedures or special considerations or duties thus ensuring a high standard of crew co-ordination.

This review should be logical in sequence and adequate but concise; a lengthy briefing may be confusing or irritating to well trained responsible crew members. It is considered that asking crew members to run through their duties is more useful than an explanation by the Captain and this method is therefore required whenever time permits.

6. MONITOR OF AIRSPEEDS

It is the Captains responsibility to observe limitation speeds and action related to these speeds. The call by the First Officer is a back up only. The monitoring of his own ASI by the Captain does, in addition to providing the Captain with primary information for decision, give required reference against possible inaccuracies in the Co-pilot's Airspeed system.

7. FIRST OFFICER'S TAKE-OFF & LANDING:

When a Captain permits a First Officer to carry out a take off or landing he must ensure that he is always in a position to take over control of the aircraft immediately; should a malfunction occur it is required that the Captain does take over.

8. SEAT BELT & NO SMOKING SIGN:

Following take-off, the switching off of the "No Smoking" sign in the

8. SEAT BELT & NO SMOKING SIGN (CONT'D)

vicinity of 1500 ft. is a signal that the cabin staff may unfasten their seat belts and commence cabin duties. When it is anticipated that the climb will be in smooth conditions, the seat belt sign may be turned off with the after take-off check. Switching off the seat belt sign, after mooring, is used as a signal to the cabin staff that the front door may be opened. Prior to entering turbulence the seat belt sign must be switched "on" and the Hostess advised. This is most important as either cabin crew or passengers may sustain severe injury if they are not warned and adequately secured. Prior to landing the seat belt sign is to be switched "on" in sufficient time (not later than approx. 10 mins. before entering the circuit) to permit the Hostesses to check that all passengers are properly strapped in.

9. THUNDERSTORMS AVOIDANCE:

In the interest of safety, prevention of aircraft damage and passenger comfort the avoidance of severe thunderstorms is of paramount importance. The following procedures are to be adhered to at all times. Avoidance will be according to radar procedures listed in the Aircraft Operating Manual.

1. Take-off -

To avoid wind reversal and downdraught, take off is not to be commenced if in the opinion of the Captain an active thunderstorm is approaching and will be within 3 miles of the position of the aircraft directly after take-off. Where available, radar should be used prior to take off but no attempt is to be made to monitor it until the aircraft is cleaned up and established on climb.

2. After Take-off -
If a clear path is not available on the alloted departure track, the aircraft should hold clear of thunderstorms until the alloted departure track is clear or an alternative track is alloted by A.T.C.

3. Cruise -
Normal avoidance must be made.

4. Descent and Approach to Land:
The aircraft must be flown clear of thunderstorms either by holding or adopting an alternative approach track. Circuit and approach to land should not be closer than 3 miles to an approaching storm at any time.

9. THUNDERSTORMS AVOIDANCE: (Cont'd)

NOTE: In the take-off and landing phases storms which have passed may be approached closer than 3 miles as the rear of a storm is comparatively inactive.

10. USE OF P.A. SYSTEM:

On all aircraft fitted with a P.A. system it is required that the Captain make an announcement covering weather, altitude, E.T.A. etc, as soon after take off as is practicable. This should be followed by at least one and whenever possible two further announcements during the cruise. The latter two announcements should cover points of interest on the route and revision to arrival times etc.

Announcements must be made following any abnormal operation which is evident to the passengers. e.g. Undue delay on the tarmac or at the holding point, rejected take off, holding prior to let down etc, or is involved in any procedure which may cause passengers apprehension. In such cases announcements need only be brief and factual with reference to A.T.C. requirements etc. and must not include specific reference to aircraft malfunction which might alarm passengers. It is required that explanations of delays be accompanied by an expression of regret for the inconvenience and advice about other aircraft connections (if such information is available and applicable).

11. FLIGHT WITH ENGINE OUT (FOUR ENGINE AIRCRAFT):

Following an in-flight engine close down, it is the Captain's responsibility to decide whether -

(a) Flight should be continued to destination.
(b) Flight should return to departure point.
(c) A landing should be made at the nearest suitable water airport.

It is expected and required that Captains do, at all times, operate Company aircraft with full regard to safety. No undue emphasis should be placed on continuing a flight to destination unless the Captain is confident that he has made the best decision. It is expected that, if an engine should be closed down during a climb prior to reaching an altitude at which satisfactory three-engined cruise can be established, that the aircraft will return to departure airport unless there are significant factors which out-weight this course of action, e.g. weather.

The following points should be considered by Captains when deciding to land, continue or return - height of aircraft, stage

11. FLIGHT WITH ENGINE OUT (FOUR ENGINE AIRCRAFT): (cont'd)

length, weather ahead or behind, wind component, aircraft weight, Captains experience on the route and aircraft type, enroute airports available, procedure to be followed and performance on two engines, reliability of engines etc.

It is expected that the Captain will truely and fully consider all the circumstances and make a sound decision.

12. ALTIMETER PROCEDURES:

1. For the climb to cruising flight level, both altimeters on all aircraft types will be set on the QNH of the departure aerodrome.

2. When cruising flight level is reached or the prescribed reporting point nearest to the aerodrome of departure, whichever is the sooner:

   (a) In the case of pressurised aircraft both altimeters will be set to the standard 1013.2 mbs. Should a large error be noticed, the procedure to be adopted is to notify A.T.C. of the error and advise them that the aircraft will be flown at a level which is half the difference in altitudes as shown by the two altimeters.

   (b) In the case of Non pressurised aircraft, normally the Captains altimeter will be set on 1013 mbs and the Co-Pilot's to the lowest QNH applicable at the time on the route being flown.

3. At the point where descent is to be commenced, both altimeters on all types of aircraft will be set on the QNH of the aerodrome of intended landing.

4. In the case of pressurised aircraft, due to failure of pressurisation or for any reason the aircraft is being flown at a lower level, then at the Captains discretion one altimeter may be set at the lowest QNH of the route being flown at the particular time. This will provide a ready reference for terrain clearance.

5. In unpressurised aircraft where the Co-Pilot is flying the aircraft for a particular leg then at the Captain's discretion the Co-Pilots altimeter may be set at 1013 mbs. but the Captain's must be set on the lowest QNH.

12. ALTIMETER PROCEDURES (cont'd)

A positive check of altimeters is to be made during every descent at heights of 15, 10 and 5 thousand feet. Each Pilot must deliberately read his instrument, reading first tens of thousands,, thousands, then hundreds of feet. The exact heights must be called in order that any discrepancies between instruments are noted.

A call of "500 feet to altitude " must be given by the pilot not flying the aircraft on all ascents and descents when approaching assigned altitude. A comparison of A.S.I.'s is to be made at the commencement of the pre-landing check. The monitoring of insutruments during any let down procedure requires the pilot not flying the aircraft to monitor the other Pilots flight instruments at the same time, cross-checking his own flight instruments to ensure that any instrument error is detected. Co-Pilots are required at all times to draw the attenion of the Captain to any instrument discrepancy or departure from acknowledged clearance.

13. TUNING & CHECKING OR RADIO AIDS:

All primary en route aids will be double checked, by the Captain. Secondary en route aids such as DME, VOR, NDB's used for cross bearings need not be double checked. All let down aids will be double checked by the Captain. During an IF let down aids which have adequate warning flags or immediate indication of failure - e.g. DME need not be aurally monitored. However the VAR should be monitored aurally during the final descent to determine passage of the station. The NDB will be aurally monitored during a NDB let down and on DME arrival where the NDB is the tracking aid. On aircraft which incorporate dual installation of an aid the Captain will check his own equipment and is not required to carry out any further double check.

14. FIRE WARNINGS:

It is company policy on all aircraft that fire warnings are to be treated as fires and the appropriate fire drill executed.

15. DESCENT PROCEDURES:

(a) At Airports Equipped with DME:

(1) The aircraft must not at any stage be descended below the laid down descent steps.

(2) When approaching under VMC, the aircraft shall not be descended below the provisions of (1) above and shall, after reaching 1500 feet above the field elevation, maintain that height until - (a) by day - within 5 miles or (b) by night - within 3 miles of the Airport,

15. DESCENT PROCEDURES (CONTINUED):

2) continued....
at which stage the aircraft will descend on an approach path which conforms with the normal ILS Glide Slope/PVG (i.e. 300 feet per mile). If joining a circuit or partial circuit the aircraft at miles may descend to the standard circuit altitude of 1,000 feet. At night pilots must appreciate the problems associated with the lack of foreground lighting, and closely monitor the altimeter.

b) At Airport Equipped with NDB's Only:

1) When approaching under VMC at night, the aircraft shall not be descended below the LSA for the sector, unless aids located at other airports provided positive guidance that the aircraft is clear of the obstruction in the sector of the flight approach path.

2) Under IFR conditions, the aircraft must conform with the approach and let down as laid down in A.I.P.'s.

16. CO-PILOT MONITOR DURING TAKE-OFF AND LANDING:

During all instrument take-offs, Co-pilots are required to positively and continuously monitor flight instruments in the order of attitude, heading, air speed and altitude to a minimum of 500 feet. Call if positive climb is not maintained on a constant heading and/or if airspeed falls below safety speed + 5 knots. During all approaches from 400 feet above airport level the Co-pilot must deliberately and positively monitor airspeed and clearly call if there is any marked or significant change and/or airspeed falls below threshold speed plus 5 knots before reaching the threshold. In adverse conditions, e.g. approaches over unlit areas, reduced visibility or turbulence, etc., Co-pilots must monitor altitude and airspeed and height each 100 feet to touchdown. It is the Captain's responsibility to ensure that these calls are made. It is expected that the Captain will carry out the appropriate monitoring when the Co-pilot is flying the aircraft.

17. MAXIMUM ANGLE OF BANK:

Twenty-five degrees is the normal limiting angle of bank for all Company aircraft, with a maximum of thirty degrees. It is required that this maximum angle be closely monitored and never exceeded, particularly in the circuit area and/or during instrument flight. Avoid abrupt application of bank and turns below 500 feet immediately after take-offs, as they do cause passenger apprehension.

18. TURNS AFTER TAKE-OFF AND ONTO FINAL APPROACH:

Turns are not to be commenced on normal take-offs until 400 feet has been reached. On approaches to land in normal conditions the final turn should be completed and the aircraft lined up with the runway at not less than 500 feet.

19. USE OF LANDING LIGHTS:

Unless glare is pronounced, landing lights are to be left on during take-off until 400 feet has been reached.

On approaches to land, landing lights are to be turned on at 500 feet.

20. OVERWEIGHT AND/OR HEAVY LANDINGS:

Following an overweight and/or heavy landing, a report must be noted in the Trip Record/Technical Log.

21. LIGHTNING STRIKES:

Pilots must report any lightning strikes at first port of landing. Similarly, bird strikes must be reported both in the Trip Record/Technical Log and with an Incident Report.

22. REPORTING AIRCRAFT UNSERVICEABILITY:

Pilots must ensure that all items of unserviceability are adequately reported in Part 2 of the Trip Record/Technical Log. This includes any items reported by the Steward. These should be itemised so that a record of rectification may be maintained.

23. ACCIDENT REPORTING:

In the event of an aircraft accident or major incident, the following reporting action is to be taken by the Pilot in command:

D.C.A. Notify D.C.A. by the quickest available means.

Antilles Air Boats Ltd. Immediately contact the Operations Manager, giving all relevant particulars. For investigation purposes, it is most important that all relevant details be noted in writing by the Pilot concerned while evidence is still available, e.g. weather, position of cockpit controls, etc.

24. INCIDENT REPORTS:

It is required that the Pilot furnish a written "Air Safety Incident Report" following an incident involving safety or operational significance.

25.. ACTION IN THE EVENT OF BOMB SCARE

In the event of the Company receiving advice that a bomb has been placed on an aircraft, the following action shall be taken:

1) On Water (Pontoon/Mooring)

a) Passengers who may be on board to be disembarked and removed to a safe place.

b) Any air or ground crews, attendents, etc. to be similarly removed to a safe place.

c) Any intending passengers, sight-seeing people, etc. also to be removed to a safe place.

d) Fire service brought as close to the scene as is safe and held at readiness.

e) Other aircraft, refuelling barges, servicing launches, etc. to be removed to a safe place.

f) The "hot" aircraft to be towed to a place where, should an explosion or fire occur, no damage will be done to persons, buildings or other aircraft, shipping, etc.

2. In-Flight

a) For cases where the aircraft is in flight, the first action will be to inform the pilot in command and have the aircraft landed at the nearest available and suitable water airport. The aircraft is to be stopped on the waterway it uses as soon as possible and passengers and crew evacuated to a safe place. Should the presence of the aircraft on the waterway cause a hazard or obstruction to other shipping, then it is to be towed to a place where it will not interfere with shipping operations and will not provide a hazard to persons or installations. The fire services at the water airport are to be alerted and placed on stand-by prior to the aircraft landing and are to stand-by the aircraft in a state of readiness as in the previous case covered.

b) While action as indicated is proceeding, the local water police are to be informed of the condition and the aircraft is to be made available to the police for their further action in searching the aircraft, passengers, luggage and freight. The operator shall provide the necessary assistance to the police to advise them of the various points of search. If the police are unable to carry out the search, the operator shall provide personnel for this purpose.

25. ACTION IN THE EVENT OF BOMB SCARE (CONTINUED)

c) The responsibility for informing the local police shall be undertaken by the Operations Manager and this will include notification to the local police at the water airports to which an aircraft may have been diverted.

d) Every bomb warning shall be reported as an incident.

26. A.P.U. LIMITATIONS OF USE

The Flight Engineer will ensure that the A.P.U. is not operated at any time there are passengers aboard the aircraft.

3. COCKPIT CHECKS:

3.0. GENERAL:

The full Check List, and all normal Operating Procedures are presented in detail in this section.

These checks and procedures - from PRE-START through to MOORED (inclusive) - coincide with the COCKPIT check list (SCROLL), but have been expanded and explained as necessary. For purposes of standardisation and efficiency of operation, specific duties, where applicable, are assigned to each crew member. It is required that these procedures be followed so that maximum crew co-ordination and efficiency may be maintained regardless of crew changes.

3.0.1 CHECK LIST PRESENTATION:

(a) Operating Manual:

In this section, check list items are identified as follows -

(i) Everytime items.....CAPITALS

(ii) All other items.....SMALL letters

(iii) Night only items are indicated by an "N"

(b) Cockpit Scroll:

(i) Initial Acceptance.....ALL ITEMS (BOTH RED AND BLACK CAPITALS)

(ii) Intransit Items.....BLACK CAPITALS

(iii) Night Items.....RED CAPITALS Prefixed 'N'

3.0.2 USE OF COCKPIT SCROLL

The first officer, at all times, must read aloud the CHALLENGE, and the Captain must give the RESPONSE ALOUD.

Both crew members must monitor that the action called for is carried out - a double check - and it is the Captain's responsibility to see that this is accomplished. It is accepted that there are odd items which cannot be physically checked by the other crew member.

STRICT ADHERENCE TO THE CHECKLIST MUST BE OBSERVED AT ALL TIMES, And the First Officer, must not call the next item, or roll the scroll on, until the item called is checked and

3. COCKPIT CHECKS: (cont'd)

3.0.2 USE OF COCKPIT SCROLL:

responded to.

The Captain may delegate the External, Internal or Flight Deck Checks, but he must always be present for the Pre-start check.

When the First Officer is otherwise engaged, the Pre-start check may be completed by the Captain, who will execute each item before rolling-on the scroll.
The First Officer will call when check completed, e.g. Cruise Check completed or final item e.g. "Pre-Landing check completed up to but excluding RPM".

3.1. EXTERNAL CHECK

The EXTERNAL CHECK is normally carried out by the Flight Engineer but it is the Captain's responsibility to confirm before boarding the aircraft that the PRE-DEPARTURE section of the Flight Engineers Check List has been completed and that the aircraft has been refuelled to the gallonage corresponding to that set out in the Flight Plan.

3.2. INTERNAL CHECK:
Torches.
Oxygen Bottles and Masks
Portable Fire Extinguishers and First Aid Kits in position, and properly sealed.
General inspection of galley and toilets.
Lifebelts aboard and dinghies stowed (if required)
Emergency Exits secure.
Cabin cargo correctly stowed and tied down.
Fuse panels complete with spare fuses.
A.C. & D.C. Circuit breakers checked in.
Can of hydraulic oil.
Drift Sight, Astro Compass, Sextant on board (as required).

3.3. RADIO CHECK:
First Officer to carry out pre-flight radio check as per Section 9 on initial acceptance when A.P.U. is available.

At Water Airports where the A.P.U. is not available this check is to be carried out during taxy.

Following a satisfactory ground check of all radio equipment, the RADIO MASTER and INVERTER to be left ON to enable the TAPE RECORDER to be checked and adjusted for volume from the Galley. These items

3. COCKPIT CHECKS (cont'd)

3.3. RADIO CHECK (cont'd)

may be left ON if it is apparent that the passengers will soon board the aircraft. However, in the event of a possible delay these items are to be switched OFF.

3.4. EXPLANATION OF COCKPIT SCROLL
PRE-START

CHALLENGE	ACTION	RESPONSE
NAVIGATION EQUIPMENT.	Drift Sight, Astro Compass, Sextant and Brackets, Air Almanac and Manuals current and on board.	CHECK
TRIP RECORD	Flight Engineer to confirm Onboard and no unserviceability.	FLIGHT ENGINEER CHECK
EXTERNAL, INTERNAL	Flight Engineer and First Officer to CONFIRM CARRIED OUT AS PER LISTS.	FLT. ENGINEER CHECKED.
(N) COCKPIT LIGHTS.	Check ON or OFF and set for intensity as required.	SET
BELT, SEAT, RUDDERS	Captain and First Officer adjust seat for height. Adjust seat belts. Adjust Rudder pedals to allow application of full rudder.	ADJUSTED
AUTO PILOT OIL VALVE	Captain to Check ON.	ON
JACK BOX	Captain and First Officer to 1. Select Transmitter selector as required. 2. Select Receiver Switches as required. 3. Emergency Switch to normal (wired)	SELECTED
CONTROLS LOCK	Flight Engineer to remove controls lock and stow.	OUT
CONTROLS	Operate the rudder, ailerons and elevators slowly through their full movement, note any binding or restricted movement.	CHECK
TRIM TABS	Confirm with Flight Engineer that the Trim Tabs have been operated through their full range and have been visually checked to neutral. Check indicators ZERO.	CHECK

3. COCKPIT CHECKS(cont'd)

3.4. EXPLANATION OF COCKPIT SCROLL (cont'd)

CHALLENGE	ACTION	RESPONSE
FIRE WALL SHUT-OFF VALVES	To be open, fully forward, and lock-wired.	ON
PITOT HEATER	Switch ON. Note Red warning light switch OFF.	SET
(N) STEAMING LIGHT	(If Night) Switch on, check visually	SET
(N) NAVIGATION LIGHTS	(If Night) Switch on.	SET
ANTI COLLISION BEACON	Select Beacon ON and check operation	ON
NOTICES	Select NO SMOKING and SEATBELT signs ON	ON
(N) LANDING LIGHTS	Check operation at night and set retracted by day.	SET
RADIO MASTER	Select Radio Master ON	ON
INVERTER	Switch on No.s 2 and No.s 1in turn and check operating.	ON
GYROS	DG set and caged against magnetic compass A/H adjusted and uncaged to observe topple and re-erection on first start-up.	SET
SPEED VALVES	Auto Pilot speed valves open	SET
FLAP INDICATOR	Select indicator, switch on, check light on and needle registering normally.	ON
FLAPS	Selector switch off and indicator needle zero.	IN
FLIGHT INSTRUMENTS	A/H's erected, adjust to level flight no warning flag showing. DG Slave switches to SLAVE. Check increase and decrease. Compare Gyrosyn Compass heading with Magnetic Compass heading. Set Altimeters to O. Cross check Datum setting. Check ASI's and VSI's at zero. Turn and Bank indicating turn and skid in correct sense.	CHECKED

3. COCKPIT CHECKS (cont'd)

3.4. EXPLANATION OF COCKPIT SCROLL (cont'd)

CHALLENGE	ACTION	RESPONSE
RADIO EQUIPMENT	Serviceability of all radio equipment should be checked by First Officer before scheduled start up time and Aids tuned to that required for initial departure.	SET
THROTTLES	Throttles to be full open to bleed exactor controls then set almost closed for start.	SET
MIXTURES	Checked in idle cut-off	IDLE CUT-OFF
PITCH	Pitch switches to be placed to full increase and four red lights observed denoting props in full fine pitch.	FINE
AUTO PILOT	Auto Pilot control handle off.	OFF
CARB HEATS	Flight Engineer to check and confirm carburettor heat controls in full cold position.	F/E COLD
FUEL	Flight Engineer to check all tanks for correct quantity as per dip/fuel docket and gallonage stated. Main tanks selected ON. Balance cock checked OFF.	F/E ON
COWL GILLS	Flight Engineer to advise open and Captain and First Officer check visually.	F/E OPEN
ENGINES HYDRAULIC	Flight Engineer to advise all props. turned through 7/11 Blades for no evidence of hydraulicing.	F/E CHECKED
FIRE DETECTION	Flight Engineer to advise test for indication of warning light and bell.	F/E CHECKED
FLIGHT ENGINEER CHECK LIST	Flight Engineer to report completion of STARTING section in Check List.	F/E CHECKED
INVERTER	Switch off unless Batteries in sound condition, A.P.U. running, or tape recorder operating.	OFF
AIRCRAFT CLEARANCE	Check that side line is removed. Boats and personnel are clear from both sides of aircraft.	CHECK

3. COCKPIT CHECKS (cont'd)

3.4. EXPLANATION OF COCKPIT SCROLL (cont'd)

START:

CHALLENGE	ACTION	RESPONSE
BOW CLEARANCE	Captain to ask "READY IN BOW". Steward to report "ON SHORT SLIP".	CHECK
START ORDER	Flight Engineer and First Officer to be advised engine starting order	ADVISED
IGNITION	All ignition switches on, ignition gates in central position.	ON
START	Captain to call Engine No. to be started First Officer to repeat Engine No. and actuate starter button placing mixture to Auto Rich when engine fires.	START

AFTER START:

