

CHECK FLIGHT CERTIFICATE



Sikorsky S76A++ S/N 760364
Turbomeca Arriel 1S1 Engines

CFS 310 issue 1

Registration:

Date:	Crew:	Observer:
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Performance	Climb #1	Climb #2	
Average Weight			
Average Altitude			ft
Average Temp.			°C
Speed			KIAS
Achieved Rate			fpm
Scheduled Rate			fpm
Margin			fpm
Permitted Margin	-20	-20	fpm

Airfield:
Start Weight Kg/Lbs*:
Takeoff cg:
Performance: SATIS/UNSATIS/NOT APPLICABLE* <i>(delete as applicable)*</i>

Defects

No.	Defect	-/R/FT	Action?

(use a continuation sheet as necessary)

Conclusions/Comments

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I CERTIFY that I have tested the above aircraft and have detailed the deficiencies and unsatisfactory features above. Those items annotated R or FT must be dealt with as shown in the notes on the reverse side.

Name:	Signed:	Date:	Licence No.:
For CAA Use only	Report Logged by:	Date:	Report No.:

NOTES

General

Only CAA personnel or pilots specifically briefed to carry out CAA Check Flights may conduct the test.

General notes on test conduct can be found in the CAA Check Flight Handbook.

Registration: If the aircraft is not on the UK register, add the manufacturers serial number and expected UK registration (if known).

Crew: Captain, co-pilot, Flight engineer (where applicable).

Airfield: Departure airfield.

Start Weight: Actual all up weight at first engine start. Also delete Kg or Lbs as appropriate.

Takeoff cg: Actual cg at lift-off, preferably as a % of the Mean Aerodynamic Chord.

Performance

A full description of climb analysis is given in the CAA Check Flight Handbook.

Climb#1/Climb#2: Enter in these columns data from the first and second climbs.

Average Weight: The aircraft all up weight at the midpoint of the measured climb.

Average Altitude: The altitude at which the line drawn to average the measured points passes through at the mid time.

Average Temp: The temperature at which the line drawn to average the measured points passes through at the mid time.

Speed: The target climb speed (Indicated Airspeed.)

Achieved Rate: The climb rate as given by the slope of the line drawn to average the measured altitude points in feet per minute.

Scheduled Rate: The expected gross rate of climb read from the appropriate graph in the Flight Manual with any adjustments for configuration differences. For large aircraft, the basic gross data are normally to be found in a separate supplement labelled 'Additional Flight Test Data'.

Margin: The difference between the Scheduled and Achieved rates of climb (negative if achieved is lower than scheduled).

Defects

Enter all defects from the flight. All defects must also be entered in the Technical Log. Procedural items entered in the Technical Log (such as re-stowing oxygen masks) need not be entered here. Items affecting flight safety which were known before the flight, whether or not they were deferred should be entered. In the latter case, the defect should be annotated accordingly after the details.

No.: The first column is to allow the items to be numbered.

Defect: Enter details of the defect.

-R/FT: Classify each defect according to its impact on safety, regardless of whether it can be deferred according to the MEL. Any deferrals should be dealt with in the normal way in the Technical Log. Items requiring rectification (or deferral under the MEL) before further flight for hire or reward or before the issue of the CofA should be marked 'R'. Additionally, items that require re-checking in-flight following rectification (such as inadequate climb performance) should be marked 'FT'. Items requiring both should be marked 'R/FT'.

Action?: This column should be left blank unless further information is required from the engineers or the item is considered to be of sufficient import that CAA action is considered necessary, then the person/department/agency from whom further action is required should be noted in this column. Annotate accordingly if an MOR or similar report is to be raised.

Conclusions/Comments

Any conclusions, notes or comments useful for tracking defects may be entered.

Name: Only the pilot who carried out the test may sign this sheet.

CAA Check Flight Schedules

All CAA Check Flight Schedules (CFSs) are prepared based on a design standard which, before September 2003, was the UK Type Certificate. Following the creation of EASA there may be different design standards in service within the European Union (EU) - this may include modifications approved in any EU country.

It is the responsibility of the flight crew to ensure that the exercises and limitations in the CFS are correct for the aircraft under test.

The prime source of information will be the aircraft flight manual and in the event of conflict the flight manual should be taken as overriding.

CAA policy is that pilots who conduct airtests on the behalf of the Authority must be acceptable to the Authority, must have been briefed on techniques and safety considerations before carrying out the tests in these schedules and must have carried out an airtest within the last 4 years.