FUEL/OIL/PRESS.	Flight Engineer to advise fuel and oil pressures adequate	F/E CHECK
GENERATORS	Flight Engineer to advise all Generator switches ON.	F/E ON
INVERTER	Switch on No.1 Inverter for outbound flights or No.2 Inverter for inbound flights.	ON
RADIO	Switch on all radio equipment. Check that equipment is tuned and identified to required stations. Note that ADF needle points to selected NDB and DME registering.	ON
GYROS	UNCAGE DG, align with magnetic compass, Note AH uncaged and erected.	UNCAGED
FLAPS	First Officer to run flaps fully out Note 1/3 flap out light shows. Return flaps to 1/3 out. Note 1/3 light is just out.	OUT AND 1/3 SET
AUTO PILOT	Align indices, engage auto pilot, note oil pressure. With turn knobs turn controls through full travel to remove air from system.	BLEED
VACUUM PRESSURE	Check 4 to 5 p.s.i. adequate	CHECK
CARBURETTOR HEAT	Flight Engineer to check control movement and rise to 30°CAT then FULL COLD.	F/E CHECK
IDLING R.P.M.	Checked at between 450/550 R.P.M.	CHECKED
BOW/HATCHES	Steward to report "BOW SECURE" and "HATCHES SHUT" and to close Flt. Deck Entrance Hatch	CHECKED

3. COCKPIT CHECKS (cont'd)

3.4 EXPLANATION OF COCKPIT SCROLL (cont'd)

RUN UP:

CHALLENGE	ACTION	RESPONSE
OIL/HEAD TEMPS	Flight Engineer to report when Oil temperatures and Cylinder Head temperatures within the limits for run-up.	F/E CHECK
PROPELLORS	Set 1800 R.P.M. F/O to move pitch switches to full decrease position. Note red lights and setting 1500 ± 50 R.P.M. Return to full increase note red lights, and return to 1800 R.P.M. Repeat same procedure.	CHECK
FEATHER	With R.P.M. set at 1800 R.P.M. F/O to actuate feather buttons. Immediately R.P.M. falls release button - note R.P.M. recovery.	CHECK
MAGNETOS	Increase manifold pressure to 25" and check required R.P.M. 2100 (± 75 R.P.M) F/O to check each ignition switch for R.P.M. drop (Max. 100 R.P.M.)	CHECKED
STATIC BOOST	Increase manifold pressure to Static and F/O to check required R.P.M. 2400 (± 75 R.P.M.)	CHECKED
FUEL/OIL GENERATORS	During above Static Boost check the Flight Engineer is to report on Fuel pressures, oil pressures and that Generators are charging.	F/E CHECK
IGNITION GATES	F/O to place ignition gates in up position.	UP
ROUTE CLEARANCE	Clearance to be obtained from Tower and repeated back. Captain to then double check with the First Officer requirements of the clearance. Note on Flight Plan.	CHECKED
BRIEFING	It is the Captain's responsibility to ensure his F/O is fully aware of the actions required during a normal take-off and particularly in the event of an engine and/or flight instruments mal-function.	CHECK

RUN UP (CONT'D)

CHALLENGE	ACTION	RESPONSE
BRIEFING (cont'd)	The Captain should outline any special considerations he may deem necessary in addition to standard procedures. The phrase standard procedures would suffice to cover the subsequent take-offs during the same tour of duty.	CHECK
ALL UP WEIGHT	Consideration of the all up weight of the aircraft and "unstick" speed for wts. in excess of 54000lbs. 85 kts. below 54000 lbs. 80 kts. Also the amount of water available for take-off and the surrounding terrain in the take-off path.	CONSIDER
PRE TAKE-OFF		
TRIM TABS	Elevator and Rudder Trims set to Zero	SET
MIXTURES	All mixture controls set at AUTO RICH.	AUTO RICH
PITCH	Prop switches at full increase, note four red lights.	FINE
FLAPS	Set and indicating 1/3 out.	1/3 OUT
FLIGHT INSTRUMENTS	A/H's erected, no warning flags Gyrosyn Compass aligned with magnetic compass and annunciating normally.	CHECK
FUEL	Flight Engineer to nominate fuel tanks and quantity selected ON.	F/E CHECK
CARBS	Flight Engineer to check cold.	F/E COLD
TEMPS & PRESSURES	Flight Engineer to advise all engine temperaturs and pressures within limits.	F/E NORMAL
COWL GILLS	Flight Engineer to close the cowl gills to the "TRAIL" position and monitor the CHT's during take-off.	F/E TRAIL
FLT. ENG. CHECK LIST.	Flight Engineer to advise completion of F/E's check list.	COMPLETED

3. COCKPIT CHECKS (CONT'D)

3.4. EXPLANATION OF COCKPIT SCROLL (cont'd)

PRE-TAKE OFF

CHALLENGE	A C T I O N	RESPONSE
CONTROLS	All flying controls through full movement.	FULL MOVEMENT
LAUNCH CLEARANCE	Launch to advise the area is clearfor take-off.	AREA CLEAR

CLIMB

POWER	Climb power set up.	CHECK
FLAPS	Flaps in, selector switch neutral, Flaps indicating in.	IN
TEMPS/ PRESSURES	Flight Engineer to advise all engine temperatures and pressures within limits.	F/E CHECK
NOTICES	No smoking sign off, seat belt sign as required.	SET

CRUISE

ALTIMETERS	Captain's altimeter set to 1013 mbs. First Officer's altimeter to lowest QNH for route segment.	SET
POWER	Flight Engineer to advise power settings from power chart.	SET
CARBS	Consider use of carburettor heat if icing suspected or likely.	F/E CHECK
MIXTURES	Check with Flight Engineer that C,H.T's are normal and place mixture controls in Auto lean.	AUTO LEAN
NOTICES	Seat Belt sign as required.	SET

3. COCKPIT CHECKS (CONT'D)

3.4. EXPLANATION OF COCKPIT SCROLL (CONT'D)

DESCENT

CHALLENGE	A C T I O N	RESPONSE
ALTIMETERS	Captain's altimeter set to 1013 mbs. First Officer's altimeter to lowest QNH for route segment.	SET
NOTICES	Check seal belt sign as required.	SET
CABIN HEATERS	Advise F/E to turn off cabin heaters.	F/E OFF
NAV. AIDS.	Nav. Aids selected and checked visually and aurally by both pilots on aids required for descent.	CHECKED
DRIFT RECORDER	Check and confirm with F/E Drift Recorder has been stowed.	STOWED

PRE LANDING:

FUEL	F/E to advise quantity checked. Fullest tank selected on Balance cock off.	F/E CHECKED
CARBS	Check with F/E Carburettor heat controls set to full cold position.	F/E CHECK
F/E CHECK LIST	Check F/E's landing check list has been completed.	F/E CHECK
AUTO PILOT	Place auto pilot control OFF	OFF
ALTIMETERS	Check both Altimeters on QNH destination and cross checked.	CHECK QNH
FLAP INDICATOR	Flap indicator switch ON and light on.	ON
NOTICES	Seat Belt sign and No Smoking sign ON	ON
(N) LANDING LIGHTS	Landing lights extended and visually check serviceability of each landing lt.	CHECK/SET
MIXTURES	Mixture control levers set to Auto Rich	AUTO RICH

3. COCKPIT CHECKS (CONT'D)
3.4. EXPLANATION OF COCKPIT SCROLL (CONT'D)
AFTER LANDING:

CHALLENGE	A C T I O N	RESPONSE
FLAPS	Flaps selected up, indicating up and selector switch neutral.	UP
PITCH	Prop switches full increase and red lights indicating full fine.	FINE
PITOT HEATER	Pitot heater checked off.	OFF
(N) STEAMING LIGHT	If taxying (at night) steaming light selected on.	ON
ANTI-COLLISON BEACON.	Select Anti-Collision Beacon OFF.	OFF

MOORED:

ENGINES	Four mixture controls moved to idle cut-off position.	CUT
THROTTLES	When engines have stopped - and not before - move throttles to full open position.	OPEN
IGNITION	Visually check that each prop has ceased rotating then ignition switches off and gates down.	OFF
PROPS	Trim props with starter button one blade vertical on top ascertaining launches are clear of the aircraft.	TRIM
RADIO EQUIPMENT	Switch all radio equipment off.	OFF
NOTICES	No smoking sign ON Seat Belt Sign OFF.	SET
GYROS	Cage DG and AH.	CAGED
FLAPS	Flaps fully up.	IN
FLAP INDICATOR	Indicator switch off and light out.	OFF
TRIMS	Wind all trim tabs to zero.	ZERO
CONTROL LOCK	Captain to align all controls and F/E to place control lock in.	IN

3. COCKPIT CHECKS (CONT'D)

3.4. EXPLANATION OF COCKPIT SCROLL (CONT'D)

MOORED (CONT'D)

CHALLENGE	A C T I O N	RESPONSE
(N) ELECTRICAL SWITCHES	Landing lights off and retracted Cockpit and Nav. lights as required.	OFF
INVERTER	If not required for tape switch off.	OFF
RADIO MASTER	If not required for tape switch off.	OFF

3.5. COCKPIT SCROLL

PRE START:

NAV. EQUIPMENT	CHECK
TRIP RECORD	F/E CHECK
EXTERNAL/INTERNAL	F/E COMPLETED
N COCKPIT LIGHTS	SET
BELT/SEAT/RUDDERS	ADJUSTED
A/PILOT OIL VALVE	ON
JACK BOX	SELECTED
CONTROLS LOCK	OUT
CONTROLS	CHECKED
TRIM TABS	F/E CHECKED
F.W.S.O. VALVES	ON
PITOT HEATER	SET
N STEAMING LIGHT	SET
N NAVIGATION LIGHTS	SET
ANTI COLLISION BEACON	ON
NOTICES	ON
N LANDING LIGHTS	SET
RADIO MASTER	ON
INVERTER	ON
GYROS	SET
SPEED VALVES	SET
FLAP INDICATOR	ON
FLAPS	IN
FLIGHT INSTRUMENTS	CHECKED
RADIO EQUIPMENT	SET
THROTTLES	SET
MIXTURES	IDLE CUT OFF
PITCH	FINE
AUTO PILOT	OFF
CARB HEATERS	F/E COLD
FUEL	F/E ON
COWLS	F/E OPEN
ENG. HYDRAULICS	F/E CHECK
FIRE DETECTION	F/E CHECK
F/E CHECK LIST	F/E CHECK
INVERTER	OFF
AIRCRAFT CLEAR	CHECK

START:

BOW CLEAR	CHECK
START ORDER	ADVISED
IGNITION	ON
START	START

AFTER START:

FUEL/OIL/PRESSURES	F/E CHECK
GENERATORS	F/E ON
INVERTER	ON
RADIO	ON
GYROS	UNCAGED
FLAPS	OUT & $\frac{1}{3}$ SET
AUTO PILOT	BLEED
VACUUM PRESSURE	CHECK
CARBS	F/E CHECK
IDLING R.P.M.	CHECK
BOW/HATCHES	STD/SECURE

3. COCKPIT CHECKS (CONT'D)
3.5. COCKPIT SCROLL (CONT'D)

RUN-UP:

OIL/HEAD TEMPS	F/E CHECK
PROPS	CHECK
FEATHER	CHECK
MAGS	CHECK
STATIC BOOST	CHECK
FUEL/OIL/GENS.	F/E CHECK
IGNITION GATES	UP
ROUTE CLEARANCE	CHECK
BRIEFING	CHECK
A.U.W.	CONSIDER

PRE TAKE-OFF:

TRIMS	SET
MIXTURES	AUTO RICH
PITCH	FINE
FLAPS	1/3 OUT
FLIGHT INSTS.	CHECK
FUEL	F/E CHECK
CARBS	F/E COLD
TEMPS/PRESS	F/E NORMAL
COWL GILLS	F/E TRAIL
F/E CHECK	COMPLETED
CONTROLS	FULL MOVE
LAUNCH	CLEARANCE

CLIMB:

POWER	CHECK
FLAPS	IN
TEMPS/PRESS	F/E CHECK
NOTICES	SET

CRUISE:

ALTIMETERS	SET
POWER	CHECK
CARBS	F/E CHECK
MIXTURES	AUTO LEAN
NOTICES	SET

DESCENT:

ALTIMETERS	Q.N.H. SET
NOTICES	SET
CABIN HEATERS	F/E OFF
NAV. AIDS.	CHECKED
DRIFT RECORDER	F/E STOWED

PRE LANDING:

FUEL	F/E CHECK
CARBS	F/E COLD
F/E LANDING CHK.	COMPLETE
AUTO PILOT	OFF
ALTIMETERS	Q.N.H. CHECK
FLAP INDICATOR	ON
NOTICES	ON
N LANDING LIGHTS	CHECK/SET
MIXTURES	AUTO RICH

AFTER LANDING:

FLAPS	IN
PITCH	FINE
PITOT HEATER	OFF
N STEAMING LIGHT	ON
ANTI-COLLISON BEACON	OFF

MOORED:

ENGINES	CUT
THROTTLES	OPEN
IGNITION	OFF
PROPS	TRIM
RADIO EQUIP.	OFF
NOTICES	OFF
GYROS	CAGED
FLAPS	IN
FLAP INDICATOR	OFF
TRIMS	ZERO
CONTROLS LOCK	IN
N ELECT/SWITCHES	OFF
INVERTER	OFF
RADIO MASTER	OFF

3. COCKPIT CHECKS (CONT'D)

3.6. ABBREVIATED CHECK LIST:

This check list is presented for use by Check Captains when conducting local flying.

The normal check list will be used for all in flight procedures, but when conducting circuit work the following abbreviated list of vital items may supercede the normal check list.

PRE TAKE-OFF *

TRIMS.....NEUTRAL.
MIXTURES.....RICH
PITCH.....FINE
FUEL .....MAIN TANKS, CONTENTS, CROSSFEED. F/E CHECK.
FLAPS.....1/3 OUT
FLIGHT INSTS.....CHECKED
COWL GILLS.....F/E TRAIL
CONTROLS.....FULL MOVE

PRE LANDING:
FLAPS.....AS REQUIRED

AFTER LANDING:
FLAPS.....UP
PITCH.....FINE

3.7. ENGINEERS FLIGHT DECK CHECK:

To be completed by Flight Engineer prior to each Flight and prior to arrival of Captain, or First Officer.

3.7.1. PRE DEPARTURE CHECK:

1. On Approaching Aircraft:-

(a) Check exterior for damage and fair lines.

(b) Check control surfaces which cannot be seen from aircraft.

(c) Check underside of wings and engines for fuel and oil leaks, loose cowls, etc.

3. COCKPIT CHECKS(CONT'D)

3.7. ENGINEERS FLIGHT DECK CHECK: (cont'd)

3.7.1. PRE DEPARTURE CHECK (Cont'd)

2. On Boarding Aircraft:-
   (a) Turn off mooring light.
   (b) Open up mooring hatch and check mooring equipment.
   (c) Remove and stow storm pendant.
   (d) Check correct Water Supply - both tanks.
   (e) Proceeding aft, inspect all bilges and stow water-tight bulkheads.
   (f) Check stowage of equipment in tunnel, i.e. work platforms, etc.
   (g) Visually check exposed control runs.

3. Flight Deck:-
   (a) Check Trip Record and rectification of previous defects report.
   (b) Turn on master switch.
   (c) Check all instruments on Engineer's panel.
   (d) Purge all fuel tanks containing fuel, wing up and starting at outboard tank.

   NOTE: The drain cock should be turned off before tank cock, otherwise an air lock will be formed.

   (e) After fumes, etc., have cleared, start A.P.U.
   (f) Check Crossfeed cocks OFF.
   (g) Check instruments, Pilots' panel.
   (h) Check operation flaps, fire warning, etc.
   (i) Turn engines through two (2) revolutions each by starter.
   (j) Switch on booster pumps, check fuel pressure and for fuel leaks under wings and engines.
   (k) Move mixture controls to "Rich" and check for fuel flow through volute drain. After checking, move to "Cut Off" position and switch off booster pumps.
   (l) Remove control lock and check movement of controls.
   (m) Check engine controls for movement, prime exactors.

4. Wing Inspection:
   (a) Remove astro hatch cover.
   (b) Remove Pitot head cover.
   (c) Dip fuel and oil tanks against docket, checking tank caps and covers for tightness at same time.

3. COCKPIT CHECKS (CONT'D)
3.7. ENGINEERS FLIGHT DECK CHECK (cont'd)
3.7.1. PRE DEPARTURE CHECK (cont'd)

4. Wing Inspection (cont'd)
(d) Stop A.P.U., Engine platforms secure.
(e) Check engines for loose cowls etc.
(f) Check upper surfaces of wings, tail planes, hull and control surfaces, for damage, cleanliness, etc.
(g) With Pilot, check control surfaces for correct movement.

5. Pilot Report

(a) Report to First Officer,

(i) Engineer's Check completed.
(ii) Deliver fuel docket for filing.

(b) Ascertain take-off weight of aircraft and enter in log.

3.7.2. STARTING CHECK:

Section 1.

1. Aircraft Master Switch "ON".
2. No.1 (Main) fuel tank cocks "ON".
3. Cowl gills "OPEN".
4. Carb. air control "DIRECT".
5. Engineer's panel instrument switches "ON".

Section 2.

1. A.P.U. at maximum charge for cold starts.
2. Induction vibrators "ON".
3. Starting panel fuel pressure light master switch "ON".
4. Check Pitot head cover "OFF".

Section 3.

1. Report to Captain "ready to start and 'all clear' astern".
2. Repeat starting order.
3. Prime engines as necessary.
4. As engines start, check oil pressure.
5. When all engines running, visually check loose cowls, etc.
6. Strike flagmasts.
7. Check pitot head clear.
8. Close astro hatch.

3. COCKPIT CHECKS (cont'd)

3.7.2. STARTING CHECK (cont'd)

Section 4.

1. Report to Captain when engines are ready for run up.

2. Enter figures in Log.

3.7.3. TAKE-OFF CHECK:

Section 1.

1. All engine temps. within limits.
2. Fuel and oil pressure correct.
3. Main tanks and all other tanks more than half full "ON".

NOTE: If nos. 2 and 3 are less than half full, no advantage can be obtained as there is insufficient head of fuel to overcome the restrictions of the fuel line due to its length and construction.

4. Pitot head clear, flagmasts stowed, dorsal hatch fitted.
5. Cowl gills closed.
6. Control locks stowed.
7. Report to Captain "Engineers check completed, ready for take-off".

Section 2.

As engines are opened up, if fuel pressure drops, switch on booster pumps (if fuel pressure does not come up, report to Captain and carry out further checks before attempting to take-off).

Section 3.

1. When airborne, turn on domestic master.
2. When safety speed is reached, adjust cowl gills as necessary.
3. After take-off, select tanks in the order of 1, 2, and 3, i.e. using the inboard tanks first.

NOTE: 150 gallons should always be left in No. 1 tank for landing and take-off. Nos. 2 and 3 may be run to ZERO.

3.7.4. FEATHERING CHECK:

1. Engine stopped, all cocks and switches off, generator switch as necessary.
2. Remaining engine temperatures and limitations not exceeded.

3. COCKPIT CHECKS (CONT'D)

3.7. ENGINEERS FLIGHT DECK CHECK (CONT'D)

3.7.4. FEATHERING CHECK: (cont'd)

3. Power load on generators within limitations (75 amp. generator).

4. Fuel crossfeed as necessary to balance load.

5. If restarting after more than 30 MINS., shut down, turnover with starter 2 revs. to check for hydraulic lock.

6. Do not open up until operating temperatures are reached.

3.7.5. PRE LANDING CHECK:

1. Carburettor air "COLD".
2. Main tanks "ON".
3. Engine temperatures not below operating limits, due to low power descent.
4. Domestic master switch "OFF".
5. Cabin Heat "OFF".

3.7.6. AFTER LANDING CHECK:

1. Cowl gills open.
2. Fuel tanks as desired.
3. Crossfeed "OFF"
4. Engine temperatures not exceeding limits.

3.7.7. CLOSING DOWN CHECK:

1. Engine temperatures not above prescribed limit before stopping.
2. Cowl gills open for at least 15 minutes after stopping.
3. Pitot head cover on.
4. Dorsal hatch cover on.
5. Dorsal hatch fitted.
6. Fuel cocks off.
7. Main switches off.
8. Pilots windows shut.
9. Control lock "IN".
10. After hatch closed and locked.
11. Bulkheads up.
12. Storm pendant attached and 'pick up' pendant laid off to allow aircraft to ride on storm pendant.
13. Mooring hatch closed.
14. Main hatch closed and locked.
15. Mooring light "ON"
16. Check exterior of aircraft and floats for damage and fair lines.

3. COCKPIT CHECKS (cont'd)

3.8. STEWARD/BOW OFFICERS DUTIES:

The Flight Steward or Bow Officers duties as they relate to the operational requirements of the flying boat are set our hereunder.

A copy of these requirements as well as an emergency check list (See Section 5) are kept in the galley of each aircraft.

For the purposes of standardisation and efficiency the specific duties as set out and as they relate to the operational safety of the aircraft must be carefully known and strictly adhered to at all times.

3.8.1. PRE START UP:

1. Stand by in the bow giving any assistance as required by launches etc.
2. On arrival of the Captain stand by for instructions, placing the aircraft on "short slip".
3. When standing in the bow, a constant watch must be kept and anything of value reported to the Captain.

3.8.2. START UP:

1. On receiving the order "Cast off in the bow" the Steward slips the moorings and reports to the Captain "Bow line gone",
2. Keep a constant watch in the bow until all engines are started and will then disconnect and stow the mooring bollard securely. Then close the mooring compartment.

3.8.3. PRE TAKE-OFF:

1. Move aft through the aircraft, closing all doors, hatches, and port holes paying particular attention to;-

   Toilet and freight locker port holes.
   Forehead entrance hatch.
   All cabin port holes and hatches.
   Freight Bay doors.
   Aft entrance hatch.
   Rear turret exits.

2. On completion of such duties advise the Captain "All hatches secure" and close forehead flight deck entrance hatch.

3. COCKPIT CHECKS (CONT'D)

3.8. STEWARD/BOW OFFICERS DUTIES (cont'd)

3.8.4. AFTER LANDING

1. As soon as the aircraft has alighted enquire from the Captain whether the anchor will be required.

2. Go below, and prepare the bow compartment accordingly, prepare drogues and report "Bow prepared for mooring" or "Bow prepared for anchoring".

3. When the aircraft is to remain on the mooring for an extended period, attach the main pendant to the aircraft storm pendant making sure to mouse the shackle.

3.9. MARINE EQUIPMENT:

The undermentioned list of marine equipment is stowed in the mooring compartment of the aircraft. It is the duty of Stewards and Bow Officers to know the use of and be proficient on the handling of such equipment.

The equipment stowed in the mooring compartment consists of:-

1. Boat Hook.
2. Axe.
3. Fog Bell
4. 2 Drogues with lines.
5. Short strop 6' x 3"
6. Long strop 12' x 3"
7. R.A.F. Double fluted type anchor (30 lbs weight) with 12' of 2" chain attached to 125' of 2½" Nylon rope.
8. Heaving line 60' x 1"
9. Megaphone
10. Towing pennant.

The aircraft is equipped with two electric bilge pumps - one located in the forward locker starboard side and the other beneath the front centre bilge board of the rear locker. A hand operated pump is stowed aft of the rear locker.

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Cont'd

4. FLIGHT TECHNIQUE

4.1 PRE START UP:

4.1.1 Manuals, Nav. Equipment

For all operations within the Caribbean Area, it is mandatory that all Manuals and equipment listed below should be carried on the aircraft:

Operations/Flight Manual	AAL - FM/S25
Flight Information Manual	AAL - FM/25/2
Aeromatical Charts	
Enroute Low Altitude Chart	L5 - 6
Protractor	
Dividers	
Computer	

Where a flight involves an over-water crossing of 500 nm or more between landfalls, and without benefit of radio aids, the following additional equipment must be in a serviceable condition and available on the aircraft:

Sextant
A.N.Tables
Astro Compass and Bracket
Drift Sight

4.1.2 Flight Planning

Caribbean Area:

A flight plan will be prepared for each flight and will be based on the most recent weather information available at the point of departure.

When operating from those islands where the required weather information is not readily available, it should be remembered that St. Thomas Marine Radio broadcasts the current synoptic situation for the entire Caribbean area and related Atlantic waters.

The frequency of this station is 2506 MHz and the times of weather broadcasts are 0800 A.S.T. and 2000 A.S.T. daily.

The Flight Information Manual has been compiled to provide crews with all the required information for each flight stage likely to be undertaken in the course of normal operations.

The fuel requirements shown are based on an estimated average consumption of 160 IMP. G.P.H. (189 GALS. US), which is considered adequate for low level short haul operations.

4.1.2 Flight Planning (Continued)
Caribbean Area (continued):

Flight plan details will normally be passed to the nearest A.T.C. facility by telephone prior to departure. However, where this is not possible, the information should be directed to the nearest V.H.F. Station on becoming airborne.

Care must be taken to ensure that each flight plan is cancelled prior to landing and while still in contact with the V.H.F. facility.

Off Airways:

Selection of cruise altitudes giving suitable terrain clearance must be in conformity with the Altimetry Rules for the particular route, and Safety Altitudes above MSL are to be used as laid down in the Enroute Low Altitude Charts.

Correct magnetic tracks and distances in nautical miles as specified in the Enroute Low Altitude Charts are to be used, and on the occasions these are not available, the Captain must compute accurate tracks and distances for the projected routes. The wind used must be applied as magnetic directions in order to compute the course to steer, and the T.A.S. in knots. The flight plan T.A.S. for climb, i.e. the T.A.S. for the altitude which the aircraft will have reached after the elapse of HALF the time estimated to be required to reach cruise level.

Fuel consumptions for flight planning are set out in Section 2 of this Manual, as is the list of Company Minimum Sector Fuels.

4.1.3 Pre-Flight Inspections

It is the responsibility of the Captain in conjunction with the Flight Engineer to complete thorough pre-flight external and internal checks of his aircraft in accordance with the detailed Check Procedures as set out in this Manual, and it is required that this schedule be completed at least 10 minutes before passengers are loaded. In accordance with Colonial A.N.O.'s, a Flight Check List is placed in the cockpit of each aircraft, and its use is mandatory at all times.

During the preparation for flight, the First Officer's duties (as delegated by the Captain, who carries the final responsibility) shall include:

(a) Loading: Gather such information as number of passengers and distribution, total baggage, mail and freight, and calculate the compartments' loads from the loading schedule or Trim Sheet. He shall supervise the luggage and cargo stowage, checking that the proper restraint has been made, particularly where seats are used, and that covers are placed around such seats. He should have a knowledge of cargo hold strengths and capacities, receive personally and sign for any mails, safe hand, under-bond, etc., be aware of and direct stowage of any dangerous cargo. All essential paperwork must be attended to, as well as

4. FLIGHT TECHNIQUE (CONT'D)

4.1. PRE START UP (CONT'D)

4.1.3. Pre-Flight Inspections: (cont'd)

(a) cont'd

preparation of the aircraft load sheet.

(b) Radio Check: At all times he should see that the A.P.U. is functioning normally. All communications equipment (HF and VHF) to be used and all Navigational Aids MUST be checked during taxying and before take-off. The extent of the Radio Check successfully concluded should be reported to the Captain pre-start-up.

(c) Ship's Papers: He shall pick up the Ship's Bag and place it on board the aircraft.

4.1.4. Cockpit Check Lists:
These are presented in a "Challenge" and Response" form and must be read and adhered to at all times to prevent the omitting of some vital action.

The co-pilot when required will call each individual Check List Item in a clear, business-like manner, and the Captain will be required to respond equally briskly, indicating the items being checked. If no appropriate response is forthcoming, the "Challenge" must be repeated before proceeding to the next item.

4.1.5. Cockpit Controls and Crew Co-Ordination:

It is essential for good crew co-ordination that a clear understanding exist between pilot and co-pilot as to the use of controls, and ancillaries. The pilot should use the throttles, rudders, elevators, and ailerons, and the co-pilot should operate the pitches, mixture controls, flaps, and "back-up" the throttles during take-off.

Use of standard cockpit terminology is just as important as good flying technique. It is imperative that all commands are executed promptly and accurately, and the continuous use of standard terminology is the best method of developing the habit. Attention should be directed precisely to the item to be changed, such as -

4. FLIGHT TECHNIQUE (cont'd)

4.1. PRE START UP (cont'd)

4.1.5. Cockpit Controls and Crew Co-Ordination (cont'd)

"Climb Power" Flaps 2/3rds"; etc.
and the crew member responsible for effecting the change should acknowledge the command to ensure that it is clearly understood.

Throughout the various procedures, detailed in the following section of these notes, the duties of each crew member are designated. For standarisation, and operational safety, it is most important that each thoroughly understands the operation at hand. It is expected that efficient and effective crew co-ordination will be maintained at all times but particularly during the execution of procedures requiring the highest order of this development.

e.g. Take-off, Instrument let-down and possible overshoot. The Captain must provide adequate and concise briefing prior to all such procedures.

When a Captain permits a First Officer to carry out a take-off or landing he must ensure that he is always in the position to take over control of the aircraft immediately should a malfunction occur, it is required that the Captain does take over.

4.2. START UP AND WATER MANOEUVRING:

4.2.1. Starting Procedures:
Before any attempt is made to start the engines a positive check must be made that the aircraft is clear of all launches and personnel. The props should have been turned through the required number of blades to check for hydraulicing. After completing cockpit drills and pre-starting checks, the Flight Engineer should be given the sequence of starting order. Then commence the start-up in order by pressing the appropriate starter button. When the engine fires release the starter button and place mixture control in Auto-rich. Indication of an overprimed engine i.e. excessive fuel runn-out of the supercharge drain, or occasional "coughing" with black smoke discharging from the exhaust - require that booster pump fuel pressure and priming cease (Mixture Idle-cut-off check) and the throttle opened wide while cranking continues. Immediately the engine commences to run, close the throttle and place the mixture control in Auto-Rich.

4. FLIGHT TECHNIQUE (cont'd)

4.2. START UP AND WATER MANOEUVRING: (cont'd)

4.2.1. Starting Procedures (cont'd)

Care must be taken with the initial throttle setting if back-firing on start-up is to be avoided. Also avoid any rapid throttle movement in an attempt to "catch" a motor.

Check that fuel and oil pressures are normal and set throttles to give 7/800 r.p.m. Repeat for each engine and set all engines at 1000 r.p.m. as soon as possible. When the engines are running smoothly, slip.

Starter operation should be limited to 20 seconds with 10/15 seconds pause between each operation.

To minimise starting delays occasioned by cold weather, requirements are; a good power supply - well-charged aircraft batteries - high fuel pressure to ensure positive priming until engine runs evenly.

Always check at outports that batteries are kept in a well-charged state by constant use of the A.P.U. (Auxiliary Power Unit) and Captains are to ensure that Flight Engineers give this frequent attention.

4.2.2. Slipping:

(a) General: When the aircraft is at a buoy it is essent- that it be secured by means which can be released exactly when desired and that it is "shortened up", i.e. moored close up to its buoy. This is usually done by removing the main mooring gear and lying on a short slip line.

The eye spliced on one end of this line is put on the main forward bollard of the aircraft and the line passed through a loop on the end of the buoy or short strop and held by hand with a few turns around the bollard. The buoy should not be more than six to eight feet from the bow, so that the buoy cannot foul the wing tip float.

The Captain should not start up until the above preparations have been completed by the bowman.

Lying at the moorings with the engines running in anything less that a strong breeze is not a good practice as the aircraft over-rides the buoy. Therefore, moorings should be slipped as soon as the outboard engines are running smoothly. The signal to the bowman to let go

4. FLIGHT TECHNIQUE (CONT'D)

4.2.) START UP AND WATER MANOEUVRING (CONT'D)

4.2.2. Slipping (cont'd)

(a) General (cont'd)
should be definite and distinct. The buoy should normally pass down the port side of the hull and inside the wing-tip float. Only on occasions will it be passed along the starboard side and then full instructions should come from the First Officer.

(b) From the pontoon:

Ensure that all pre-starting checks have been carried out and that the passenger gangway has been removed from the aircraft.

Check with the Bowman:

(a) Bow side line off.
(b) Main bow-line on and ready to slip.

Carefully ensure that no personnel are standing on the pontoon forward of the propellors and then start the engines.

Normally the two outer engines (Nos. 1 & 4) will be started first in the pontoon.

The order in which these engines should be started is dependent on the wind direction. If a cross wind is blowing the aircraft will be found to be lying against one side of the pontoon. It is then desirable to start the engine on the opposite side so tending to keep the aircraft in position and eliminate the possibility of a swing across the pontoon and subsequent hull damage.

When the engines are running smoothly the tail line should be released. The speed should be kept to a minimum and the aircraft should be kept straight by judicious use of engine until clear of the pontoon. Once clear of the pontoon the bowman should be instructed to "Let go forward".

(c) From a Mooring Buoy: As for all slipping procedures ensure that all hatches and doors are closed and that pre-starting checks have been completed. Check with the Bowman:
(a) All launches are clear of the aircraft.

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING: (CONT'D)

4.2.2. Slipping (cont'd)

(c) (cont'd)

(b) On short slip
(c) Ready to slip

Observe the position of the buoy relative to the aircraft.

Normally the port outer (No.1) engine should be started first. This will position the buoy on the port side of the aircraft. The starboard outer (No.4) engine should then be started. When both engines are running smoothly the slip should be made.

NOTE: Under certain conditions (i.e. where obstructions exist) it may be necessary to start No.4 engine first. The above procedure is however, standard under normal conditions.

When the engines are running smoothly instruct the Bowman to "Slip Moorings" and check immediately that the moorings have been slipped before opening throttles further, then ensure that a float does not hit the buoy and that the aircraft does not run over the buoy. When clear of the buoy start the remaining engines.

(d) Slipping from a Mooring buoy without starting Engines: The following conditions may make it desirable to slip the mooring and "drift":-

(a) When the aircraft is headed towards and close to the shore or other obstruction, aircraft or launches, etc. are in the immediate port and starboard vicinity thus restricting the room to turn.

(b) A moderate to strong wind is blowing.

Under these circumstances, providing the way is clear behind the aircraft, the moorings may be slipped.

PRECAUTIONS TO BE TAKEN ARE:-

(a) A launch capable of taking the aircraft in tow is standing by.

4. FLIGHT TECHNIQUE (CONT'D)
4.2. START UP AND WATER MANOEUVRING: (CONT'D)

4.2.2. Slipping: (cont'd)

(d) Cont'd

(b) The First Officer is standing in the astro dome to observe the aircraft's line of drift.

(c) Engines primed and ready for immediate start.

When the Captain considers there is sufficient turning room clear of obstructions - start engines.

Where there is only a light breeze making the "Drift" method impracticable and in the Captain's opinion there is insufficient turning room if the engines were started due to obstructions, etc., a tow launch is to be called for, and the aircraft towed clear of all obstructions.

(e) Turning on the Buoy:
This is not a common maneouvre but nevertheless is a useful one which can be used when:-

(a) There is restricted turning room.

(b) Reasonably calm conditions.

The prime object being to head the aircraft in a direction clear of obstructions before slipping the mooring.

Assuming that all pre-slipping checks have been carried out, adopt the following procedure:-

(a) "Sail" the aircraft so that the buoy will be on the same side of the aircraft to which you desire to turn i.e., if the turn is to starboard, then the buoy is to be kept on the starboard.

(b) If the wind conditions render sailing the aircraft impracticable, the bow officer can haul on the mooring pennant and achieve the same result.

(c) Using the starboard turn as an example, start the P.O. engine and set the lowest idling r.p.m. The aircraft will take up the slack of the mooring

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING: (cont'd)

4.2.2. Slipping (cont'd)

(e)(Cont'd)

(c) (cont'd)

cable and then commence to turn starboard using the mooring as a pivoting point.

(d) When the aircraft is headed in a clear direction, start a starboard engine and slip the mooring immediately.

PRECAUTIONS:

(a) Check the mooring is sound and capable of holding the aircraft.

(b) Exercise extreme caution otherwise damage may result to the bollard.

4.2.3. Taxying:

General:

The forces acting on a flying boat on the water are as follows:

(a) Thrust
(b) Drag
(c) Wind
(d) Tide
(e) Force applied by the use of the drogues.

Thrust and Drag:
The aerodynamic drag of the aircraft is slight whilst the hydrodynamic drag (i.e. hull resistance through the water) is appreciable. The combined effect of these two factors is slightly less than the thrust at normal idling speeds. A slight increase in aerodynamic drag can be attained by keeping the elevators depressed and fully extending the flaps.

Wind:
The effect of the wind when it is from straight ahead is merely to increase the aerodrynamic drag thus lowering the aircraft's forward speed.

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.3. Taxying (cont'd)

Wind: (cont'd)

When the wind is on the beam it will have two effects on the aircraft:

(1) The aircraft will "weather cock"

(2) In addition to (1) the aircraft will tend to drift sideways to leeward.

Tides:

The effect of tides may be quite considerable and will be most apparent when taxying in confined areas on picking up or slipping moorings. The effect of tides, therefore, in the above circumstances cannot be overlooked as the danger exists that the aircraft may be carried into a dangerous position.

Drogues:

Drogues may be streamed on either or both sides of the aircraft as required. Intelligent use of the drogues will do much to facilitate the water handling of the aircraft. The forces applied to the aircraft by the use of a drogue may be resolved into the following:

(a) A reduction in the forward speed as a result of the additional drag.

(b) A turning moment in the direction of the side on which the drogue is streamed.

NOTE: This turning moment will increase as the turn is made as the drogue will stream further out from the side of the hull.

Methods of Control During Taxying:

Control when taxying is obtained by the co-ordinated use of engines, rudder and aileron. Drogues may also be used to assist in the control of the aircraft.

Engines:

The main control is obtained by the use of the engines. It should be remembered, however, that close co-operation with the Flight Engineer is necessary, especially in the case of prolonged taxying, to ensure that no engine is heated excessively.

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.3. Taxying (cont'd)

Rudder:

Maximum use of the rudder should be made for directional control. The assistance gained is considerable especially when heading into wind.

Ailerons:

(a) When taxying cross wind maximum use of the ailerons should be made in order that the leeward float be kept as much as possible out of water.

(b) The ailerons may also be used to assist in directional control. When heading into wind the aileron drag is appreciable whilst the water resistance of the wing tip float is negligible. The use of full opposite aileron in conjunction with opposite rudder is recommended.

Drogues:

It should be remembered when using drogues that:

(a) If the drogues are steamed at excessive speeds the sudden violent strain imposed may either split the drogue or break its line, thus rendering it useless.

(b) If it becomes necessary to haul in a drogue whilst still taxying the aircraft's speed should be reduced to a minimum to enable the drogue to be "tripped".

TO SUMMARISE:

The following points should be remembered when taxying:

Always taxi slowly in congested areas and rough water conditions.

The use of engines for directional control in congested areas also increases the forward speed of the aircraft.

In high wind conditions when turning on to a downwind heading it is of assistance to enter the turn with a swing and in very high wind conditions no attempt should be made to turn downwind owing to the possibility of the leeward wing tip float sustaining serious damage. Under such conditions with the engines slow running the aircraft will drift backwards.

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.3. Taxying (cont'd)

TO SUMMARISE (CONT'D)

The tendency of the wing tip float to bury itself may often be used as a guide as to whether it is advisable to make a turn downwind. Attention should also be paid to the windward engines as the wash may damage the propeller blades when high power is used.

"Sailing" under conditions of high Wind -

The technique of sailing a flying boat under high wind conditions is of considerable importance and no little value. The employment of this technique makes it possible for an aircraft to be manoeuvred into the desired position without the use of the high powers necessary for example, in cross wind taxying. The use of high powers (as has already been pointed out above) leads to high forward speeds which may be most undesirable.

The technique is briefly described hereunder:

Sailing a flying boat under high wind conditions amounts to drifting backwards or sideways as desired.

Drifting backwards is attained by holding the aircraft's head into wind and slow running the engines so that the thrust is insufficient to counteract the wind effect.

Drifting sideways is attained by holding the aircraft's head slightly out of wind in the direction in which it is desired to move, and by applying just enough power to take the sternway off the aircraft. The wind effect on the keel surfaces is then more effective than the counter-acting effect of the keelson and under-water surfaces. Where a tendency to sail forward exists, it can normally be counteracted by extending the flaps fully.

The Captain at all times has the responsibility of seeing that the manoeuvring path is clear. Therefore careful checks ahead and on both sides must be made constantly to ensure positive clearance at all times.

Strong winds and tides require extra care and anticipation, as does taxying on the Harbour when the dangers from amateur yachtsmen and speed boat enthusiasts is very real.

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.3. Taxying (cont'd)

Each Captain must be aware of and comply with all rules and regulations for manoeuvring shipping in harbours and ports as laid down by the Maritime Authority controlling that port.

Whilst taxying check with the engineer periodically regarding cylinder head temperatures especially in cases of prolonged taxying, and try to avoid zig-zag taxying by ahticipating the aircraft swing and applying the correct engine powers. By setting three engines, and using one outboard throttle for corrective purposes, a straight and smooth path can usually be maintained.

Both pilots should keep a good look out on each side to ensure that the area is clear of obstructions which may cause damage to the hull and when taxying cross wind make maximum use of the ailerons to keep the leeward float out of the water.

When taxying at night in addition to the above the following points should be observed:

Ensure that the steaming light is on, and make maximum use of the landing lights and Aldis lamp to keep clear of all obstructions.

Do not taxi at a high speed or "run-up" on the flare path in close proximity to the flares. This will generally result in the swamping of the flare punts.

4.2.4. Run-up - Pre-take-off Briefing:

During taxying the functioning of directional flight instruments should have been checked. Once the oil temperature has started to rise, power may be increased progressively. 1300 - 1600 RPM is an approved and usually satisfactory power to expedite oil warm-up. Exercising the props with the pitch controls, and the check of feather pump operation both assist with the movement of cold oil. Exercise pitch controls twice on intial run-up. However, it is very important that any reduction in RPM, whether by pitch controls (governor check) or feathering action, should be restricted to a maximum drop of 300 RPM due to the high BMEP's induced and the resultant engine damage if exceeded.

When the temperatures and pressures are satisfactory the

4. FLIGHT TECHNIQUE (CONT'D)
4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.4. Run-up - Pre-take-off Briefing (cont'd)

Flight Engineer will advise the Captain "Engines OK for "run up". The run up is normally carried out down wind to reduce the amount of spray thrown through the propellors under choppy conditions. To keep the aircraft straight it is normal to run the engines up in pairs.

The run-up should be conducted as per the Check List, including a check for electrical interference to the VAR whilst the generators are "IN".

The tolerances for the Magneto Check and Static Boost Check are the placarded RPM ± 100, and the mag, drop from No.1 to No.2 switch up to a maximum of 100 RPM. provided the engine is not rough. The difference between No.1 and No.2 mags (synchronisation) should not exceed 40 RPM. That is to say, if No.1 shows a mag. drop of say 50 RPM, switching then directly to No.2 should indicate not more than 90 nor less than 10 drop, otherwise the magnetos are too far out of synchronisation.

To clear oiled up plugs, reduce MP to 25" Hg. and apply maximum (35°C) carburettor heat for a short interval (10-20 secs. Then with carburettor heat COLD, return MP to Static Boost and re-check mags. After such a check a minimum period of 2 minutes is necessary to enable the AMC to stabilise before opening up for take-off. Should this technique not clear the trouble, it is adviseable during the return to the buoy to taxy with the Ignition Selection on the faulty magneto, in order to "cold pot" the offending cylinder.

Briefing: Before take-off the Captain must consider what action he will take in the event of engine failure. Consideration of such factors as available water, obstructions past the waterway and terrain clearance, that is all conditions likely to be encountered immediately after take-off, will decide this action whatever the stage of failure, and these decisions must be conveyed to the First Officer, in the form of pre-take-off briefing, The First Officer should listen carefully, intelligently appreciate, and adhere to these instructions.

It is imperative that each pilot has a clear understanding of what he must contribute, for the certainty of recovery

4. FLIGHT TECHNIQUE (CONT'D)

4.2. START UP AND WATER MANOEUVRING (CONT'D)

4.2.4. Run-up - Pre-take-off Briefing (cont'd)

after engine failure depends on the knowledge of the crew and the co-operation between them.