The CAA does not accept responsibility for the use of a CAA CFS on a test flight not directly under their control.

CHECK FLIGHT SCHEDULE



Sikorsky S76A++ S/N 760364

CFS 310 Issue 1

Turbomeca Arriel 1S1 Engines

Registration

Test Date

1. INTRODUCTION

This schedule is applicable only to Sikorsky S76A++ Helicopter **S/N 760364** with Turbomeca Arriel 1S1 engines. It is based on the assumption that the every day operation of the helicopter serves as a continuous check on the functioning of all normal services.

The Flight Test must be carried out by an experienced pilot acceptable to the Airworthiness Division of the CAA in accordance with this schedule and the general guidance given in the CAA Check Flight Handbook. The crew are expected generally to monitor the behaviour of all equipment and report any unserviceable items. In addition to completing all the tests in this schedule any characteristics which are considered to be unsafe or undesirable must be recorded.

The minimum crew for this flight is to be increased by a flight observer.

WARNING

1. Although it may be legal to carry passengers on a test flight with a Certification of Airworthiness in force it is strongly recommended, for Check Flights and other tests entailing greater risk than normal flight, that:
 - 1) It is preferable to use ballast, and
 - 2) Before accepting any passengers on a test flight the pilot in command should inform them that the risk is greater than on an ordinary flight.
2. Under no circumstances are the limitations contained in the CAA approved Flight Manual to be exceeded.
3. If a clipboard or kneeboard is used to record the results there is a possibility of fouling the controls especially the duals, if fitted. To reduce this possibility, the pilot must have briefed the observer on the need to ensure that the clipboard is well clear of the controls especially during manoeuvres requiring large control deflections such as low speed envelope and autorotation. The pilot should monitor the position of the clipboard during the flight to ensure that it is not in a potentially hazardous position. Whenever possible, flexible, rather than rigid, clipboards should be used.

Should there be any query about the Flight Test or its results, the local CAA Surveyor or the Helicopter Flight Test Section at Airworthiness Division, Flight Department, Aviation House, Gatwick must be consulted.

It is permissible for this Schedule to be completed on separate flights and dates provided the loading for each flight is clearly stated. All defects from all flights must be recorded on the Check Flight Certificate even if rectification work has been carried out between flights.

It is recommended that the tests are made in the sequence given. The results are to be written in ink in the spaces provided.

Operator/Maintenance Organisation		Registration	
Aerodrome		Flight Dates	
	Pilot		
	Co-pilot		
	Observer		
Weather			
Aerodrome altitude		QFE/QNH	
Wind velocity/direction		Ground Temp	
Take-off time(s)		Landing Time(s)	

2. LOADING

The aircraft is to be loaded to a weight limit of 10800 lbs or to the highest AUW as is practicable. A lower weight to comply with the Operator's company policy is also permitted. The CG should be approximately in the neutral position.

NOTE: In general, tests should be carried out at a high AUW, however the autorotation RPM check has to be carried out at a low weight. It is permissible to carry out the autorotation RPM check (para. 18) on a separate flight/date and without an observer if desired.

Take-off weight (actual)	
Fuel contents	
C.G. position	

3. PRE-FLIGHT INFORMATION

Aircraft Serial No.	
Total airframe hours	
EAPS fitted?	

	No.1	No.2
Engine Serial No.		
Hours run since new		
Hours run since overhaul		

4. **PRE-FLIGHT CHECKS**

- 4.1 Carry out the normal external inspection (check pitot and static heat, see 4.3 below)
Doors and transparencies: Condition and Operation

Seats and harnesses

Placarding: Legibility and accuracy

Instruments: Legibility and accuracy of colour bands and markings.
General condition.

Check altimeters within ±50 ft for the same pressure setting.

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Adjust pedals to full aft position. Alternatively press pedals rapidly to determine if adjusters slip on either side.

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CWP and warning lights: all bulbs working, markings clearly visible.

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4.2 External Power/DC Primary Busses

- a) With battery switch(es)-ON, external DC power connected and - OFF, check that the BUS TIE OPEN caution light is - ON.
- b) Place the EXT POWER switch-ON. The BUS TIE OPEN caution light should go off and the BATT OFF caution light should go on.