Briefing should be concise and to the point - not a length tirade, nor so brief as to be inadequate - but the vital decisions "cut and dried" before opening the throttles, and clear in the minds of both pilots, Such other assistance at take-off that the Captain may require should also be included in the briefing, so that there is no confusion in either mind at the instant of engine failure.

4.3. TAKE-OFF:

4.3.1. Normal:

It is required that all take offs will use the full length of the waterway with the greatest effective operational length, up to the maximum crosswind component, unless some particular circumstance such as severe turbulence on the take-off path makes such a selection inadviseable. It is the Captain's responsibility at all times to ensure, that the waterway to be used is adequate for his aircraft's all-up weight, and that it provides the greatest margin for safety of those available to him. He has full authority for deciding whether or not a particular waterway as nominated by Launch Control, is adequate for his operation, and though he is not bound to use such swept waterway he should appreciate that a preference for another at some waterports could entail a considerable delay.

Adjustment of seat, belt and pedals must be checked before take-off to ensure full and comfortable control in the event of engine failure. Both pilots must be able to apply FULL rudder, knees must not jam or foul the yoke movement, Seat height should be as low as it is possible to sit without impairing satisfactory vision, for this gives a more powerful rudder leverage in the case of engine failure (force being relatively straight forward with a minimum of downwind pressure) with less tendency to slide up the back of the seat. Belt adjustment too must be comfortably but firmly, secured for this too will prevent any "riding-up" out of the seat when heavy foot pressures are applied.

After the run-up and appropriate pre-take-off checks, and briefing has been completed, and the launch clearance

4. FLIGHT TECHNIQUE: (CONT'D)
4.3. TAKE-OFF: (CONT'D)
4.3.1. Normal (cont'd)

obtained, line-up the aircraft at the centre of the water-way as near to the end of the useable length as possible. Check flying controls FULL MOVE, engine temps, and pressures within limits, and begin the take-off run. With the left hand holding the yoke approximately central, open the throttles smoothly and continuously up to full take-off power with the right hand. Power should be applied slowly and evenly at first, but the rate of application should be increased as the throttles are opened. Remember that great stresses are being imposed on engine components in accelerating a heavy propeller to speed, and any rough mis-use (such as "walking" throttles forward, or opening in steps) increases these mechanical stresses. Maximum take-off boost should be checked as aircraft accelerates for ram effect can cause overboosting. During the initial take-off the right hand should remain on the throttles in order to ensure immediate control of power in an emergency, to control the aircraft swing and also to maintain the required MP. It is recommended practice to have the F/O "back-up" the throttles to maintain the correct power setting. Monitoring instruments etc., and indicating any malfunctioning are also vigils of the F/O during take-off. Use of take-off power is limited to 2 minutes.

In the initial stages of the take-off run the control column should be held slightly aft of the neutral position. When the aircraft gets "on the step" the control column should be allowed to go slightly forward to approximately the neutral position and the correct take off attitude maintained. When take-off speed is reached it is necessary to ease back the control column in order to get the aircraft airborne. NOTE: The aircraft will not fly itself off.

Any tendency for the aircraft to porpoise can normally be encountered by either -

moving the control column so as to smooth out the surges or by holding the control column well back until the porpoising stops. However, should the aircraft continue to porpoise close the throttles and make a fresh take-Off run.

Keep the aircraft straight and level with coarse use of rudder and aileron intially. Should the aircraft not be taking off directly into wind use of an outboard throttle may be necessary initially to keep the aircraft straight

4. FLIGHT TECHNIQUE (cont'd)
4.3. TAKE-OFF: (cOnt'd)
4.3.1. Normal (cont'd)

or to compensate for engine torque causing the aircraft to swing to port. continue acceleration until 80 kts. speed has been called by the First Officer, and then lift the aircraft off the water with gentle backward pressure on the yoke. The aircraft should be allowed to assume positive climb -away attitude whilst accelerating to 110 kts. for the first power reduction.

At this speed power should be reduced to Meto Power and acceleration continued to the climb speed of 120 kts. When not less than 300 feet above the field elevation flaps should be retracted. At 500 ft. power should be reduced to "CLIMB POWER". Sudden changes of attitude or any suggestion of rought handling should be avoided during these early stages of the take-off for the performance of a Sandringham at maximum A.U.W. depends to a very significant degree on correct technique. If turbulence, or terrain clearance, make necessary the need for a higher than normal climb power, METO POWER may be held for a longer period. The undivided attention of both pilots is required during this period of operation until the aircraft is well established on climb. The monitoring of engine instruments during take-off, and all flight instruments immediately after take-off (particularly during night and/or instrument take-off) can make a very real contribution to the safety of the operation. The co-pilot may be required to feather an engine (always check externally, and tacho to ensure that prop has feathered) and he should therefore be attentive and so eliminate the possibility of misconstruing an instruction. All actions must be deliberate as certainty, rather than speed, is the prime requirement in all aircraft operation.

N.B. Should the First Officer be performing the take-off, and engine failure occur, the Captain will take over control, and duties assumed as outlined in Section 5.1.4.

After retracting 1/3 flap at 300 feet, straight-ahead climb should be continued to a minimum altitude of 500 ft. QFE (terrain permitting) whence a Rate 1 turn onto course should be executed, after checking for other traffic.

4.3.2. Cross-Wind:

The natural tendency of any aircraft to weather-cock into wind is due to the wind effect on the keel surface. This tendency

4. FLIGHT TECHNIQUE (Cont'd)
4.3. TAKE-OFF: (Cont'd)
4.3.2. Cross-wind (cont'd)

is not particularly noticeable in calm conditions, but in strong winds, it is quite pronounced, as will be evident during taxying.

During take-off, to enable control of the aircraft along a straight path, anticipation and the intelligent use of all available means of control is required. The available means of control are differential motor, and the aircraft's flying controls, elevator, rudder, aileron. However, as the speed increases, the effectiveness of the aircraft's flying controls - elevator, rudder, aileron - increases from nil at commencement to maximum at approximately 60 K. Use of differential motor too (leading with upwind throttles), during the early stage of the roll assists to maintain the desired straight take-off path. The drift may also be countracted to some extent by a slight turning further out of wind once the aircraft is on the step.

To summarise then: During the early roll control will be maintained by differential motor and ailerons. As the speed builds up, control will be continued by the use of elevator, rudder, and aileron which have become increasingly effective with speed. Great care should be exercised to ensure that neither wing tip float drags in the water.

Technique for executing a cross-wind take-off; Begin with the left hand on the yoke, holding the wheel over (aileron) to maintain wings level, stick held central and the right hand on the throttles, opening smoothly, and leading with the upwind throttles. Use the rudder coarsely, for although forward speed is low, the slipstream from the motors provides useful control from this source. As the forward speed increases, the proportional increases in the effectiveness of flying controls, allow the nose to plane at the level flight attitude, and even-up the throttles. Keep the wings level (it will be noticeable that less aileron is required at speed) and accelerate, keeping the aircraft firmly in contact with the water. At 80 Kts. unstick smoothly but cleanly, avoiding any exaggeration of "bounding" into the air, or any tendency for the hull to re-touch. Do not attempt to pull the aircraft off the water too soon as if the aircraft falls back on to the water with drift on severe strain will be exerted on the hull.

4. FLIGHT TECHNIQUE (CONT'D)

4.3. TAKE-OFF (CONT'D)

4.3.3. Night Take-Off:

Take-off procedures at night are the same as for daylight operation except that on becoming airborne no attempt should be made to flatten out, but a steady climb should be maintained until the required circuit altitude has been reached.

All take-offs at night will be carried out with both headlights ON, unless some special circumstance, such as bad haze or water reflection makes their use undesirable.

Before commencing the take-off ensure that cockpit lighting is satisfactorily adjusted, having regard to the increased brilliance caused by the generators cutting in. Cockpit lighting should be just sufficient to afford clear vision of the instruments, yet not so bright as to destroy outside vision of flare path lights, obstructions, etc.

After take-off the headlights should be switched off as desired - entirely a matter for the Captain's discretion.

4.3.4. Take-off Onto Instruments:

Of paramount importance is that all flight instruments are serviceable, and correctly adjusted. The image of the A/H should be adjusted so that correct attitude presentation is shown and the Gyros should be set and uncaged.

As the aircraft becomes airborne, transition from visual to instrument flight should be effected without hesitation or delay. Under no circumstances must PART visual, PART instrument, flight be attempted - the only SAFE method is full instrument flight immediately after unstick. Co-ordinate the full panel, trim the aircraft correctly, and be careful not to over-correct on controls. Continue normal climb straight ahead (terrain permitting, of course) to a minimum of 500 ft. above the ground, and execute a Rate 1 climbing turn onto course.

Some conditions, such as heavy passing squalls, with accompanying poor visibility, and probably severe turbulence immediately after take-off, may indicate the wiser plan of delaying the take-off until the particular hazard has passed.

The exercise of good judgement in furnishing his flight at all times with the greatest possible margins for safety is a prime requirement of a Captain's responsibility.

4. FLIGHT TECHNIQUE (CONT'D)

4.3. TAKE-OFF (CONT'D)

4.3.4. Take-off Onto Instruments: (cont'd)

Factors involved when "flying out" on instruments are enumerated and discussed in a later Section on Attitude Instrument Flight.

4.3.5. Engine Failure During Take-off:

Before commencing any take off pilots should have in mind the possibility of an engine failure, and should estimate a point where the aircraft will become airborne and the point where there ceases to be sufficient runway remaining to land and pull up in the event of an engine failure. Particular attention should be paid to the above point, bearing in mind the variation in the take-off areas and type of water conditions in which this Company operates. The following is suggested as a guide only, as much will depend upon the wind strength and type of sea running on the particular occasion. Should an engine failure occur before reaching the two-thirds used mark, it should be possible to retract the power and still pull up before the end of the available water. Care must be taken in the retraction of the throttles as a swift retraction will tend to make the aircraft leap out of the water. If the throttles are being retracted, a considerable reduction in speed can be obtained by easing the control column to the fully forward position, and so obtaining a maximum friction between the hull and the water, however, it must be borne in mind that the plates can be torn out off the bottom forward end of the hull if this is done at high speeds.

Should the engine failure occur after passing the 2/3 mark it should be possible to continue the take-off on the remaining 3 engines. In the case of the failure being one of the inner engines there will be little difficulty experienced in maintaining directional control . If the failure is an outer engine a greater tendency to swing will be experienced but can easily be corrected.

Should an engine failure occur the take off may be continued or discontinued depending upon such other factors as: available water ahead obstructions beyond the waterway etc. It is important all these factors be considered and the crew briefed prior to opening up for take-off in order that no confusion exist at the actual instant of failure.

4. FLIGHT TECHNIQUE (CONT'D)

4.3. TAKE-OFF (CONT'D)

4.3.5. Engine Failure During Take-off (cont'd)

After an engine has failed, and it is decided to continue the take-off, check any swing with coarse use of rudder, unstick immediately, and initiate climb away at not less than 105 kts. A little aileron will assist, dropping the wing slightly (3^{o}-5^{o}) towards the "good" engines to obtain best performance.

Positive identification is vital, and one recommended method is an analysis of foot pressures - the heavy foot pressure required against the "good" engines identifies the failed engine with the side on which there is a nil foot load. i.e. "dead foot, dead engine". Identification must be checked and DOUBLE checked. Once correct identification (and verified by the First Officer) has been established, carry out feathering procedure, closing the throttle first as a further check on correct identification. Trim the aircraft (ball in centre, etc.) for maximum performance.

For maximum gradient of climb for terrain clearance maintain 105 kts. However, when clear of obstruction, accelerate to the best climb speed of 110 K. Do not be anxious to discard take-off power. Above 500 feet, performance having been established, power may then be reduced to METO.

During the take-off the First Officer's main responsibility will be to monitor engine instruments - and thereby double-check the engine that has failed. It is important that he notify the Captain loudly and clearly. If take-off is continued, he can expect an order for flap retraction.

4.3.6. Three Engine Take-off:

In the event of take-off having to be carried out on three engines, the following conditions should be complied with:-

(a) On no account should take-off be attempted when the Port outer engine is inoperative.

(b) On no account should a three engine take-off be attempted when passengers or freight are aboard.

(c) The aircraft should be as light as possible, all moveable load removed and only sufficient fuel for the projected trip with the normal 2 hours additional reserve to be carried.

4. FLIGHT TECHNIQUE (CONT'D)

4.3. TAKE-OFF (CONT'D)

4.3.6. Three Engine Take-off: (cont'd)

(d) The aircraft to be loaded so that the trim is within best range. Some ballast may have to be put aboard in order to obtain the most satisfactory trim.

(e) The direction of take-off should be towards the maximum clear area of water. This will, of course, depend to a large extent upon the wind and sea conditions.

(f) A 3 engine take-off should not be attempted in a very rough sea or swell conditions but delayed until better conditions prevail.

(g) A minimum number of operational crew should be carried.

(h) Flight may be undertaken only if weather conditions permit the navigation of the aircraft by visual means.

(i) 3-engine take-off must not be attempted at night.

As so many varying conditions may be experienced it is impossible to lay down a hard and fast handling procedure for take-off on three engines. Experience has shown that under normal conditions the following method may be successfully attempted.

(a) Taxy aircraft to position where a maximum take-off run can be obtained with the wind on the opposite bow to the inoperative engine.

(b) Carry out normal pre take-off check, flaps 1/3 out etc.

(c) Slowly open throttles of the two symmetrical engines.

(d) As aircraft tends to swing in to wind open up the third engine until swing is corrected.

(e) In certain favourable conditions it may not be possible to keep the aircraft straight by coarse use of flying controls, but it will normally be found necessary to employ differential use of the throttles to keep the aircraft straight. In these circumstances every effort should be made to keep at least two throttles fully open whilst obtaining maximum power possible from the third. This will only be accomplished by using the outboard engine as a means of keeping the aircraft straight since it is apparent that a small reduction of power on an outboard engine will have some effect on the directional stability of the aircraft than any similar reduction

4. FLIGHT TECHNIQUE (CONT'D)

4.3. TAKE-OFF (CONT'D)

4.3.6. Three Engine takeoff(cont'd)

(e) (cont'd)
of power on an inboard engine.

(f) Once the aircraft is on the step and with a wind on the opposite side to the inoperative engine it should normally be possible to keep the aircraft straight by use of rudder with very little assistance from the engines and the aircraft should be airborne without further trouble.

(g) It will be observed that there will be a tendency for the wing on the side of the inoperative engine to drop more than usual during the initial stages of take-off. It is therefore recommended that full aileron control be applied in the opposite direction before commencing take-off.

A 3-engine take-off in conditions of flat calm can frequently be accomplished with a light aircraft following a similar procedure to that outlined above. Under these conditions it will be found necessary to allow for a longer take-off run and full use can be made of the aircraft's tendency to swing to Port. On opening up two symmetrical engines it will be found when the throttles are fully opened and the engines deliver the maximum power that the aircraft will tend to swing to Port. As this swing to Port becomes more pronounced the third engine may be brought into operation the throttle being slowly open until the swing to Port ceases and the aircraft tends to swing in the other direction. By this time it should be possible to have all throttles fully opened and the differential use of the outboard engine combined with rudder control should be sufficient to ensure directional stability.

Three engine take-off may only be carried out with the express permission of D.C.A., approval being required for each and every such.

4.4. EN ROUTE

4.4.1. Climb:

Normal climb will be conducted at 120K. IAS and within 3° of the course to be flown. Turns onto course should not be initiated below 500 ft. and such turns should be Rate 1 with correct bank, and smoothly handled entering, during and recovering therefrom. Turbulence may widen the acceptable tolerances, but the aim should be a constant attitude, rather than a chase of airspeed to keep within the arbitrary limits. Correct trimming is the key to a constant

4. FLIGHT TECHNIQUE (CONT'D)
4.4. EN ROUTE (CONT'D)
4.4.1. CLIMB (CONT'D)
attitude.

Correct power should be maintained at all times and close attention given to engine instrument indications, particularly in the early climb. However, when climbing in cloud, continuous application of carburettor heat is desirable, notwithstanding the slight power loss resulting therefrom.

As the aircraft continues to climb the manifold pressure will drop off. Keep easing the throttles forward in order to maintain 800 BHP for normal climb. This power can be met approximately by the following power settings:

Sea Level to 3000'	35" MAP and 2300	RPM
3000' to 6000'	34" MAP and 2300	RPM
6000' to 9000'	33" MAP and 2300	RPM

The climb should be conducted strictly according to the terms of the ATC clearance, and altitude will be measured initially with both altimeters on the QNH setting of the water airport of departure. On approaching the Cruise level, or at first reporting point whichever is sooner, the Master Altimeter (Captain's should be set to 1013.2 mbs. and the transition to cruise made with reference to it).

Prior to reaching the intended cruising altitude decide on the cruise BHP to be used bearing in mind the aircraft's all up weight and request the power setting from the Flt. Engineer. It is recommended by Maintenance Staff that powers be used as to give approx. 125 BMEP (See Power Chart Section).

4.4.2. Cruise:
At the top of the climb the transition to cruise is made, and altitude maintained within ± 100 ft. of the assigned level. The master altimeter should be ~~set~~ to the Flight Level datum of 1013.2 mbs., whilst the other altimeter is set to the LOWEST QHN for the route. Without reduction of the climb power the aircraft should be levelled off, trimmed for straight and level flight, and the airspeed allowed to build up to the expected IAS for the selected cruise power. When this performance has been achieved, cruise power should be set up accurately, and the remainder of the cruise check list completed.

In a cold, moist atmosphere it may be necessary to apply carburettor heat continuously to the engines, and best results are obtained with an indicated 15-20° of such applied heat. Power thus lost can be recovered by an increase of .25" MP for every 5° the carburettor air temperature is above standard - up to a maximum correction of 1" MP.

4. FLIGHT TECHNIQUE (CONT'D)

4.4. EN ROUTE (CONT'D)

4.4.2. CRUISE (CONT'D)

On the cruise a general check on the efficient operation of the flight with attention to co-ordinated control of navigation, engine operation, and attention to passengers should be maintained. In good conditions, nil or slight turbulence, the Auto Pilot may be used.

Maximum co-operation must be given to ATC on matters of position reporting - amending ETA's beyond ± 2 mins. of the Flight Plan , notification of amendments to IAS where this differs by 10K. or more from the Flight Plan - initiating requests for Level changes, checks on terminal and alternate weather reports, etc. etc. SAR facilities for the route should be well known and appreciated.

Consideration should be given to the Steward & Hostess & their duties in the cabin, & such information as time interval, the likelihood of turbulence, and the best time for the serving of meals, etc., will assist them in the most efficient organisation of service to the passengers.

It is also required that the Captain make at least one short announcement over the Public Address system, giving pertinent information associated with the flight, e.g. weather, altitude, E.T.A. etc. It is also required that pilots use the P.A. whenever the aircraft is unexpectedly held due to weather, has to return to the mooring due to mechanical defects, or is involved in any procedure which may cause passenger apprehension.

Fuel Useage: Inboard tank fuels should be burned during the cruise , but tanks should not be drained - the possibility of an air lock, and, too, the disturbing surprise to passengers as an engine stops suddenly.

If a tank should run out inadvertently, technique is to close the throttle, mixture to A/R. Check Flight Engineer has placed fuel selector to another tank and fuel booster pumps are on. The Throttle is closed to prevent the "roar" which would otherwise occur when the engine began to receive fuel again.

4.4.3. Navigation and Weather Appreciation

The compass should be checked after take-off for any significant error which will be apparent when compared with the known heading of the Astro Compass.

It is obvious that the Navigation log will coincide with the prepared Flight Plan only when the forecast winds are accurate, and the courses, speeds, as planned, are flown. Whilst alterations to speed are known, and may be accounted for, and compass error checked, determination of accurate wind speed and direction is far from satisfactory in many cases.

4. FLIGHT TECHNIQUE (CONT'D)

4.4. EN ROUTE (CONT'D)

4.4.3. Navigation and Weather appreciation (cont'd)

VFR (map reading) is acceptable when conditions permit, and DR is acceptable for limited periods on certain routes. But the only method which provides precise and immediate information under IFR is Radio Navigation. At all times full use must be made of ALL THREE methods, as is possible depending upon the R/Aids available, the possibility of checking on ground objects, and the anticipated accuracy of DR. DR is considered to be the basis upon which other aids are checked, and therefore should not be disregarded as ground features may be mistaken (or are not visible) and R/Aids can give misleading information.

Constant use and reference to Astro Navigation provides a useful check on DR and R/Aids, as is an appreciation of route topography,
guide, the aid is tobe accurately flown throughout.

G/S and W/V should be computed to each reporting point. The order of required navigational accuracy is that at any time the aircraft's position must be known within 5 miles, and should this ever be seriously in doubt immediate steps must be taken to use all practicable aids to establish an accurate position. Practice on regular routes at Air Plotting from the last known FIX, using an estimated W/V, and thus establishing an 'Area of probability', will provide an assessment of the value of this technique should the need for its use ever arise.

If diversions from track are necessary to circumnavigate storm areas, or for any other reason, always note down courses, times, speeds flown. This enables position to be established as required, and an accurate interception of the original track when desired. A.T.C. must be notified of any such diversions.

On flights over long stretches of water a Critical Point must be calculated between the waterport of departure and destination, or between any two suitable water airports between those two points. The purpose of PNR calculations should be appreciated too, and made where necessary.

Full appreciation of Pressure Systems, cloud types, and associated hazards of turbulence and icing should be studied by every pilot over each route he flies. Anticipation then, in avoiding what experience has taught him to expect,

4. FLIGHT TECHNIQUE (CONT'D)

4.4. EN ROUTE (CONT'D)

4.4.3. Navigation and Weather Appreciation: (cont'd)
will ensure the safest, most comfortable flight from A. to B.

Turbulence: Speed should be reduced in turbulent air to minimise stresses on the aircraft, and discomfort to the passengers. In moderate to severe turbulence the speed should be reduced to 120 I.A.S. Higher speeds increase the likelihood of structural damage, while at lower speeds the aircraft might easily be stalled by an abnormal gust with subsequent loss of control. Anticipation - and that means reducing the speed, and putting on the SEAT BELT sign BEFORE the turbulent area is reached - is the requirement at all times.

At all times that severe turbulence is encountered full particulars and pertinent details should be entered in the Mechanical Log of the Trip Record.

Icing: In conditions of moderate icing, though immediate action may not be necessary, consideration should be given to diverting from track, level change, or any procedure which will remove the aircraft from the danger area. In this manner a 'plan of attack' has been formulated before the need arises.

Severe icing conditions should be avoided at all times, and steps taken to ensure that flight is not continued in these conditions.

4.4.4. Use & Knowledge of Radio:
It is required that both pilots possess a sound working knowledge of all radio equipment installed on the aircraft, be able to carry out fault finding and fuse checking in a logical and thorough manner, and operate all equipment in an efficient manner. A logical sequence for checking an apparently unserviceable unit is; power supply, correct settings on equipment, headset, microphone key, jackbox, connections etc. Incorrect operation of the equipment on one or more of the points mentioned is more often the cause of unserviceability than failure of the unit.

A listening watch on the appropriate Communications Channd (VHF or HF) should be maintained at all times on the ground and in the air.

4. FLIGHT TECHNIQUE (CONT'D)
4.4. EN ROUTE (CONT'D)

4.4.4. Use & Knowledge of Radio: (Cont'd)

Low batteries, too, are one of the main causes of communication failure on the ground particularly when using VHF - this can be overcome by cutting-in generators.

Calls should always be made in correct phraseology, and all comments, queries, etc., kept to a minimum to keep the air clear for other communications. Standard phraseology in conditions of poor reception is more easily read, and therefore considerably reduces the possibility of error. It is vital that clearances are correctly understood, repeated back to the ground station when required, and noted on the Flight Plan.

Particularly when under Approach, or Tower Control, the Captain should maintain a listening watch, thus reducing delay in reply, double checking on clearances, and obviating the possibility of the First Officer transmitting an unauthorised message. This could be hazardous if clearances are accepted, and either not passed on or are distorted and misunderstood due to high noise level in the cockpit.

A.I.P's containing all essential route radio information must be carried at all times. Although it is not required that the Emergency Radio Procedures listed in these volumes should be known in complete detail, it is required that essentials be known and the general requirement understood, for conditions may arise where reference to a book is quite impracticable.

4.4.5. Interception of Diversions:
With the increase of traffic density around Capital City airports it cannot be too strongly emphasised that aircraft should be on diversion tracks as soon as possible after take-off. An analysis has shown that aircraft after take-off can with a suitable angle of interception join the diversion tracks within a 5 mile radius of the field.

Pilots are to work out the approximate interception course and ensure that they get on track as quickly as possible to achieve the interception within the laid down limits.

4. FLIGHT TECHNIQUE (CONT'D)
4.4. EN ROUTE (CONT'D)

4.4.6. Auto Pilot Operation:
Before flight whenever use of the Auto Pilot is intended, the system must be checked for and bled of air. Procedure for this is set out in Section 8 of this Manual.

The Auto Pilot is intended to relieve the tedium of long flights, and though it can be used on climb and descent, it is expected that its use will be confined to the Cruise Level.

Correct trimming before engaging, and frequent (about every 20 minutes) disengaging to ensure correct trim is being maintained, are requirements of acceptable technique.

No turn greater than 10° is permitted with the pilot engaged, and a check for "hunting" or oscillation must be made when first engaging. Speed valve openings should be set at a value which will give the smoothest operation - opened too wide the auto pilot action is too fast and jerky, and often is the cause of much of the undesirable oscillation mentioned. If the pilot "hunts" excessively, causing discomfort to passengers, particularly those seated aft, it should be disengaged and the aircraft flown manually.

When the elevator trim requires a good deal of attention owing to passenger movement, adjustment on the A/P, or on the aircraft trim, or on a combination of both, does not guarantee continuous perfect trim, and it is often found on disengaging the pilot that a pronounced out-of-trim condition exists.

More frequent disengaging and checking is the only method. If this becomes too tedious, it is better to hand fly the aircraft.

The Auto Pilot should not be engaged and left unattended during flight, due to the restricted limits of its gyros, which in the event of severe turbulence could topple with serious consequences. The Auto Pilot A/H, whilst A/P disengaged, topples at approximately 50° in both the Pitching and Rolling planes, but when the A/P is engaged the limits are restricted still further to 20° in the Pitching and 30° on the Rolling Planes. The Auto Pilot D/G, when A/P disengaged, topples at approximately 55° in both planes, but with A/P engaged limits are 20° in Pitch and 30° in Roll.

4. FLIGHT TECHNIQUE (CONT'D)

4.4. EN ROUTE (CONT'D)

4.4.7. Engine Failure in Flight:

Should an engine fail en route the aircraft should be secured for continued flight as per procedure set out in this Manual - viz. correct identification, full feathering procedure, power on the "good" engines.

For maximum range the altitude at which to continue to the emergency waterport should be the LOWEST SAFE ALTITUDE at the LEAST POSSIBLE power to achieve the indicated airspeeds set out in the Power Section. If flying above this altitude when failure occurs, do not immediately squander the excess.

Set up METO power intially, request a clearance to the lower altitude, and descend slowly. Stabilise at this lowest safe altitude and "come back" on power, guided by Placard, to achieve the required performance. Check endurance at the increased fuel comsumption rate.

Over water, or on long flights with no intermediate alighting areas, CP and PNR calculations should have been made, and the port of destination already decided. ATC should be advised of the intention, the ETA (working on the reduced groundspeed) at the emergency waterport, and requested for a clearance to descend at a pre-determined rate to arrive at a safe altitude over the alighting area.

Turbulent areas should be avoided, if possible, as these destroy performance with resultant rapid loss of height.

4.4.8. Descent:

Descent from the cruise should be planned in such a manner that, at 500 feet per minute (not in excess) the aircraft would arrive in the circuit area at 1000 feet above the water level.. Of course, this continuous straight-in descent path is not always possible, due to terrain clearance, and/or Traffic Control, but careful planning will avoid arriving with unnecessary altitude, or the "dragging in" through turbulent lower layers by having descended too early. Anticipatioh of traffic delays will have a considerable bearing on this planning.

Before leaving the cruise the altimeters should be set to the QNH of the water airport of arrival, and the Seat Belt Sign "ON" if turbulence is anticipated. Power not less than minimum placarded RPM should normally be set, but there is no objection to top cruise power (boost settings within limits), providing the air is smooth and no areas of turb-

4. FLIGHT TECHNIQUE (CONT'D)
4.4. EN ROUTE (CONT'D)

4.4.8. Descent (cont'd)

ulence are anticipated. Remember that even in clear, smooth, air during daylight hours, turbulence is often experienced in the lower levels. Keep a check on engine temperatures in cold weather - reduction of forward speed will reduce the cooling.

On commencing the descent, set and maintain a power setting to give a B.M.E.P. as near to 123/125 as possible by continual retraction of the throttles. The recommended practice is to obtain a power setting giving 123/125 B.M.EP for each 2000 ft. level below the cruising altitude. Put this setting on before descending to the level for which the power was calculated.

The terms of the descent clearance from ATC should be strictly observed, with prompt vacating of altitude and correct height keeping as instructed.

A positive check of altimeters is to be made during every descent. Each pilot must deliberately read his instrument, reading thousands then hundreds of feet.

The exact heights must be called in order that any discrepancies between instruments are noted. A call of "500 feet to altitude" must be given by the pilot not flying the aircraft on all ascents and descents when approaching assigned altitude. A comparasion of ASI's is to be made at the commencement of the pre-landing check.

Pilots must not descent at anytime below the DME arrival steps until within 3 miles of the airport when cleared to approach under VMC at night. Irespective of the Lower Limit permitted on the DME arrivals on attaining a height of 1500 above the airport elevation, with Visual reference established height must be maintained until within 5 miles of the airport when the aircraft may conform with the normal 300 feet per mile gradient to the threshold. Pilots must appreciate the problems flying over water with the lack of foreground lighting and closely monitor the altimeter.

4. FLIGHT TECHNIQUE (CONT'D)

4.5. LANDING:

4.5.1. Normal - Full Flap, or Partial Flap:

In the circuit area, the pre-landing check should have been completed, and the speed stabilised at the flap extension speed of 120K. Launch instructions are actually advice, and if the Captain considers a variation desirable he should advise of his wish and intention. Bear in mind, of course, possible inconvenience and delay. At a position approximately two-thirds the way down the runway on the downwind leg, the flaps may be extended, RPM and MAP, having been checked. Losing height and speed continuously from this point, commence turn onto base leg when the trailing edge of the wing has passed the intended point of landing, and continue the turn, varying it for drifting out or getting too close in, until lined-up on final approach at a minimum height of 500 ft. Speed crosswind should be 115 Kts. and the extension of 2/3 FLAP At this stage will provide a more comfortable opportunity to retrim and adjust the power than later on final. On final with speed not above 105 K. the rest of the flap may be lowered if required. From this point speed should be reduced progressively from 105 to approximately 90K at flare out. The touch down should be made at approximately 75 to 80 Knots IAS depending upon the aircraft weight. The use of continually reducing speed and height enables the tendency to under or overshoot to be corrected with small corrections to power necessitating only small changes in trim and attitude. The benefit of this reflects in the touchdown. Prior to touchdown, throttle off steadily, and flare off so that the hull knifes on gently with power off and the aircraft in the horizontal flying attitude. As the hull touches ease the stick slightly forward to maintain positive water contact, and keep the aircraft level. As the controls become less effective, allow the aircraft to fall lightly off the step, and hold the stick back to prevent any tendency for the elevators to be damaged by water.

It is most important to maintain lateral level throughout the landing run especially with conditions of rough water as the wing tip floats are very easily damaged.

Opinions vary as to the degree of flap that should be used in varying wind conditions, but a skilled pilot should experience little difficulty with any amount of flap. FULL FLAP should be used wherever possible, and at least 2/3

4. FLIGHT TECHNIQUE (CONT'D)

4.5. LANDING (CONT'D)

4.5.1. Normal - Full Flap, or Partial Flap:(cont'd)
FLAP should be used on all landings to keep the landing speed to minimum. Into a strong wind, if 2/3 FLAP only is used, a normal approach angle can be maintained with moderate power. Raising the flaps should be done at the end of the alighting run.

4.5.2. Cross-Winds
The approach to land into a crosswind will be standard in respect of speeds and heights, but allowance must be made for drift in order to make good a straight-in track along the strip. The effect of the wind on base leg must be appreciated. If the turn onto base is downwind, care must be taken that the increased speed does not cause overshooting the final turn in, otherwise S. turns will become necessary and the opportunity to check drift and make good a straight-in track will be lost. On the other hand, if the component on base leg is a headwind, the final turn will need to be delayed slightly in order once again to ensure straight-in tracking.

The "crabbing" approach should continue right through to the flare off, whence drift should be removed, and the aircraft's head pointed directly up the waterway. At the instant of touch-down, the wings should be levelled, and the aircraft applied positively to the water. Roll the wheel over to windward to prevent the wing lifting, and maintain full directional control with rudder. Raise the flaps.

It is quite unnecessary to fly heavily onto the water, yet the flare and hold-off should be kept to a minimum to prevent the aircraft touching down with drift on, which may cause serious damage to the hull, and could precipitate a severe swing during the landing roll and possible damage to a float caused by "side loading".

Landing must not be made in crosseind components in excess of 15 Kts.

4.5.3. Night - with or without Landing Lights:
At night a standard circuit pattern is to be executed in preference to a straight-in approach, and the aiming point for touchdown should be the second flare. The optical illusion of lights appearing much closer than they actually are, causes a common tendency to undershoot. Landing lights should be checked during the pre-land Cockpit Drill, and instrument panel lighting should be adjusted to provide

4. FLIGHT TECHNIQUE (CONT'D)
4.5. LANDING (CONT'D)

4.5.3. Night - with or without Landing Lights (cont'd)

adequate vision of all instruments without destroying vision outside the cockpit.

Landing lights will normally be switched on at 500 ft., and used for all landings, but conditions of haze, mist, water reflection etc., may make their use undesirable. Using the right-hand light only, in poor visibility, will minimise glare. Reference to the altimeter should be continued throughout the entire approach even after the landing lights pick out the water.

At 200 feet gradually level out reducing approach speed to 85 knots. Maintain 85 knots, and the rate of descent at this stage should be maintained at 200 f.p.m. by the use of the engines. After touchdown slowly close all throttles.

4.5.4. Zero Flap:
Since the purpose of flaps is to lower the stalling speed, enabling a lower landing speed, and to make possible a steeper angle of descent to touchdown, it follows that, when they are not used, more speed will need to be carried (to provide the same margin above the stall - 20% on approach, 15% for touchdown), and a flatter angle of descent must be expected. Technique therefore requires a slightly longer final approach with IAS approx. 10K higher than a flapped approach - and that is 100K over the threshold instead of 90K. Because the property of increased drag, and therefore the more deceleration in a normal landing, is not available, there should be more water available than for a flapped landing.

However, since the occasion of an unflapped landing (due unserviceability) is somewhat of a precautionary procedure, more precise handling - and therefore some "whittling" of the in-built margins of a normal landing (as to approach gradient etc.) - is made necessary.

NOTE: After touchdown the throttles should be closed very slowly. Do not close the throttles suddenly as this will tend to make the aircraft leap out of the water.

4. FLIGHT TECHNIQUE (CONT'D)

4.5. LANDING (CONT'D)

4.5.5. Low Visibility and Close Pattern:

In conditions of minimum visibility and ceiling, there is a tendency to execute steep turns at low altitude in an endeavour to keep the waterway in view. This can be overcome by adopting the following technique which is the safest, simplest procedure:

(a) Locate the waterway and track along it, assessing W/V.
(b) Execute a 180° Rate 1 turn onto the reciprocal, and fly a downwind leg of 1½ - 2 minutes.
(c) A Rate 1 turn through 180° back onto the original heading, with turns being accurately done, should cause the water way to appear ahead.

NOTE: At 300 feet, one mile from the waterway on the downwind leg is with the wingtip running along the waterway. The turn from downwind should be commenced when passing the end of the waterway.

The aim is to position the aircraft at 300 ft. on final approach, in the configuration (flaps, speed, etc) it would have reached at 300 ft. on a normal approach. Good judgement is required in deciding when to extend flaps, and it is recommended that flap be lowered crosswind and taken before turning onto final.

Since the requirement for a low weather circuit could follow engine failure on take off in minimum weather conditions, on such an occasion the aircraft will be set up asymmetrically as follows:

Flaps Up - RATED POWER - IAS 115Kts.

4.5.6. Three Engine Landing:

A standard circuit pattern (heights, speeds etc). should be followed, with METO RPM on the operative engines. Flap must not be extended until the possibility of an undershoot has be eliminated.

It is considered that from 300 ft. the pilot is committed to a landing - he must have decided whether or not to "go around" and the extention of FLAP is consequent on his decision that a comfortable landing is assured. The ideal approach is made with 2/3 flap, and IAS not below 110 K. to the Committal Point of 300 ft., thus providing

4. FLIGHT TECHNIQUE (CONT'D)
4.5. LANDING (CONT'D)

4.5.6. Three Engine Landing: (cont'd)
ample safety margins should a baulked approach become necessary. Beyond Committal, speed may be reduced progressively to 90 K. approaching the threshold.

If the failed engine is one of the outers it is advisable during the final stages of the approach to close the throttle of the other outboard engine and carry out the landing using the inboard engines.

Rudder bias may be removed when crossing the threshold - not earlier, for it will be of assistance when and if power is applied for an overshoot - in order that no swing is experienced when throttling back for touchdown.

Should it be necessary to effect an asymmetric landing cross-wind, wherever possible land with the "dead" engine on the downwind side.

4.5.7. Overshoots:

Four and Three Engines:
If an overshoot becomes necessary AFTER flaps are down advance power to Take-off, retract flaps 1/3 and initiate climb away at IAS not less than 105 K. At 110 K. and flap retraction being complete - reduce to RATED Power and permit acceleration to continue to 120K. Proceed as for initial and cruise climb phases of normal T.O.

4.5.8. Moorings:
(a) Mooring to a Standard Mooring Buoy:
When approaching a mooring buoy, the final approach will normally be made into wind using the outboard engines only.

Where a wind of less than 10 knots exists, it will usually be found necessary to use one or both drogues.

Use may also be made of full flap to reduce the aircraft's forward speed.

Maximum use should also be made of the aircraft control surfaces to "sail" the aircraft when approaching the buoy, most particularly in the final stages in preference to using additional power to maintain

4. FLIGHT TECHNIQUE (CONT'D)
4.5. LANDING (CONT'D)

4.5.8. Moorings: (cont'd)
the desired aircraft heading.

If the surface wind is more than 8/10 knots, considerable benefit will be gained by using the aircraft control surfaces to "sail" the aircraft. However, for lower speeds the benefit is limited.

Where there is a tide running, the choice of whether the approach is to be made with or against the tide, or into wind will usually be governed by whichever is the stronger and so offer the most resistance to the aircraft's approach speed.

Where the angle of wind varies with the direction of the tide and both offer approximately the same resistance, the best result may be found by "marrying" the two factors.

When the approach is made with the tide and into a light wind, it will usually be found that the drogues offer only limited assistance in restricting the aircraft's speed. Similarly, when approaching buoy with the tide, it must be borne in mind that if the tide is of reasonable strength, the mooring buoy will usually lay with the tide, and a considerable amount of the mooring buoy cable may be taken up already. Therefore, it is most desirable to approach with the absolute minimum speed otherwise damage may result to the bollard or the mooring pennant may snap.

(b) Approach and Mooring to a Warping Buoy:
The approach to a warping buoy will be basically the same as to a standard buoy.

However, care must be exercised to pass to the correct side of the buoy when the pennant is being actually placed on the aircraft bollard. It will be seen that where the aircraft passes over the rope leading from the pontoon to the buoy, the drogues may become tangled or the various lines crossed. This could result in the snapping of the drogue lines (particularly in the event of missing the buoy and going around again) and probably the loss of the drogue or drogues.
Furthermore, this manoeuvre may result in the crossing of the warping line and the bail line. This is mainly applicable to calm conditions. Thus further time

4. FLIGHT TECHNIQUE (CONT'D)

4.5. LANDING (CONT'D)

4.5.8. Mooring: (cont'd)

(b) (cont'd)

will be lost while the launch tows the aircraft back across the warping line.

Therefore, it is necessary at all times to keep the warping buoy between the pontoon and the aircraft.

4.6. INSTRUMENT FLIGHT

4.6.1. Instrument Flying General:

Precision instrument flight requires a good understanding of Flight Instruments, their uses and limitations, a thorough basic training in the required techniques, and adequate and consistent practice. Properly adapted ground trainers (LINK) are of considerable assistance in contributing to the standard of this phase of work (particularly in the execution of Radio Aids procedures), but unfortunately they do not as yet faithfully reproduce aircraft flight characteristics. Maximum "in flight" practice (both simulated and actual) is most necessary..

Some detail of uses and limitations of various flight instruments is listed below.

Artificial Horizon: Two electrically driven artificial horizons are fitted in the main instrument panel and one suction operated A/H is incorporated in the Auto Pilot. The Captain and First Officer's A/H are electrically operated, pitch and roll are indicated in the conventional manner. Erection of the gyro is done by means of a caging device operated by a pull knob on the front casing. The gyro should be erected as soon as A.C. power is switched ON. Pitch Bar adjustment can be made within 5° up and 15° down by means of a knob in the lower LH. corner. Maximum horizon bar travel is $\pm 27^{\circ}$. The Gyro is free to $\pm 85^{\circ}$ in pitch and free through 360° in roll.

Whilst taxying, check that the instruments are erected. The auto pilot A/H should be uncaged and used as a standby.

4. FLIGHT TECHNIQUE (CONT'D)
4.6. INSTRUMENT FLIGHT (CONT'D)
4.6.1. Instrument Flying General (cont'd)

Airspeed Indicator: This instrument measures the aircraft's speed through the air. Since correct indication depends on air density, corrections for position error, instrument error (if any), pressure, temperature, and in some cases compressibility, must be made to obtain the true airspeed.

During manoeuvres the airspeed indicator has considerable "apparent" LAG, which is due to the time taken for the aircraft to overcome its inertia while changing attitude. It follows, too, that the heavier the aircraft the longer the duration of this apparent lag. Full appreciation of this fact is necessary particularly during instrument approaches when speed must be controlled accurately.

Altimeter: This instrument measures the pressure of the outside air at the particular place, with dial indication of altitude, but such indication is accurate only when assumed standard conditions prevail in the atmosphere. It must be clearly understood therefore that the altimeter does not measure altitude.

To register height above sea level, the sub-scale is set to the QNH of that particular location. But because this QNH is based on certain assumed values, the possibility of inaccurate readings at locations, of high geographic altitude, must be considered. Of course at locations near the sea level the possibility of inaccuracy is greatly reduced.

At take-off the errors which must be appreciated are Compressibility (the aircraft's close proximity to the ground) and Position error (the forward motion of the aircraft). The cumulative effect of these errors during take-off indicate a "loss" of some 80 ft. of height, most of which is due to Position Error (Speed). However, after becoming airborne, within 20 feet. of the ground, indication of positive GAIN is established.

Gyrosyn Compass: The system has the following units on the instrument panel: 1) A "free slaved gyro" switch and in the normal "SLAVE" position the flux valve and amplifier will control the gyro to correct any drift and in the "FREE" position the system operates as a directional gyro.
2) A set heading switch marked "INC" and "DEC". This

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.1. Instrument Flying General: (cont'd)

two-way spring-to-centre-off switch when held to the selected position will override the flux valve control and cause the heading indication to increase or decrease as selected. When the system is operating as a D.G. the set heading switch can be used to re-align the indicator following any directional drift. 3) A centre-pointer annuciator, a steady deflection of the pointer either side of the centre line will indicate that the gyrosyn control unit is receiving slaving signals from the flux valve and amplifier to either increase or decrease the indicated heading. During flight a constant small oscillation about the centre line is normal.

Directional Gyro: Indications by this gyro-driven instrument are accurate and 'dead beat' i.e. it indicates the exact amount of turn, and stops turning when the aircraft stops turning. Allowing approximately 5 minutes for the gyro to reach operating speed, a ground check of this instrument should be made for steady and 'dead' beat indication.