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4.3 Pitot heat:-

- a) With the battery switch ON and external DC power on, pull the PLT PITOT HTR PWR and CPLT PITOT HTR PWR circuit breakers.
Turn the pilot and co-pilot heat switches ON.
PITOT HEAT caution light should be ON.
- b) Reset the circuit breakers. PITOT HEAT caution lights should go out. Check the pitot tubes. They should be warm. Also check heated static vents. WARNING: The pitot tubes may get very hot.
- c) Turn pilot and co-pilot pitot heat OFF.

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4.4 Engine Failure Warning System

a) #1 and #2 ENG OUT warning lights - ON.

b) Engine out ground test switch (side of console) - hold at TEST. Alternating tone will be heard. To reset tone, press #1 then #2 ENG OUT light on pilot's side. Warning lights will remain on. (If capsules have been previously pressed, no tone will be heard). If tone resets when only one capsule has been pressed this indicates a fault.

c) Cycle battery and external power off and on to reset engine failure warning system

d) Repeat check using #2 then #1 ENG OUT light on pilot's side to reset tone.

PILOT

#1/#2	#2/#1

CO-PILOT

#1/#2	#2/#1

e) Repeat on co-pilot's side.

4.5 Fire Extinguisher System

a) EXT-FIRE switch - OPEN. Red WARN light - ON.

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b) Pull both T-handles back 1 inch.

c) FIRE EXT switch - MAIN, then RESERVE. Check that green TEST light goes - ON in each position. Release switch.

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d) EXT-FIRE switch - SHORT. Red WARN light and green TEST light - ON.

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e) FIRE EXT switch - MAIN, then RESERVE. Check that green TEST light stays - ON in each position.

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f) Both T-handles - Full Forward.

g) EXT-FIRE switch - NORM

h) Check red WARN light and green TEST light - OFF

4.6 Fire Detector System

EXT power ON

- a) Fire detector test switch - FWD. FIRE warning lights and T-handle lights should light and continuous tone should be heard.
For aircraft fitted with multi warning AVAD system a chime and "Fire Engine 1", "Fire Engine 2" audio warnings will be heard. Note that the second capsule should not be pressed before the full warning is heard.

- b) Press #1 then #2 FIRE warning light capsules to reset tone. If tone resets when only one capsule has been pressed this indicates a fault.

#1/#2

- c) Repeat a) to b) with fire detector test switch - AFT/BAG, resetting as required. Press capsules in order shown.

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#2/#1

- d) Repeat on co-pilot's side.

- i) FWD

#1/#2

- ii) AFT/BAG

#2/#1

4.7 Flotation System Test

Perform if not carried out on a regular basis operationally.

Before carrying out the Flight Manual check the serviceability of the test switch must be determined as follows:

- a) With external power connected, pull out all 6 float circuit breakers, 2 float control and 4 float power, put test switch to 'TEST' position. No lights should indicate.
- b) Reset and pull each POWER CB in turn, as each one is reset, the float test red light should illuminate. If any float POWER CB fails to illuminate the red light, discontinue the testing and investigate.
- c) If each float POWER CB correctly lights the red test light in turn, when reset, with the others pulled, then the test switch is serviceable.
- d) Reset CB's. (Leave switch in 'TEST' position)

Carry out Flight Manual checks (Part 1, Section II).

Reset 'TEST' switch to NORM.

4.8 Fuel Levers:

- a) Move No.1 and No.2 fuel levers to OFF, DIR, PRIME, and XFEED. Check for binding, detents, and alignment with markings.

4.9 Engine Levers/T-Handles

- a) With trigger pulled, move the No.1 and then the No.2 engine levers through their entire range, including travel forward of position marked FLY. With triggers functioning, check for positive stops at Idle and Fly. There should be no evidence of binding.

EXT-FIRE switch – OPEN

- b) Place the engine levers in the FLY position and fuel levers in CROSSFEED. Pull each fire T-handle fully back. There should be no evidence of binding and all levers must reach their OFF position. Reset the T-handles.
EXT-FIRE switch - NORM, lights OFF

4.10 Rotor Brake

- a) Apply the rotor brake. Check rotor brake pressure from 200 to 300 psi and the ROTOR BRAKE caution light on. Also check the pressure relief valve by attempting to pump the pressure above 300 psi. Release the rotor brake. Check rotor brake pressure at zero and the ROTOR BRAKE caution light off.