Due to the earth's rotation (and varies with latitude) precession causes a drift from the correct heading, which in a serviceable instrument should not exceed 15° per hour. Periodically, about every 20 minutes, the correct heading should be reset.

During take-off there is no significant error in this instrument, and its indication of direction may be taken as a true presentation.

Limiting movement of 50° in both the pitching and rolling planes causes the gyro to "topple" if exceeded, and re-erection takes a considerable time.

Turn and Bank Indicator: This instrument gives a faithful presentation of directional balance, or unbalance, and indicates error-free rate and direction of turn. The turn indicator is actuated by a gyro so mounted that any turn by the aircraft causes deflection in the direction of the turn proportional to the rate of turn. Company instruments are adjusted to indicate a Rate 1 turn when the needle is deflected one full needle's width from straight flight indication.

Because of the mounting of this gyro, "Toppling" cannot

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.1. Instrument Flying - General (cont'd)

Turn and Bank Indicator: (cont'd)

occur, and therefore rate of turn indications will continue when other gyros have exceeded their angular limitations of movement.

An indication of Slip/skid us derived from the ball in the base of the instrument. This ball is free to move within a glass tube.

Vertical Speed Indicator: This instrument, because of its design, has a LAG of from 6 to 9 seconds to indicate true readings after ANY change of attitude, and therefore is a most unreliable guide to attitude, and must not be used as more than an additional Cross-check.

4.6.2. Attitude Instrument Flight:

This entails controlling the aircraft by instruments with reference to its attitude although the natural horizon cannot be seen.

The requirement of satisfactory control when airborne demands certain considerations of attitude instrument flight. These are:

(a) Control: The Pilot must know how to control the aircraft in visual conditions, and from experience in controlling its performance, know the relationship of attitude to airspeed, height, and direction. He should therefore know his aircraft, and appreciate the relationship between what he sees outside the cockpit and the picture the instruments show inside. One basic principle which deserves special attention is the effect of power on performance in any particular attitude. Providing the attitude and power are constant, the performance will remain unaltered. Any change in attitude and or power will result in a change of performance - the airspeed, rate of ascent or descent, rate of turn, or all three may change.

(b) Instruments: For intelligent interpretation the pilot must know the principles of construction and operations of the instruments used. Details as set out by Sperry on their various units are recommended as study material to this end. A knowledge of limitations and errors, and serviceability checks, is essential.

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.2. Attitude Instrument Flight (cont'd)

(c) Physiological Sensations: To avoid any confusion which may be caused by sensory illusions, the pilot must be aware of the sensations he is likely to experience in instrument flight so that he may recognise and disregard them. During take-off the most important of these is caused by acceleration, giving an apparent tilt to the vertical (a FALSE vertical). This gives the "feel" of NOSE-HIGH, and to follow one's instinct of lowering the nose tends to continue the error - for acceleration continues and the illusion continues.

(d) Cross-Reference: Attention must be given to ALL instruments, and the picture they show as a WHOLE, rather than give attention to ONE in a "chase" of an individual pointer. Constant practice is the only manner of increasing the speed of cross-reference, which speed is directly proportional to the standard of instrument flight.

For Take-off Onto Instruments, ensuring the safest, most comfortable transition, an application of the above is summarised:

(i) There can be no satisfactory combination of both visual and instrument flight techniques. At night, or when instrument conditions prevail shortly after becoming airborne, attention must be transferred COMPLETELY to the flight instruments.

(ii) All flight instruments must have been satisfactorily ground checked for serviceability, and suction pressure maintained:

(iii) Control direction during the take-off run by reference to the Gyrosyn Compass.

(iv) At 80 Knots airspeed the aircraft should be lifted cleanly into the air and positive climb attitude established by:

(a) Check Gyrosyn for directional control.

(b) reference to A/H for "nose-up" and "wings level".

(c) reference to ASI for speed build-up to performance (Attitude and power)

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.2. Attitude Instrument Flight (cont'd)

(d) reference to ALT for positive GAIN in height.

(e) Check T & B for directional balance.

(f) Cross-check VSI for rate of ascent.

(v) cross-reference in the order of (iv) should be made again and again, remembering that the speed of such cross-reference will determine the standard of instrument flight.

(vi) DO NOT concentrate on any ONE instrument, but intelligently interpret the WHOLE picture.

(vii) After positive climb out has been achieved, any after take-off drills may be tidied up.

4.6.3. Let Downs: NDB, DME, LOC.

The following instrument approach procedures are advances as a "pattern" for this phase of the work, and should be adhered to in principle. It is appreciated that particular A.I.P. patterns and prevailing conditions may vary these procedures, but on such occasions it is expected the pilot will exercise his discretion.

Before commencing any let-down the A.I.P. should be consulted, however familiar the procedure to be used may be. Study the detail of the plan, profile, holding pattern, and note DME distances for procedure turn, etc., and familiarize with the procedure for Missed Approach. Rough sketching of all relevant information does more to fix the "pattern" in the mind's eye than mere perusal of the Approach Chart.

The Radio Aids to be used, both primary and secondary, should be tuned and checked prior to commencing any let-down, and, in the case of LOC, electrical interference should be checked. Secondary aids, in addition to providing a cross-check on the primaries, are available in the event of failure of the Primary Aid. The Captain should check and identify each aid, and both crew members should continually monitor the primary aid. At the same time the Captain should main-tain a listening watch on Tower/Approach Control.

When holding, having been allotted an expected Approach time, attention should be given to positioning the aircraft

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.3. Let Downs: (cont'd)

for arrival over the let-down commencement point at that time. Accurate flying and timing, and anticipation of a clearance, minimises delays to other aircraft, and thus contributes to the overall operating economy.

(a) VOR

(i) When first transferring to Tower Control obtain the ground wind, or the wind likely to be encountered during the approach, and make an assessment of the drift that can be anticipated. This wind component will determine the time delay (increased or decreased) before commencing the Procedure Turn over the VAR/VOR site.

(ii) Approach at the intial Approach Height as per AIP, or as instructed. If shuttling is required the standard holding pattern should be used to descend to the nominated Approach Height.

(iii) At 3-5 DME, or Z Marker - 2 minutes, carry out the Pre-landing Cockpit check, Set 2100 RPM and 21" MP and stabilise at 120 K IAS.

(iv) Over the Z marker, commence descent at 500 fpm/120K. IAS to the Procedure Turn height.

(v) Approaching the Procedure Turn height, i.e. 50-100 ft. above, fly level at 120K, descent may continue to that specified height during the turn.

(vi) At the nominated DME distance, fly around the Procedure Turn level at 115K. (1-2" MP increased may be necessary.) The standard turn is a Rate 1 through 80° either left or right, from the prescribed track, followed by a Rate 1 in the opposite direction for re-alignment on the reciprocal track. The effect of the wind component on the radius of the turn should be appreciated.

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.3. Let Downs (cont'd)

(a) VOR (Cont'd)

(vii) On completion of the Procedure turn inbound, descend to the prescribed minimum altitude at 500 fpm/120K. IAS.

(viii) If not visual at the Minimum, hold level at 110K. IAS by increasing MP to 28"-30", and at the Z marker or VOR site overshoot on the prescribed Missed Approach Track.

(b) N.D.B.:

(i) and (ii) as for VOR Let-down

(iii) at 3-5 DME, or NDB - 2 minutes, carry out the Pre-landing Cockpit Check. Set 2100 RPM and 21" MP, and stabilise at 120K. IAS.

(iv) Over the NDB, commence descent on the designated track, at 500 fpm/120K. IAS to the altitude and distance listed in the A.I.P. for commencement of the procedure turn. If DME is not available the DR time must be used.

(v) Approaching the Procedure Turn height, i.e. 50-100 ft. above, fly level at 120 K. Should the distance for procedure turn be reached before arrival at the prescribed height, descent may continue to that height during the turn.

(vi) At the DME distance, or DR time, for procedure turn, fly around the turn level at 120K (1-2" MP increase may be necessary). The recommended turn is a Rate 1 through 45° from the outbound track, Left or Right as specified., held for one minute (or 15° bearing change, whichever is achieved first), followed by a Rate 1 turn through 180° in the opposite direction and return to intercept the inbound track at an angle of 45°.

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.3. LET DOWNS (CONT'D)

(b) N.D.B. (cont'd)

(vii) At the DME distance inbound, descend to the prescribed minimum altitude at 500 fpm/110 K. IAS.

(viii) If not visual at the Minimum, hold level at 110K. IAS by increasing MP to 30", and at the NDB overshoot on the prescribed Missed Approach track.

(c) D.M.E.

If the direction of the station is uhknown, considerations of Orientation and Homing must precede the let-down procedure. The following is the technique to be adopted:

Orientation:

(i) Turn on to any heading a multiple of 30° i.e. 240°, 270°, 300°.

(ii) If the distance indication INCREASES turn 180° on to the reciprocal course.

(iii) If the distance indication is CONSTANT turn 90° left. If this new course results in an INCREASING distance turn a further 180°

(iv) When a course giving a DECREASING distance is established, start timing to obtain the RATE OF CLOSURE.

Homing:

(v) If the RATE OF CLOSURE is poor by comparison with the RATE which is expected when on a direct track to the beacon then turn 30° left and start timing again.

(vi) If this new course gives a RATE OF CLOSURE which is approximately the best that can be expected then hold steady on this course. If it gives an improved RATE OF CLOSURE but still not as good as can be expected on a direct track to the beacon, then try a further 30° turn to the left.

4. FLIGHT TECHNIQUE (CONT'D)
4.6. INSTRUMENT FLIGHT (CONT'D)
4.6.3. LET DOWNS (CONT'D)

(c) D.M.E. (cont'd)
Homing (cont'd)

(vii) If the first 30° left turn results in worse RATE OF CLOSURE than that obtained on the original course, then immediately turn 60° to RIGHT.

(viii) Depending upon the distance at which the HOMING procedure commence, this 30°/60° bracketing procedure may be repeated as necessary to find a course giving the maximum RATE OF CLOSURE. However, if it is certain that a course being flown will bring the aircraft within 10 N.M. of the beacon, then it is advisable to hold that course.

(ix) Within the 10 N.M radius a course toward the beacon will result in the needle showing a continuous decrease in distance. If the RATE OF CLOSURE slows appreciably turn left 30°.

(x) If this turn is in the wrong direction the needle will almost stop when an 80° turn should be made immediately to the right.
This 30°/80° procedure carried out once within the 10 NLM. radius will normally result in passing within 2 N.M. of the beacon, plus the aircraft height above the beacon.

(xi) Within the 10 N.M. radius descend to the altitude as shown in the A.I.P. for the commencement of the letdown.

(xii) Complete the normal pre-letdown cockpit check at a distance of three to five miles and assume standard letdown airspeed.

(xiii) If the aircraft comes abeam of the beacon, as shown by a stationary needle, at a greater distance, than 2N.M then immediately turn 90° in the direction

4. FLIGHT TECHNIQUE(CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.3. LET DOWNS (CONT'D)

(c) D.M.E. (CONT'D)

Let Down:

(xiv) Position the aircraft so that it passes within 1 N.M. of the beacon (plus aircraft height) on a heading within 45° of the outbound track, and commence letdown on a D.R. course, if the drift can be ascertained, otherwise the A.I.P. outbound track as course. Powers, speeds, use of Flap as for VAR, NDB let-downs.

(xv) Commence the procedure turn at the distance as set out in the A.I.P. If the procedure turn altitude has not been reached at this distance continue losing height in the turn down to the correct altitude. Use the 80° type procedure turn.

(xvi) On the inbound leg letdown to the minimum on the D.R. course. If no allowance for drift has been made outbound or inbound and the wind has been on the beam at 15 to 30 kts. a 30°/80° procedure on the inbound leg will be necessary. If the beam wind has exceeded 45 Kts. the turns will need to be 60°/150°. However close-in bracketing is to be avoided if it is obvious the course being held will bring the aircraft within the landing visibility minimum of the aerodrome.

A DME Arrivals Procedure is a procedure, D.C.A. approved where traffic permits, to facilitate an aircraft's arrival at the minimum circling height. It is permitted only when meteorological conditions at the field are above those requiring a standard Let-down procedure. Procedures for the various aerodromes, when approaching on certain tracks, have been issued, and most be complied with when such an arrival has been permitted. Other requirements are:-

(a) Check DME for correct indication - e.g. when passing over a point a known distance from the beacon.

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.3. (cont'd)

(c) D.M.E. (CONT'D)

(b) Tune and identify the track guidance facility (VOR, NDB).

(c) Normal descent, powers and speeds, to DME 10.

(d) At DME 10, complete the Pre-landing cockpit check. Set 2100 RPM and 21" MP, and stabilise at 120K IAS.

(e) At DME 5, descend to the specified altitude at 500 fpm/120 K I.A.S.

Localiser:

(i) and (ii) as for VOR, NDB

(iii) Approaching the let-down commencement point outbound, complete the Pre-landing cockpit check sufficiently early to avoid crowding any stages of the approach. Stabilise the aircraft with the appropriate base power:- 2100 RPM/21" MP 120K

(iv) At 2 n.m. or 1 minute beyond the let-down point outbound commence the procedure turn.

(v) At 2 n.m. or 1 minute prior to commencing final approach; speed 120 K., hold level.

(vi) At the let-down point, commence descent at the selected rate at 110 K. 15"-18" is the approximate power requirement.

(vii) At 100 ft. above the minimum, consider preparation for possible overshoot.

(viii) At the minimum, if visual, reduce speed for final approach, and continue for a routine landing.

4.6.4. Localiser Holding Technique. Patterns:

It is considered that all holding will be carried out in clean configuration. 120 K. IAS provides comfortable aircraft handling in most circumstances.

4. FLIGHT TECHNIQUE (CONT'D

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.4. (cont'd)
It is desirable that holding be carried out in auto lean mixture and minimum power settings commensurate with fuel economy and engine limitations.

4.6.5. Overshoots from Minimums:
All overshoots from the minimum on an instrument approach should follow the same pattern of POWER, FLAP RETRACTION, STABILISE AT NORMAL CLIMB SPEED, and follow the prescribed Missed Approach procedure.

Power requirements for overshooting from the minimum on VAR, NDB, and DME are satisfactorily met by Normal Climb Power. However, when overshooting from the minimum on the Localiser, a minimum power of RATED POWER (and T.O., if necessary) is considered necessary.

On all occasions when executing an instrument let-down mental preparedness for an overshoot, rather than an anticipation of breaking contact, places the pilot in the strongest possible position in the event of a necessary Missed Approach. It also tends to minimise the feeling of tension experienced by some when approaching the minimum.

4.6.6. Engine Failure During Let-Down:
Should an engine fail during an instrument let-down, it is expected that the pilot would abandon the approach, secure the aircraft (prop. feathered, etc.), before commencing descent to the minimum. He should warn the tower of the emergency and notify his intentions.

Should an engine fail en route, and the aerodrome of destination require a Localiser Approach, it is expected that, if possible, the aircraft would proceed to the nearest suitable waterway with weather at or above circling minima.

4.6.7. Aural Null Procedures:
General:

1. The automatic operation of the radio compass depends on the combination of signals from both the loop antenna and the vertical or phasing antenna. Because of icing conditions, or malfunction of some sort, the phasing antenna may be lost or become inoperative. Under these conditions, the pilot must rely entirely on aural null indications for direction finding.

4. FLIGHT TECHNIQUE (CONT'D)
4.6. INSTRUMENT FLIGHT (CONT'D)
4.6.7. (cont'd)

homing and let-downs. It is obviously important, therefore, that pilots be thoroughly familiar with aural null procedures.

2. A failure of the phasing antenna will be indicated by satisfactory reception with the function switch on LOOP, but no reception on ANT or COMP. To tune in a station in this case, it is necessary to rotate the loop with the L/R switch to an estimated maximum position in relation to the desired radio station. This will avoid tuning in the station with the loop in a null position, and resulting lack of signal.

3. It must be realised that a high signal heard in the headset provides a sharp null, while a low signal results in a wide null. If the null is severl degrees wide turn the audio volume knob up. When the volume level is high, a smaller movement of the loop is necessary to change the strength of the signals being received and the "null" will be narrow. When the null has been narrowed by the use of the volume control as much as possible, the bearing can be closely determined by splitting the null width on the azimuth dial. At times, due to great distance from the radio station, it may be impossible to narrow the null to more than 15 - 20°. In such cases, "splitting the null" will still provide a reasonable accurate bearing.

4. When the reception of radio signals is poor, and it is difficult to get a reliable null aurally, the tuning meter will give a visual indication of the null. Watch the tuning meter as the loop is rotated, and when the null position is reached, tuning-meter will deflect toward the minimum (or counter-clockwise) side. It must be remembered that bearings taken by the aural null method are subjected to 180° ambiguity if the location of the station is not known.

To solve the 180° Ambiguity:

1. To solve the 180° ambiguity, turn the loop to the wing tip null position with the L/R switch.

4. FLIGHT TECHNIQUE (CONT'D)
4.6. INSTRUMENT FLIGHT (CONT'D)
4.6.7. cont'd

2. Then turn the aircraft until an aural null is received. Note the Compass heading.

3. Fly this heading, feeling for the change in position of the null by rotating the loop, until a desired angle of change is obtained (10° approx).

4. When a distinct change in bearing is obtained, note the position of the bearing indicator.

5. If the bearing has decreased the station is to the left; if the bearing has increased, the station is to the right. The distance to the station can then be computed by noting the length of time flown, the number of degrees of bearing change and using the following formula:

$$\text{Time to Station (minutes)} = \frac{60 \times \text{Time for Bearing Change (Mins.)}}{\text{Degrees of Bearing Change.}}$$

6. If the aural null is to be used for homing, turn the aircraft toward the station and fly toward the station with the null at 0° on the bearing indicator but check periodically for movement of the null. It is easier to rotate the loop than to turn the aircraft.

NOTE: WHILE FLYING THIS PROBLEM AN EXACT HEADING MUST BE MAINTAINED. IF THE NOSE OF THE AIRCRAFT IS OFF THE HEADING A FEW DEGREES, THERE WILL BE AN EQUAL ERROR IN THE ANGULAR CHANGE OF THE NULL.

Tracking:
Having solved the 180° ambiguity and turned the aircraft so that the null is on the nose (i.e. Null is received with bearing indicator on "0") the aircraft will be tracking directly towards the Radio Station. To detect drift it is adviseable to rotate the loop continuously whilst tracking. Drift will be apparent when the null moves away from the nose or "0" position on the bearing indicator. Corrections for drift will be made in much the same manner as in ADF operation, the difference

4. FLIGHT TECHNIQUE (CONT'D)

4.6. INSTRUMENT FLIGHT (CONT'D)

4.6.7. cont'd

being that in ADF operation the needle of the bearing indicator points to the Radio Station continuously and automatically, but in manual or loop operation the needle is only pointing to the Radio Station when the loop is rotated to the null poistion. The direction to turn to regain track will be indicated by the needle position, and track will be intercepted when the null is displaced from "0" by the angle of correction (normally 20°).

Passage of Station:

1. In homing by use of the aural null method, it is usually difficult to determine the exact time of passing over the radio station. As the station is approached, the volume steadily grows louder and even with careful reduction of the AUDIO control in attempting to keep the null at a usable width, it may become impossible to get a completely silent null. Instead, the null may be replaced by a wide zone of minimum signal; that is, the loop can be rotated a large amount to either side of the null position without changing the volume of the signal being received.

To determine positively that the station has been passed the following procedure should be used:-

1. After flying approximately 80% of time to station turn 30° left or right (usually down wind). Hold this heading for 1 minute or a 15° change in the null position whichever is first.

2. Parallel Track: If turn was to left the null should now be displaced to the right of the position when homing.

3. Rotate loopcontinuously on this heading when null is received on the beam position (90° or 270° on bearing indicator) the aircraft will be passing the Radio Station.

Track away from station may be intercepted by turning 30° in the appropriate direction, remembering that the track will be intercepted when null is 30° from 180°. If it is desired to pass within 1 mile of the Radio Station the following procedure may be used:-

4. FLIGHT TECHNIQUE CONT'D

4.6. FLIGHT INSTRUMENT CONT'D

4.6.7. cont'd

1. Turn aircraft 30° from track as in previous procedure.

2. Parallel Track: When null is 30° from "0" turn aircraft 15° in direction of Radio Station. Repeat this procedure when null is again 30° from "0".

If after one 15° turn the movement of the null has considerably increased in speed the second 15° turn should not be necessary as the aircraft is obviously close to the Radio Station.

4.7. ASTRO NAVIGATION:

4.7.1. The Sextant's Description:
The principal difference between the Mark 1X and the Mark IXA and the Mark IXB Sextant is:-

Instead of manual device by which six individual shots are taken subsequently resulting in a "mean sight" the Mk.IXA has a clockwork mechanism which takes 60 shots over a period of 2 minutes.

Alternatively, on the face of the clockwork mechanism there is a nickel knob with a pointer attached pointing to Fig. 1 or Fig. 11 representing a choice of either 1 or 2 minutes shots. Select the period of shot, i.e. 1 or 2 minutes before winding up the clock. This is done by pulling the nickel knob out gently and turning the pointer to the figure representing the desired period of the sight. Extreme care must be taken not to overwind the mechanism. If the time is taken on completion of the sight it will be seen that in order to obtain the mean time of the sight, 30 seconds must be deducted from 1 minute sights and 1 minute from 2 minute sights.

The Mk. IXB Sextant has as an additional aid a choice of lens. The stronger of the two lens is for sighting stars of lesser magnitude. The selection of lens is obtained by pulling the plate to which the lens are attached out against a spring tension and rotating until the desired lens is in position - release gently.

4. FLIGHT TECHNIQUE (CONT'D)
4.7. ASTRO NAVIGATION (CONT'D)

4.7.1. (cont'd)

Important Points:

(a) Never put the sextant away with the clockwork mechanism wound up.
(b) Never leave a bubble in the chamber when putting the sextant away.
(c) Do not use any more pressure than absolutely necessary when operating the bubble setting knob.
(d) Do not leave the sextant hanging in the astro dome, most particularly during the day as the sun's heat makes the fluid in the bubble chamber expand with resultant decrease in the size of the bubble and probable damage in the chamber.

Useful Hints:
When sighting stars it is desirable to warm the lens either by breathing warm air or placing a finger over it for a few seconds as the lens tends to fog due to the sudden change in temperature when the eye is applied.

Immediately after warming the lens, wipe clean with a handkerchief and begin shooting sight as soon as possible.

NOTE:
(a) If the sextant bulbs blow, they can be replaced by bulbs from the radio compass control box or the spares box in the sextant case.
(b) In the event of the batteries being low, use the aircraft supply by fitting the attachment which is found in the sextant case.

Care of the Mark IX Sextant:
The following errors may be introduced into the Mark IX sextant if it becomes worn or dirty or if it is not handled properly:-

(a) Shot Indicator: If the rachet device operating the shot-counter becomes worn or gets out of adjustment it is possible for the occasional shot to go uncounted, and so the wrong number of shots will be taken. Inspection of the instrument will detect this trouble. Always make certain that the stop pawl of the counter ratchet engages slightly before the clutch disengaging lever reaches the limit of its travel.

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.1. cont'd

(b) Jamming of the slow-motion knob: The slow motion knob operates the mirror through a screw and nut mechanism. A small amount of dirt in the screw will sometimes cause the mechanism to jam or else become very stiff at some points in its travel. This happens very often in cold weather. No attempt should be made to force the knob, but rather the instrument should be returned for cleaning.

(c) Slipping the Clutch: If the slow motion knob on a sextant is moved rapidly or jerkily either when winding up to make the bubble and body coincide or when winding back to zero the clutch may slip and give an incorrect reading for the average of six shots. This condition may be accentuated by cold weather or dust in the instrument. In order to avoid this trouble use a slow, deliberate motion when operating the slow motion knob.

(d) Resetting Knob: Before re-setting the average reading to zero the clutch should be disengaged. This takes the tension off the re-setting knob which might otherwise pull off.

(e) Bubble Re-setting Knob: If the bubble control wheel is slackened too far it may bind against the left handle of the instrument and damage the bubble chamber or break the control wheel. See that the screw holding this control wheel in position is properly in place.

To Obtain a Bubble:

1. Take up slack on diaphragm knob.
2. Invert the sextant.
3. One-eighth of a turn of the knob will now introduce a sizable bubble into the chamber.
4. Right the sextant and reduce the size of the bubble in the normal way.
5. Remove all tension from the knob.

4.7.2. The Sextant's Operation:

(i) Set correct shade (No.5 to 7 most suitable for Sun)

(ii) Insert bubble (remember increased pressure increases size of bubble and vice versa).

4. FLIGHT TECHNIQUE(CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.2. cont'd.

(iii) Set approximate altitude to nearest 10^{o} below on the course adjusting knob and see that it clicks "home" - the 5 increase lever should be used where necessary.

(iv) Clear averaging window by holding down clutch on left hand side of sextant and rotating knob below eye piece at back of sextant. (N.B. See that single shot apertures read zero prior to this operation).

(v) Press tit under eye piece shade to ensure that shot window reads zero.

(vi) Proceed to shoot the Sun by bringing the bubble to the centre of the visible field always between the two vertical wires and coinciding the Sun's image with it.

(vii) Wind knurled knob under right hand handle to affect this and the actual altitude of the Sun can now be read as a single shot in the windows on the right of the sextant at the right hand bottom corner.

(viii) To obtain the average of six shots, having followed directions (vi) and (vii) the clutch lever on the left hand side of the instrument is held down while the knurled knob is returned to zero position.

(ix) This operation is repeated a further five times coinciding the Sun with the bubble, and then holding the clutch whilst returning the knurled knob to zero. (This adds 1/6th of the actual result on each occasion or 6/6, i.e. the average for the whole operation).

(x) When the lever has been pulled for the sixth time a shutter is automatically inserted into the optical system so that the sun is no longer visible.

(xi) In order to obtain the average result of these six shots of the Sun the bottom left hand windows on the right side of the sextant is consulted.

(xii) For the purpose of working the shot out, the mean time of the shot is also required, and this is obtained by logging the time at which the first shot was taken and the finishing time of the last shot.

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.3. Use of Tables:

Assuming that you are conversant with the sextant, the following procedure is required to work out the shots:-

(i) Log time of start of shot.
(ii) Log time of finish of shot.
(iii) Interpolate to obtain mean time of shot.
(iv) Log Height Sextant (Hs) + Instrument Error (and Dome refraction if necessary) - Result - Height Observed (Ho).
(v) Log mean time of shot + Watch Error - Result G.M.T. of shot.
(vi) Enter Air Almanac on correct date at G.H.A. sun for hours and 10's of minutes G.M.T. of shot-log for this.
(vii) Log Declination (N.B. always insert N.or S. as indicated).
(viii) Add Increment for remainder of minutes from interpolation table on right fly leaf - result G.H.A. Sun.
(ix) To the G.H.A. Sun an amount of Longitude must be added (or substracted) to give the result (L.H.A.) as a whole figure in degrees. The figure added must therefore be as near as possible to your D.R. Long.
(x) Latitude as a whole figure of degrees as near to your D/R position as possible must also be logged (N. or S.) (N.B. Should the figrues selected differ greatly from your actual position the result will still work out satisfactorily).

You have now finished with your Air Almanac, and must enter the A.N. Tables with,

(a) The number of degrees of your declination (see vii) selecting the correct page (contrary or same) by comparing the Dec. N. or S. with the Latitude N. or S.

(b) Select actual L.H.A. (see ix).

(c) Move across on this line to the column of correct latitude (see x)

(d) Log Altitude + d and Az as indicated.

(e) Check True Bearing from Az by note at foot of page. (N.B. N. or S. Lats. are at the foot of opposite pages.

4. FLIGHT TECHNIQUE (CONT'D)
4.7. ASTRO NAVIGATION (CONT'D)
4.7.3. cont'd

(f) Turn to last page of book and take out correction for d. and minutes of dec. still unaccounted for.

(g) Alt. + result of previous paragraph gives Height Calculated (Ho).

(h) Difference between Hc and Ho (see iv) is intercept (towards or away).

(i) Rule here is G.O.A.T. (greater observed altitude towards). The results of this may now be plotted.

Use of Tables:

Example:

DATE	20/1/52				AIR-BODY SUN	
				Hs	58°	24'
CLOCK	07	10	45	IE		NIL
ERROR			-10	P in A		-
	07	10	35	DEC. 20° 11'S DOME		-
G.H.A.	284°		44'	LAT. 25° S	58°	24'
INC.	0°		09'			
G.H.A.	284		53'	Chosen Long.		
Long	109°		07'			
L.H.A.	394°		00' = 034°			
ALT.	58°	17' = 15		AZ. 92	TB. 272°	
Cor		+ 3		D/R POSN.	(25°S.)	
Hc	58°	20'			(109°E) approx.	
Ho	58°	24'				
		4' TOWARDS				

DRILL FOR SHOOTING STARS AND WORKING OUT RESULTS WITH A. N. T. s.

SEXTANT - OPERATION

The operation of the sextant is practically the same as that outlined for shooting the sun differing only in the following points:-

(i) All shades are dispensed with (zero should show here)

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.3. cont'd.

(ii) Batteries or power supply are connected through the left hand handle and by pressing the switch IN the light IN the sextant (i.e. on the bubble) is lighted while pressing the switch OUT lights OUTSIDE light.

In order to work the results out the procedure again parallels that used with the Sun for paragraphs (i) and (v).

(vi) Enter Air Almanac on correct date at G.H.A. Aries for hours and ten's of minutes of G.M.T. of shot - Log this.

(vii) Add increment for remainder of minutes and seconds from interpolation table to left of G.H.A. table on inside of Air Almanac cover.

(viii) To this add also the sidereal hour angle (S.H.A.) of the star which can be obtained from the star list also on inside of front cover.

(ix) Result of (vi), (vii) and (viii) is G.H.A. of star.

(x) Log also the number of the start and the latitude (N. or S. in whole degrees nearest to your D/R position.

(xi) Select an amount of Long. as near as possible to your D/R Long. whose value is such that when added (or subtracted) to the G.H.A. star the result will be a whole number of degrees. This will be the L.H.A. star (Local hour angle).

(xii) You are now finished with your Air Almanac and must enter the front half of the A.N. Tables with -

(a) The number of your star (see x) selecting the page labelled at the top for N. or S. Latitudes according to your own position.

(b) Select actual L.H.A. star (see xi).

(c) Move across on this line to column of correct Lat. (see x) and take out figures for ± t and Az. as indicated.

(d) Check True Bearing from Az. by note at foot of page.

(e) Turn to first page of book and take out correction for "t" and date.

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.3. cont'd.

(f) Altitude ± (e) above give Height Calculated (Hc).

(g) Difference between Hc and Ho is intercept in Nautical Miles.

(h) Rule here is G.O.A.T. again for miles towards or away.

Plot Results.

DATE: 20/1/52

CLOCK	18	32	51
ERROR			- 11
G.M.T.	18	32	40
G.H.A. Aries		037°	16'
INC.		0°	40'
S.H.A.		259°	19'
G.H.A.		297°	15'
Long.		91	45
L.H.A.		389	00°
ALT.		59°	18'
Cor.			NIL
Hc		59°	18'
Ho		60°	59'
			101' TOWARDS

No. 20
LAT. 5° S.

Chosen Long.
≈ 029°

t-2

AZ 65
D/R PSN.

AIR BODY		SIRIUS (STAR)
Hs	60°	59'
IE		NIL
P in A		-
DOME		-
HO	60°	59'

TB 245
(05°S
(92°E approx.

An incorrect D/R position was chosen purposely to show that the difference is made up for by a large Intercept.

DRILL FOR PLANETS

SEXTANT:

The operation of the sextant is identical with that used with stars.

USE OF TABLES:

In order to work out the results, the procedure is as follows:-

(i) A special table for G.H.A. of each suitable visible planet is incorporated in the Air Almanac on the same page as the G.H.A. Aries.

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.3. cont'd

(ii) Enter the table for the correct planet on correct date and log G.H.A. for hours and tens of minutes G.M.T.

(iii) Add interpolation for further minutes and seconds from the same table as you used with the star Interpolation (Results G.H.A. Planet).

(iv) Log. Dec. N. or S. and Lat. N. or S.

(v) To the G.H.A. planet add the necessary Long. (nearest your D/R Long.) to bring the result (LHA) to whole number.

(vi) This completes the use of the Air Almanac and the A.N.T's are used exactly the same with planets as with the sun (See P.4) (a) to (i)

DATE: 20/1/52				AIR BODY	SATURN (PLANET)	
CLOCK	18	08	15	Hs	51°	26'
ERROR			- 11	IE		
G.M.T.	18	08	04	P in A		
			DEC.22° 27' N.	DOME		
			LAT.05°S.	Ho	51°	26'
G.H.A.		293°	45'			
INC		2°	01'			
G.H.A.		295°	46'			
Long.		92°	14' Chosen Long.			
L.H.A.		388°	00 =028°			
ALT.		51°	32' d-40 AZ. 136	TB 316		
Cor.			-25 D/R POSN.	(5°S		
Hc.		51°	07	(92°E. approx.		
Ho.		51°	26			
			19' TOWARDS			

DRILL FOR MOON

A special table is also used for the G.H.A. moon in the Air Almanac. It appears under the G.H.A. Sun.

The procedure with the moon is identical with that used on planets, of course selecting G.H.A. Moon Table.

4. FLIGHT TECHNIQUE (CONT'D)

4.7. ASTRO NAVIGATION (CONT'D)

4.7.3. cont'd

NOTE: (i) The declination of the Moon changes more rapidly and must be carefully watched.

(ii) In order to get the correct Ho of the moon a further correction besides I.E. and dome refraction must be considered. This is parallax in Altitude appearing in a column to the right of the G.H.A. moon table. The value varies with the Hs and must be selected carefully and always ADDED.

DATE: 20/1/52				AIR BODY	MOON
CLOCK	07	15	15	Hs	37° 50
ERROR			- 10	IE	NIL
G.M.T.	07	15	05	P in A	- 47
G.H.A.		205°	38'	DOME	-
INC		1°	14'	Ho	38° 37'
G.H.A.		206°	52'		
Long.		109°	08'		
L.H.A.		316°			
ALT.		38°	59'		
Cor.			- 9		
Hc.		38°	50'		
Ho.		38°	37'		
			13'		

DEC. 03° 15' N.
LAT. 25° S.
Chosen Long.
AZ. 117
d-35
AWAY

TB. 063
DR. POSN (25° S.)
(109° E.) approx.

Wherever ± or add or subtract is mentioned in conjunction with long. + refers to longitude East and - refers to longitude West.

4. FLIGHT TECHNIQUE (CONT'D)

4.8 DROGUES

Stowage - Handling - Streaming and Tripping:

The drogues must be correctly stowed in the proper container provided in the mooring compartment.

Sequence of Stowage:

(a) Trip lines neatly folded in the bottom of the respective containers.

(b) Drogues.

(c) Main drogue lines folded on top with the securing clip uppermost.

On completion of securing the bollard:

(a) Clip the main drogue lines to the drogue lugs on each side on the external surface of the mooring compartment.

(b) Place the drogues over the side, one each port and starboard at the same time ensuring that the loops in the trip lines which are approximately 1 yard from the apex of the drogues are looped over the appropriate lug on the internal sides of the mooring compartment. At this stage both the main trip lines should be trailing in the water.

(c) The drogues are now ready for streaming.

Example: On Captain's signal merely release the trip line loop of the desired drogue from the internal lug, and it will stream automatically. The bow officer will then indicate that the drogue is streamed and holding.

Tripping Drogues:
In the event of a baulked approach it may be necessary to trip the drogues which is achieved by hauling on the trip lines and spilling the water.

To keep the drogues tripped, loop the trip lines several turns on the internal lugs until otherwise instructed.

4. FLIGHT TECHNIQUE (CONT'D)

4.8 DROGUES (CONT'D)

On completion of the mooring, haul in the drogues by means of the trip lines and where possible hang the drogues by securing the trip line loops over the internal lugs and allow the water to drain off befor stowing.

4.9 ANCHORING

The conditions to be observed before anchoring are:

1. Rise and fall of the tide.
2. Tide flow
3. Suitability of the holding ground
4. Leeward shore for sheltered and safe anchorage.

Dropping Anchor

Instruct the Bowman to prepare the heaving line with one end attached to the aircraft if uncertain as to the available depth of water. Then attach the loose end of the anchor rope to the bollard of the aircraft. The aircraft should be taxied as slowly as possible to the required position and when the required depth is obtained the anchor is paid out until the rope is vertical. Then making a bowline knot twice the vertical distance back, the loop obtained is slipped over the bollard and the motors stopped.

When using the anchor, instead of a buoy it is desirable to ensure as far as possible that the sea or river bed is not smooth rock or a hard gravel nature.

On dropping anchor, it is essential the anchor rope be let out to a length equivalent to at leat 3 times the dept of water expected at High Tide.

Similarly in places where big tide variations are experienced some of the anchor rope may have to be hauled in to prevent the aircraft swinging onto any nearby obstructions or shoals at low water.

For at least 10 minutes after completion of mooring visual bearings are to be taken at regular intervals to ensure the aircraft is not dragging the anchor. An "Anchor Watch" must be kept at all times where the anchor is used as the sole means of mooring.

4. FLIGHT TECHNIQUE (CONT'D)

4.9 ANCHORING (CONT'D)

In unfamiliar places always use a lead line to determine the depth of water for a suitable mooring.

Weighing Anchor:

Assuming that the pre-starting checks have been made:-

(a) Start an inboard engine, two if possible and providing the aircraft can be maintained at a low speed set lowest possible idling r.p.m.

(b) Whilst the aircraft is moving forward, instruct the bow officer to haul in the anchor line.

(c) When the aircraft is about to pass over the mooring, the bow officer will endeavour to trip the anchor. However, it may be necessary to loop the line over the bollard, thus allowing theforward movement of the aircraft to achieve the desired result.

(d) Maintain the lowest possible forward speed until the anchor has been hauled into the mooring compartment.

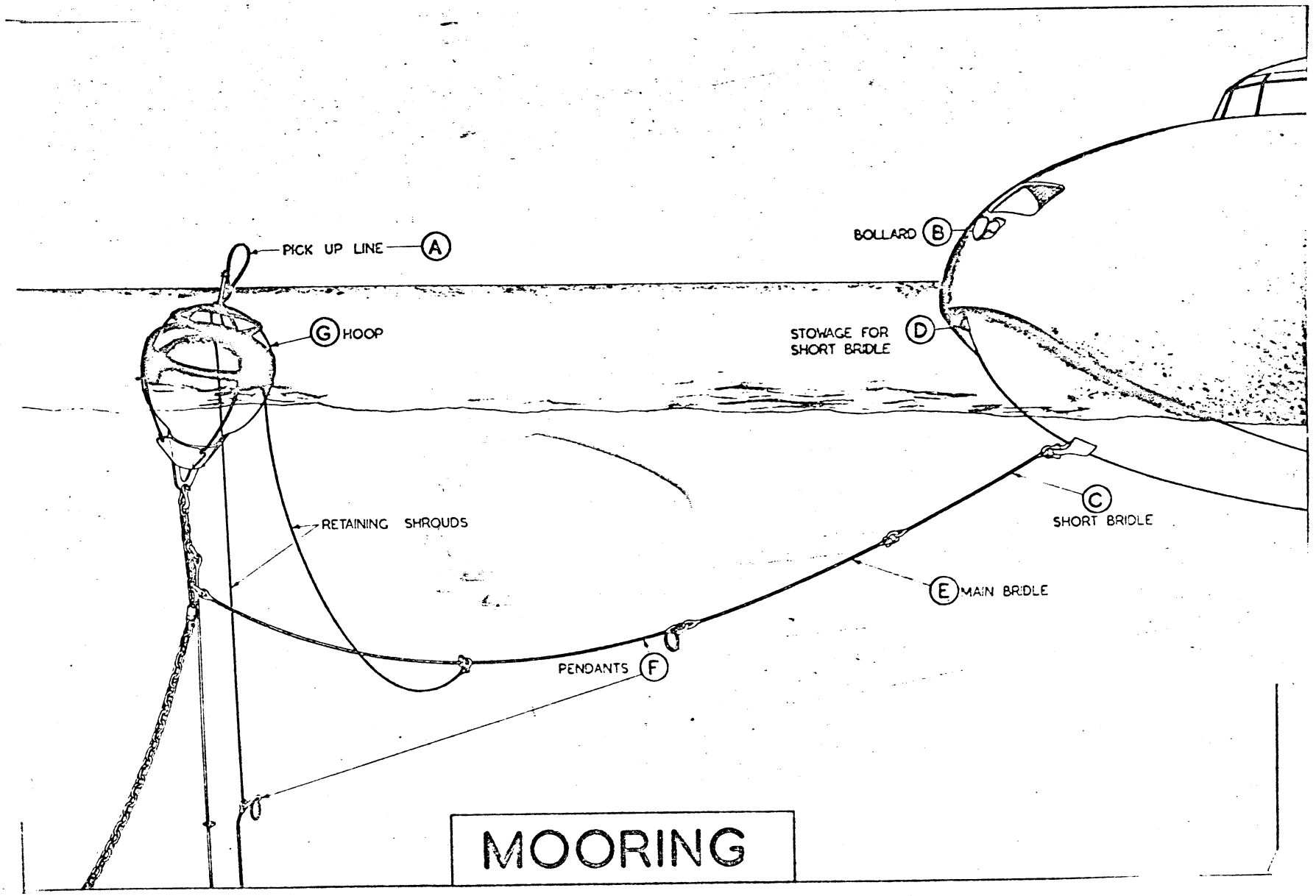
On completion of weighing anchor, start remaining engines.

Precaution: Extreme care must be exercised to ensure the anchor does not hole or strike the hull.

Note: If the aircraft is resting in shallow water it may be desirable to let out more anchor line thus allowing more time to start engine or engines before taking up the slack of the mooring line.

An alternative method is to haul in the anchor line until the aircraft is almost over the anchor and then start engines. In this way, there is virtually no forward speed when the anchor is tripped and so involving less risk of the anchor swinging and striking the hull when it is being hauled in.

This method however will depend upon the strength of the wind or tide or both.


PICK UP LINE A
BOLLARD B
G HOOP
STOWAGE FOR SHORT BRIDLE D
RETAINING SHROUDS
C SHORT BRIDLE
E MAIN BRIDLE
PENDANTS F

MOORING

Emergency Procedures	ANTILLES AIR BOATS LTD. SANDRINGHAM S.25	SECTION 5 INDEX

P R E F A C E

Emergency Procedures are categorised either "A" or "B".

Category "A" - will be divided into Phase 1 and Phase 2 - Phase 1 comprising actions which require immediate action.

Category "B" - include all abnormalities, which uncorrected could lead to an emergency situation.

5.1. ENGINE FAILURE:

5.1.1. ENGINE FAILURE ON TAKE-OFF - CONSIDERATIONS

During the take-off the following points of technique shall be observed:

(a) In the event of engine failure at any time during take-off the Captain will always take over control of the aircraft.

(b) The Captain will be responsible for the observation of safety speed and action related to the failure. The call from the F/O will be as a back up to the Captain.

(c) The F/O will clearly call and/or indicate malfunction at any time.

(d) The Captain will always call for or initiate take-off rejection.

(e) The Captain will confirm failed engine indication prior to personally carrying out feather action.

(f) The F/O will monitor flight instruments immediately the engine is feathered.

(g) On any engine failure or fire the engine number of the control shall be nominated prior to actuating the control.

5.1.2. ENGINE FAILURE DURING TAKE-OFF

(a) With flaps one third out, safety speed at maximum all up weight, and at full take-off power is 105 knots.

(b) If safety speed has been attained the aircraft will climb away slowly on three engines. Do not allow the I.A.S. to drop below 105 knots. The failed engine must be feathered. Flaps may be safely retracted at 300 feet.

(c) In the event of engine failure below safety speed close the throttles of the remaining engines and land straight ahead.