4.11 Engine Starters/Igniters

a) Set the following initial conditions:

- No.1 and No.2 Engine Levers - OFF
- No.1 and No.2 Fuel Levers - OFF
- Rotor Brake - ON
- Master Start - OFF

b) Depress the No.1 Engine Starter button and move the engine lever slowly forward. Ignition should be heard when one-half inch beyond SHUTOFF. The No.1 engine starter should not engage. Repeat the check for the No.2 engine

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c) Turn the MASTER START switch ON. Move the No.1 and No.2 engine levers one inch forward. Depress and release the No.1 engine starter button. The starter should not engage. Repeat with the No.2 engine

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d) Move both engine levers to the SHUTOFF position. Depress and release the starter buttons. The starters should engage.

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NOTE: It may be necessary to open the DV window to hear the igniters.

Re-configure engine and fuel levers.

Satisfactory completion of pre-start checks.

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5. **ENGINE START/ROTOR ENGAGEMENT**

Carry out rotor brake on starts for both engines.

Satisfactory control of T5 during start

Eng. 1	Eng.2

ROTOR ENGAGEMENT

Hydraulic power (approx. 3000 psi) available before 10% N_R.

No.1	No.2

NOTE: Depending on the modification state of the undercarriage, No.2 system may not produce 3000 psi until 65% N_R.

Overspeed system advisory lights out by 25% N₂ and 45% N₁

No.1	No.2

Fuel totaliser set (if fitted)

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6. **POST START CHECKS**

6.1 Servo Interlock Check

At 70% N_R place pilot's SERVO switch to No.1 OFF, co-pilot's NO.2 OFF. #1 SERVO SYSTEM caution light should remain ON, no transfer should occur. Recenter co-pilot's switch, and place pilot's in NO.2 OFF. #2 SERVO SYSTEM caution light should go ON. Place co-pilot's SERVO switch to NO.1 OFF. No transfer should occur. Recenter co-pilot's switch.

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Repeat check with co-pilot's switch leading

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6.2 N_2 Beep Range:

a) At flat pitch with one engine in FLY and the other in IDLE, set the following N_2 values on each engine in turn in FLY.

	MIN	MAX
No.1		
No.2		

Min $100 \pm 0.5\%$ Max $108 \pm 1\%$

Acceleration time to maximum beep should be no more than 8 seconds.

b) With both engines in FLY:

Min $103 \pm 1\%$ Max $109 \pm 1\%$

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c) Check that the beepers:

are smooth both up and down from either pilot's or co-pilot's side,

--

have approximately equal beep rates for both engines, and

--

are wired so that the pilot has over-ride capability over the co-pilot.

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6.3 N_1 Tachometers:

Carry out test in accordance with Flight Manual Pre-Take-off check. Note indicated digital N_1 and placard value.

No.1	No.2
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Placard N_1

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6.4 Engine Acceleration/Surge Check

During the engine stall (surge) check, check for smooth acceleration and deceleration and no loud popping noises indicative of a compressor stall.

With No.1 N2 beeper at MAX beep and No.2 N2 beeper at MIN beep:

a) Retard No.1 engine lever to slightly split the N_2/N_R needles then re-advance until the needles are just re-joined. Note that No. 1 engine N1 must be at least 70% before proceeding to b)

b) Rapidly advance No.1 engine lever to FLY. Acceleration time to maximum torque should be no more than 4.5 seconds.

NOTE The limit is valid for altitudes below 3000 ft, at higher altitude this check should not be carried out.

c) Repeat the above check with the No. 2 engine.

CAUTION

T_5 , N_1 and torque must be closely monitored during this check to avoid exceedance of limits.

Note During the engine stall check, note any lateral oscillations which might be attributed to a faulty damper. There should be no excessive (4 "beats") inplane lateral oscillations.

c) Place both engine levers in the FLY position and match torques.

Satisfactory completion of pre-taxy checks.

7. TAXIING CHECKS

Taxy time

7.1 Satisfactory operation of parking brake.

7.2 During taxi, depress both pilots' brakes and insure that the aircraft comes to a smooth controlled stop with no indication of binding or swerving.

Repeat this check using the co-pilots' brakes.

Turns :

Perform a ground taxi turn to the right by depressing the right pedal. Increase to a tight turn. There should be no indications of binding in the pedals. (Do not depress the brakes during this check).

Repeat the check in a ground taxi turn to the left.

8. POWER ASSURANCE CHECK

Carry out power assurance checks IAW Flight Manual, Part 1, Section 2.