5.1. ENGINE FAILURE (cont'd)

5.1.3. ENGINE FAILURE IN FLIGHT:

The aircraft must be properly handled, to achieve optimum climb performance. The safety speed should be maintained accurately, and should this speed increase or decrease appreciably, the corrective action should be carried out smoothly. An abrupt change of attitude will result in altitude or speed loss depending upon whether the I.A.S. is above or below safety speed. When flying completely on instruments, maintenance of correct attitude is vital, and attention should be concentrated on the flight instruments, diverting only to check that the correct control is manipulated during the emergency procedure.

The prompt initiation of the correct emergency drill, is also vital, particularly the items of "Phase 1". Here, the correct balance between speed and certainty must be maintained. Be absolutely sure that the failed engine, is positively identified, and then proceed at a rate which will enable some thought to be given to each individual item of the emergency procedure.

The tendency to yaw must be immediately corrected by the application of rudder and aileron, and a positive climb out attitude adopted. The application of 3°-5° of bank will assist control of the aircraft, and improve performance.

Maximum power will be required until performance has been established. At 300' QFE accelerate to best climb speed, 110 kts., retract flaps and reduce power to METO. (Maximum time for take-off power is 2 minutes). Engine instruments should be carefully monitored throughout by the Flight Engineer.

PHASE 1	THROTTLE.....CLOSED	"A"
	FEATHER.....BUTTON IN	
	MIXTURE.....IDLE CUT OFF	
	FEATHER ACTION.....PROP STOPPED, BUTTON OUT.	

5.1. ENGINE FAILURE (cont'd)

5.1.3. ENGINE FAILURE IN FLIGHT: (cont'd)

PHASE 2	POWER.....MAX. CONTINUOUS INITIALLY, THEN REFER SECTION 7 FOR ASYMM. POWER. TRIM.....ADJUST GENERATOR.....OFF IGNITION.....OFF ENGINE LIMITATIONS...CHECK F/ENG. (OPERATING ENGINES)

NOTES:

(1) If after pressing feather button the propeller fails to feather, hold button in until propeller stops, then immediately return to neutral; repeat several times if necessary.

(2) Altitude is a valuable assest - do not waste it. Advance power on live engines, initially to "METO". If possible obtain a clearance to the lowest safe altitude and descend slowly to this altitude, since flight can be maintained on lower powers in the lower altitudes. Refer to Section 7, Range, three engines.

(3) Proceed to nearest suitable water airport.

5.1.4. FIRST OFFICER'S DUTIES - ENGINE FAILURE ON TAKE-OFF

(When F/O is flying) -

1. Captain takes over
2. Double check identification
3. Check correct feather action completed
4. Standby for Phase 2 of Engine Failure in Flight (5.1.3.)
5. Monitor boost, R.P.M. of operating engines
6. Monitor flight instruments.

5.1. ENGINE FAILURE (cont'd)

5.1.5. MAGNETO FAILURE IN FLIGHT

"B"

1. FAULTY MAGNETO.....OFF
2. MANIFOLD PRESSURE NOT TO EXCEED 25" HG.
3. CONTINUE FLIGHT ON ONE MAGNETO ONLY.
4. IF THE ENGINE IS STILL ROUGH, FEATHER AND CLOSE DOWN IN THE NORMAL WAY 5.1.3.

5.1.6. RUNAWAY PROPELLER

"A" If the Propeller should runaway at any time (or on T.O. exceed placarded R.P.M. by 200).

PHASE 1	1. THROTTLE.....CLOSED(TO RETURN RPM WITHIN GOVERNOR RANGE) 2. REDUCE SPEED.....TO 105 KTS. IF NECESSARY 3. PITCH.....COARSE 4. IF GOV. CONTROLS.....USE POWER NORMALLY 5. IF GOV. DOES NOT CONTROL..FEATHER
PHASE 2	6. IF UNABLE TO FEATHER...PROCEED AT MIN. SPEED TREAT AS FIXED PITCH PROP, AND LAND.

NOTE: IF ON CRUISE AND UNABLE TO FEATHER DESCEND TO LOWER ALTITUDE IF POSSIBLE, SINCE WINDMILLING DRAG LESS AT LOWER ALTITUDES.

5.1.7. POWER OSCILLATION

"A"

Serious damage to an engine may result from overspeeding after it momentarily cuts out or begins oscillating, if power is suddenly restored with the propeller in fine pitch. To prevent the possibility of damage to the engine from this cause, observe the following procedure when power suddenly drops, or undamped power oscillation is indicated.

5.1. ENGINE FAILURE (CONT'D)

5.1.7. POWER OSCILLATION (cont'd)

"A"

PHASE 1	1. THROTTLE.....CLOSED 2. SPEED.....110Kts (IF NECESSARY) 3. PITCH.....COARSE
PHASE 2	CHECK FOR NORMAL OPERATION AT REDUCED POWER IF OSCILLATION STOPS, SLOWLY INCREASE R.P.M. AND POWER TO NORMAL. IF ERRATIC OPERATION CANNOT BE CONTROLLED - FEATHER AS PER 5.1.3.

5.1.8. UNFEATHERING - IN FLIGHT

"B"

BEFORE UNFEATHERING F.W.S.O.V. OPEN THEN SELECT FEATHERED ENGINE AND TURN ENGINE OVER, THROUGH 11 BLADES WITH ENGINE STARTER, CHECKING FOR ANY INDICATION OF HYDRAULICING.

1. IGNITION.....ON
2. THROTTLE.....CLOSED
3. PITCH.....COARSE
4. PRESS AND HOLD FEATHER BUTTON IN UNTIL 800 RPM INDICATED THEN RELEASE
5. MIXTURE.....AUTO RICH
6. FUEL & OIL PRESSURE.....CHECK F/ENG.
7. GENERATOR.....ON
8. SLOWLY INCREASE POWER TO WARM UP AT 1800 RPM AND 18" HG. UNTIL MINIMUM HEAD & OIL TEMPERATURES ADVISED BY FLIGHT ENGINEER.

5.1. ENGINE FAILURE (cont'd)

5.1.9. UNFEATHERING - ON THE WATER

BEFORE UNFEATHERING F.W.S.O.V. OPEN, CUT IN GEN. ON OPERATING ENGINES SELECT FEATHERED ENGINE AND TURN ENGINE OVER, THROUGH 11 BLADES WITH ENGINE STARTER, CHECKING FOR ANY INDICATION OF HYDRAULICING.

1. IGNITION.....ON
2. THROTTLE.....SET(AS FOR NORMAL START)
3. PITCH.....COARSE
4. UNFEATHER BY HOLDING FEATHER BUTTON IN, UNTIL BLADE ANGLE CHANGES.
5. CARRY OUT NORMAL START - CHECK F/ENG.
6. PITCH.....FINE
7. GENERATOR.....ON
8. WARM UP IN NORMAL MANNER

5.2. ASYMMETRIC CIRCUITS & LANDINGS:

5.2.1. THREE ENGINE - Circuit and Landing:

The normal circuit is such that it can be comfortably flown on three engines and if a pilot is in the habit of flying it correctly he should not vary his technique for three engine flying. The only variation that need be made, is that the power setting for three engines will be naturally higher than for an approach with four engines. However it is essential to consider the following points when planning the circuit and approach pattern.

1. Except in an emergency, direct approaches on three engines particularly at night, should be avoided as it is better to intercept and fly a partial circuit rather than risk the errors of judgement commonly experienced even on normal direct approaches.
2. The final turn should be completed at a minimum altitude of 500'.
3. The correct approach is made with 2/3 flap and at an airspeed not less than the safety speed of 105 Kts.
4. The approach is maintained down to the committal point of approx. 300' from where the aircraft can confortably make the water, speed reducing to 90kts. approaching the threshold.

5.2. ASYMMETRIC CIRCUITS & LANDINGS: (cont'd)

5.2.1. Three Engine - Circuits & Landings (cont'd)

5. Carry out normal landing.

5.2.2. BAULKED LANDING - FOUR AND THREE ENGINES:

PHASE 1	(a) BEFORE TOUCHDOWN: 1. POWER.....METO 2. FLAPS.....TO 1/3 3. CLIMB SPEED ..(INCREASING TO 110 Kts) 4. PROCEED AS FOR NORMAL CLIMB.
PHASE 1	(b) AFTER TOUCHDOWN: 1. POWER.....T/O 2. FLAPS.....1/3 AND CARRY OUT NORMAL TAKE-OFF PROCEDURE

NOTE: A committal point of 300 feet is nominated as the minimum safe height from which a three engine overshoot can be carried out. This allows a safe margin if control difficulties are experienced during gusty conditions.

5.3. FIRE CONTROL

5.3.1. General:

The action taken in the event of fire will depend on the location of the fire and the configuration of the aircraft (whether stationary, taxying or airborne) but one thing is certain - the prompt implementation of the correct remedial action is essential to successfully combat an aircraft fire.

In the case of a fire in any of the components carried in the fuselage, care should be taken in selecting the appropriate extinguisher. Where visible evidence of an engine fire exists or the fire detector alarms, the fire drill should be implemented immediately.

Regard all fire alarms as genuine and follow the appropriate procedure without delay.

5.3. FIRE CONTROL (cont'd)

5.3.2. FIRE ON START UP (IN PONTOON)

"A"

PHASE 1	1.	MIXTURE.....IDLE CUT OFF
	2.	STOP PRIMING.....CHECK F/ENG.
	3.	THROTTLE.....AS FOR STARTING
	4.	KEEP ENGINE TURNING ON STARTER...ADVISE F/O
	5.	ATTEMPT TO START
PHASE 2	6.	IF FIRE CONTINUES.....STOP CRANKING
	7.	PORTABLE CO_2 .....DESPATCH F/ENG TO ASCERTAIN IF FIRE IS OUT
	8.	F.W.S.O.V.....SHUT
	9.	EXTINGUISHANT.....AIRCRAFT AND/OR CO_2
	10.	IGNITION.....OFF
	11.	WARN STEWARD TO PREPARE FOR EVACUATION
	12.	FIRE FLOAT.....CALL FOR ASSISTANCE

IF EVACUATION IS NECESSARY CLOSE DOWN OPERATING ENGINES AND EVACUATE PASSENGERS FROM PORT FOREHEAD HATCH OR STARBOARD AFT HATCH.

5.3.3. ENGINE FIRE AT/AWAY FROM MOORING

"A"

PHASE 1	MIXTURE.....IDLE CUT OFF
	F.W.S.O.V. (BURNING ENGINE)...SHUT
	EXTINGUISHANT (BURNING ENGINE)..SHOT 1 and SHOT 2 IF NECESSARY
	FIRE FLOAT.....CALL ASSISTANCE
	PORTABLE CO_2.....DESPATCH F/ENG ASCERTAIN IF FIRE IS OUT.
PHASE 2	WARN STEWARD TO PREPARE FOR EVACUATION CLOSE DOWN. OPERATING ENGINES IF LAUNCHES AVAILABLE IF NECESSARY, ORDER EVACUATION OF PASSENGERS. CONSIDER USING ANCHOR TO SECURE AIRCRAFT BEFORE ABANDONMENT.

5.3. FIRE CONTROL (cont'd)

5.3.4. "A" ENGINE FIRE - IN FLIGHT

PHASE 1	COMMENCE REDUCING SPEED TO 105 KTS. IDENTIFY.....ENGINE AFIRE THROTTLE.....CLOSED FEATHER.....BUTTON IN MIXTURE.....IDLE CUT OFF FEATHER ACTION.....PROP.STOPPED BUTTON OUT. F.W.S.O.V.....SHUT EXTINGUISHANT.....SHOT 1 THEN SHOT 2
PH 2.	AS FOR ENGINE FAILURE IN FLIGHT-5.1.3. NOTE: DO NOT ATTEMPT TO RE START ENGINE.

5.3.5. ELECTRICAL FIRE

PHASE 1	GENERATORS.....OFF F/ENG BATTERY MASTER.....OFF F/ENG ALL WINDOWS.....CLOSED HAVE TORCHES READY AT NIGHT PORTABLE CO_2.....PLAY ON SEAT OF FIRE.
PHASE 2	SMOKE EVACUATION.....IF NECESSARY WARN STEWARD.....ALARM (IF REQUIRED) ALL ELECTRICAL UNITS.....OFF IF SOURCE OF FIRE FOUND - BATTERY MASTER.....ON F/ENG. GENERATORS.....ON F/ENG ESSENTIAL SERVICES.....RESTORE IF SOURCE OF FIRE NOT LOCATED - LAND AT NEAREST WATER AIRPORT.

5.3. FIRE CONTROL (cont'd)

5.3.6. CABIN, COCKPIT OR LOCKER FIRES:

P H. 1	ALL WINDOWS.....CLOSED PORTABLE EXTINGUISHERS....AS REQUIRED (CO2 OR WATER GLYCOL)
P H. 2	SMOKE EVACUATION.....IF NECESSARY WARN STEWARD.....FASTEN SEAT BELTS & NO SMOKING

NOTES:

For kapok fires water is the most effective extinguishing agent.

CO2 extinguisher is used for surface fires, or fires involving inflammable liquids or electrical equipment.

5.3.7. SMOKE EVACUATION:

One member of the crew should be prepared to use oxygen to avoid the effects of fumes, after the fire has been extinguished and during the removal of smoke and fumes from the aircraft interior.

1. FLIGHT DECK HATCHES.....OPEN
2. BOTH TOILET DOORS.....OPEN
3. COCKPIT SIDE WINDOWS(F/O'S).OPEN
4. DORSAL HATCH.....OPEN
5. UNTIL ALL SMOKE AND FUMES ARE DRAWN OUT OF THE A/C.

5.4. EMERENCY LANDING, FORCED LANDING/DITCHING

General:
The emergency landing and forced landing/ditching procedures have been combined in one check list, as they are similar in many respects. In the emergency landing it is considered that the aircraft should be prepared for rapid evacuation just as for forced landing/ditching, but it is not necessary to have

5.4. EMERGENCY LANDING, FORCED LANDING/DITCHING: (CONT'D)

General: (cont'd)

passengers remove, or loosen clothing or adopt the ditching position. To highlight the purely forced landing/ditching items, a boxed enclosure has been placed around these items in the check lists. Individual crew duties have been allotted to provide the most efficient means of coping with these emergencies.

Following the individual crew duties the emergency pre-land check is carried out to ensure that each crew member has completed his allotted duties. It is expected that complete crew drills will be carried out, but if insufficient time is available, completion of the Emergency Pre-land check will cover the vital actions necessary prior to landing.

Summary of Emergency Conditions:

These procedures can be categorised as follows -

CONDITION 1:
These situations where malfunction or damage is not positive, but the pilot can be reasonably assured of a safe landing such as minor damage to the hull or a float.

Procedure:
Other than complying with the laid down technique, normal procedures will apply.

Alert Ground Control and crew only.

CONDITION 2:
When landing on a recognised water airport with a known malfunction, where aircraft damage to some degree will result. This is known as an emergency landing.

Procedure:

a. Normal Pre-land check.
b. Perusal of the listed applicable emergency landing technique.
c. Crew to carry out emergency landing and forced landing/ditching technique.
d. Emergency Pre-land check
e. Evacuation procedure.

CONDITION 3:
Ditching or Forced Landing on an uprepared area away from an Airport.

Procedure:

a. Crew to carry out Emergency Landing and Forced Landing /Ditching check.

5.4. EMERGENCY LANDING, FORCED LANDING/DITCHING (CONT'D)

General (cont'd)

Condition 3: (cont'd)

Procedure: (cont'd)

b. Emergency pre-land check
c. Evacuation procedure
d. Ditching Drill.

5.4. EMERGENCY AND FORCED LANDING/DITCHING PROCEDURES

THE FOLLOWING INDIVIDUAL CREW DRILL SHEETS ARE A COPY OF THOSE CARRIED IN THE AIRCRAFT. IF REQUIRED IN AN EMERGENCY, THEY MAY BE REMOVED FROM THE MANUAL.

5.4. EMERGENCY LANDING AND FORCED LANDING DITCHING PROCEDURES (CONT'D)

5.4.1. "A" EMERGENCY DESCENTS

In the event that an emergency arises which for safety reasons necessitates a rapid rate of descent at reduced forward speed, e.g. an uncontrollable aircraft or engine fire, complete the following items:-

PHASE 1	1.	THROTTLES.....CLOSED
	2.	REDUCE SPEED TO.....110 KTS
	3.	FULL FLAP.....DOWN
	4.	CONTINUE DESCENT AT MAX. OF 110 KTS.

IF THE DESCENT IS DICTATED BY REASON OTHER THAN FOR REACHING THE SURFACE FOR AN EMERGENCY LANDING IN THE SHORTEST POSSIBLE TIME, IT IS DESIRABLE TO COMPLETE THE DESCENT WITH MINIMUM PLACARDED POWER.

5.4.2. CAPTAIN'S DUTIES:

1. Seat Belt and No Smoking Sign.....On
2. Ground Station:-
   Advise F/O to transmit, emergency signals giving details of position, and Captain's intended action.
3. Steward - Summon by alarm bell or P/A
4. Brief Crew
   (a) Approximate flight time available.
   (b) Intended plan of action.
   (c) Cabin precautions (no naked lights etc.)
   (d) Jettison Cargo
   (e) Positioning of Dinghies.
   (f) Warning signal for "Brace for Impact" (30-60 seconds notice).
5. Advise Passengers - This is Captain..... may I have your very close attention. We are experiencing..... which may make it necessary to land. The Steward and Hostess will instruct you in the necessary precautions. It is essential you remain very calm and do exactly as instructed. We will advise you of any further developments.

5.4. EMERGENCY LANDING AND FORCED LANDING DITCHING PROCEDURES (CONT'D)

5.4.2.

6. Torch — Ensure available

FORCED LANDING/DITCHING

7. Loosen Collar, Tie, Shoe Laces, remove sharp objects etc. from pockets.

8. Fit Life Jackets....Do not inflate

9. Consider technique (a) VFR 2,000 ft. carry out sea evaluation establish ditch heading.

(b) IFR Descend at 200 f.p.m. contact water at minimum A.S.I.

10. Normal pre-landing check

11. Emergency Pre-landing check

FORCED LANDING/DITCHING

12. Signal to brace - 30-60 seconds before impact

13. After landing - Impact Drill

14. Carry out Emergency evacuation procedures

5.4.3. EMERGENCY PRE-LAND CHECK - FLIGHT CREW

Altimeters.....Check

Belt & Smoking.....ON

Excess Fuel.....Burn off when practicable

Cockpit Equipment.....Secure F/Eng

Cockpit Hatches.....Open F/Eng

Life Jacket.....ON - DO NOT INFLATE

IMMEDIATELY BEFORE IMPACT

Mixtures.....I.C.O.

Fuel.....Off F/Eng

Battery Master.....Off F/Eng

F.W.S.O.V.....Pull

5.4. EMERGENCY LANDING & FORCED LANDING/DITCHING PROCEDURES (CONT'D)

5.4.3. (cont'd)

IF ENGINE FIRE ON LANDING -

Battery Master..... On Flight Engineer

Use Extinguishers.

EVACUATION PROCEDURE:

Captain:-

1. If aircraft appears undamaged and seaworthy instruct Flight Engineer to inspect bilges, and to start APU to conserve batteries.
2. If aircraft is to be abandoned supervise and assist in the launching and loading of dinghies, ensure ration pack and dinghy radio placed on board.
3. Assist passengers through exists warning them not to inflate life jackets until OUTSIDE the aircraft.
4. After evacuation instruct passengers to move well away from the aircraft.
5. Ensure all passengers and crew have abandoned the aircraft.
6. Collect torches.
7. When opportune salvage first aid kits, food, liquid, rugs etc.
8. Take command of No.1 dinghy, tie dinghies together to prevent dispersal and call roll.

NOTE: Prior to launching dinghies, it is essential that the safety line be attached to the aircraft and not detached until the last person has been evacuated.

5.4.4. FIRST OFFICER'S DUTIES

When Emergency decided -

On Captain's Instructions:

1. Transmit distress message on air-ground frequency in use, giving position, time, true heading, IAS, flight level, nature of emergency, intentions, time fuel will be expended and estimated time of landing or ditching.

5.4. EMERGENCY LANDING AND FORCED LANDING DITCHING PROCEDURES (CONT'D)

5.4.4. cont.

2. Torches.....Ensure available

3. Stow loose cockpit equipment

4. Flight deck hatches - open

5. Check on cabin preparations.
Remove emergency exits nominated by Captain
Return in time to carry out emergency pre-land check.

FORCED LANDING/DITCHING

6. Loosen collar, tie and shoe laces, remove sharp objects etc. from pockets. Fit life jacket - DO NOT INFLATE.

7. Regain radio contact, if HF/DF available, tune radio and clamp down key.

8. Emergency pre-land check.....Complete

9. Call height and speed each 100 feet from 1000' - IFR

10. Aid Captain with controls on touchdown

11. Impact drill.....Complete

12. Torch, portable fire bottle - retain

13. Carry out emergency evacuation procedure

EVACUATION PROCEDURE:

First Officer

1. Prepare to take CO2 portable extinguisher through astro hatch to deal with any sign of fire and to assist with evacuation.

2. Supervise and assist in the launching and loading of No. 2 dinghy ensuring ration pack and radio placed aboard.

3. Place charts, sextant and ships papers aboard

5.4. EMERGENCY LANDING AND FORCED LANDING DITCHING PROCEDURES (CONT'D)

5.4.4. cont.

4. Supervise evacuation of passengers and crew

5. Take command of No. 2 dinghy making contact with No. 1 dinghy.

NOTE: AVOID PANIC
CREW MEMBERS TO WEAR UNIFORM CAPS IN ORDER THAT PASSENGERS MAY READILY RECOGNISE THEM.

5.4.5. FLIGHT ENGINEER'S DUTIES

When emergency decided -

On Captain's Instructions -

1. Advise fuel remaining and endurance

2. Torch,.....Ensure available

3. Stow loose flight deck equipment, tool kit, etc.

4. Assist to jettison cargo

FORCED LANDING/DITCHING

5. Loosen collar, tie, and shoe laces, remove sharp objects etc. from pockets.

6. Fit life jacket - DO NOT INFLATE

7. Ensure No. 1 Dinghy, radio and ration pack is ready for launching.

8. Collect verey pistol and cartridges for transfer to dinghy.

9. Remove astro hatch

10. Emergency pre-land check.....Complete

11. Impact Drill.....Complete

12. Torch, portable fire bottle.....Retain

13. Carry out emergency evacuation procedure