ENG	PRESS ALT	OAT	TARGET TORQUE	N1 OBS	T5	N _r	Fuel Flow	POWER MARGIN
1								
2								

(Margins also to be recorded in Post Flight. Action, Section 22)

EAPS	ON	OFF
ANTI-ICE	ON	OFF

9. **HOVER CHECKS**

9.1 Match torques at 30% torque at 107% N_R and establish a low hover. Record the following:-

Take-off time.

<i>ENG</i>	<i>TORQUE</i>	<i>N₁</i>	<i>N_R</i>	<i>PRESS ALT</i>	<i>OAT</i>
1					
2					

Maximum difference in torque between engines 5%.

9.2 While in a stable hover, turn off collective trim. Add left pedal, collective should not drop. Add right pedal, collective should not climb.

Reset collective trim ON.

10. **LOW SPEED ENVELOPE**

10.1 AFCS engaged. See Appendix 1 for test method. Assess the vibration level, control response and position (adequate control margin) during the following manoeuvres. The tests should be flown at the Flight Manual sideways/rearwards airspeed limits (35 knots up to 6900 ft) unless this would result in a groundspeed in excess of 20 kts.

Do not exceed 20 kt estimated groundspeed.

a) Turns on the spot.

b) Sideways flight left and right

c) Rearwards flight

10.2 Disengage AFCS and carry out gentle hover manoeuvres (it is not necessary to fly sideways/rearwards up to speeds flown in b) and c) above).

Re-engage AFCS, note smooth re-engagement.

10.3 Hover Augmentation Mode.

Check collective trim is ON.

Check correct operation of hover augmentation mode and radio altimeter hold.

Manoeuvre the helicopter using the 4-way cyclic switch.

11. SINGLE ENGINE CLIMB PERFORMANCE

Carry out a climb on each engine in turn for 4 minutes on a straight course. Climbs should be carried out in stable, non turbulent conditions away from cloud. Do not start to record until established in the climb on condition.

Associated Conditions

Altimeter - set to 1013 mb

Landing gear - retracted.

Speed - V_{BROC} (74 KIAS - 1 knot per 1000 ft PA)

All air bleeds - off

EAPS - off

AC GEN - off

Off line engine - zero torque, positive N_2 split, N_1 at or slightly above 70% in order to keep on-line engine N_1 gauge in AEO mode.

Engine power -

- Torque 104%

- N_1 100% (N_1 gauge in AEO mode)

- T_5 845°C

- N_R 100%

NOTE 1: Torque/engine parameters not to exceed values shown above during climb.

NOTE 2: The climb performance must be analysed and compared with the scheduled performance, see Section 21.1 of this Schedule.

NOTE 3: This climb is carried out at the maximum N_1 allowed for non-emergency operation. The Flight Manual limits for OEI operation apply for actual emergency use. The scheduled data in Appendix 3 is valid for climbs at 100% N_1 , if the torque limit of 104% is reached before 100% N_1 , then the climb will need to be carried out at higher altitude.

NOTE 4: The climbs should be carried out at an altitude/OAT combination where the N_1 "correction" is close to 1.0; i.e., in Fig. 1-9 of Flight Manual N_1 Tachometer Check Table values should be close to 102.7 *. For this the climbs will need to be carried out at about 1000 ft when OAT is high.

* Note that the set N_1 value will be 100% not 102.7%.

11.1 SINGLE ENGINE CLIMB PERFORMANCE

ENGINE No 1

Conditions

Torque 104%
 N₁ 100% (N1 Gauge in AEO mode)
 T₅ 845°C
 N_R 100%

Time	Alt	OAT	IAS	Torque	N ₁	T ₅	N _R	Engine Oil Temp Press	Fuel Flow	Fuel
0										
0.30										
1.00										
1.30										
2.00										
2.30										
3.00										
3.30										
4.00										

After the climb, obtain an accurate OAT by flying at approximately mid-climb altitude at V_{broc} in level flight for 1 min. to allow OAT to stabilise

Alt	
OAT	

11.2 SINGLE ENGINE CLIMB PERFORMANCE

ENGINE No 2

Conditions

Torque 104%
 N₁ 100% (N1 Gauge in AEO mode)
 T₅ 845°C
 N_R 100%

Time	Alt	OAT	IAS	Torque	N ₁	T ₅	N _R	Engine Oil Temp Press	Fuel Flow	Fuel
0										
0.30										
1.00										
1.30										
2.00										
2.30										
3.00										
3.30										
4.00										

After the climb, obtain an accurate OAT by flying at approximately mid-climb altitude at V_{broc} in level flight for 1 min. to allow OAT to stabilise

Alt	
OAT	

12. **ENGINE MAXIMUM CONTINGENCY N₁ CHECK & ENGINE OUT AUDIO TONE**

At 60 to 74 KIAS, landing gear down, N_R 107% check that maximum contingency N₁ (101.7%) can be achieved on each engine in turn. Altitude/OAT envelope "B" in Figure 1 (Note that this is for an Arriel 1S and a higher altitude will be required for a 1S1). Although the Maximum contingency torque limit is 127%, the torque should be minimised by carrying out the test at higher altitudes as the object of the test is to achieve the N₁ engine limit of 101.7%

Ensure operating conditions (weight, altitude and OAT) will permit flight on one engine without exceeding limits shown below.

Select heater ON. Slowly retard the engine lever on No.2 engine. Audio engine out tone should be heard at 65% N₁.

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Continue retarding No.2 engine to idle (approx. 50% N₁), increase collective to give approx 100% N₁ on No.1 engine, check auto shut down of heater occurs

--

Check decimal point on N₁ gauge of on-line engine is flashing at N₁ greater than 94%

No.1	No.2

Select heater OFF if auto shutdown had not occurred (record failure in box above).

Increase pitch above 100% N₁ until either a limiting engine/torque parameter is reached or the rotor droops to 100%. Note it is **not** required to exceed 101.7% N₁ for this test, i.e. N₁ topping value is not needed.

Associated conditions :

Do not exceed engine/torque limitations

IAS 60 to 74 KIAS

Torque 127%

N₁ 101.7% **NOTE 101.7% N₁ must be obtained without exceeding torque or T₅ limits - if necessary climb to higher altitude.**

T₅ 885°C

Airbleeds Off Anti-ice Off unless operationally required

Re-advance No.2 engine and repeat with No. 1 engine retarded.

Select heater ON. Engine out tone at 65% N₁. Auto heater shutdown.

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NOTE Time above 101.2% N₁, 128% T_q, 868°C exceeding 10 seconds must be recorded in the engine log book. If all the parameters cannot be recorded in this time give priority to N₁, torque, N_R and reduce collective before 10 seconds is exceeded.

Note the following (Give priority to recording the data in the double lined box):

ENG	PRESS ALT	OAT	N ₁	TORQUE	N _R	T ₅	FUEL FLOW	TIME ABOVE INTERCON
1								
2								

13. **HANDLING CHECKS**

13.1 Cruise

Ensure Landing Gear Up

13.1.1 At normal cruise power note the following in stabilised conditions:

	<i>PRESS ALT</i>	<i>IAS</i>	<i>OAT</i>	<i>ENGINE</i>	<i>N1</i>	<i>T5</i>	<i>TORQUE</i>
PILOT				1			
CO-PILOT				2			
STANDBY							

FUEL WEIGHT VIBRATION LEVEL

If the aircraft is fitted with the optional alternate static system check that the altimeter error at 120 KIAS is in accordance with the FM Supplement (window closed).

If vibration level is high, note frequency and axis.

Altimeters. Check for proper operation and agreement.
e.g. no excessive lag, smooth operation.

ASI's should agree to within ± 5 knots.

Check VSI's for correct operation.

13.1.2 At normal cruise power carry out turns left and right (30° AOB). Note control response and vibration level.

13.2 Maximum Speed **Ensure Landing Gear Up**

Determine Vne from placard before next test.

Without exceeding placarded VNE apply maximum continuous power and stabilise at maximum obtainable speed in level flight.

Vibration level.

If vibration level is high, note frequency and axis.

At V_{NE} carry out gentle turns (up to 20° AOB) left and right.

Note:-

Vibration level.

Control response.

13.3 Rapid Engine Acceleration

Match torques at 70% and note approximate collective position. With engine levers in FLY position in a stabilised descent at approximately 75 KIAS with approximately 5% torque set (do **not** re-match), increase collective to give about 70% torque in 2 to 3 seconds. Check there is no tendency for surge and satisfactory engine response.

Note 1

Care must be taken not to increase collective too quickly; carry out practice collective pulls at a slow rate first and progressively increase rate. Increase collective to the approximate position noted at 70% matched torques.

Note 2 : Do not reduce below N_R limit (91%).

Engine response/surge

Transient NR droop %

14 **AFCS CHECKS**

The following checks are for Sperry DAFCS equipped aircraft.

14.1 Trim out at approximately 135 kts. Record any bias in any one trim axis that makes it difficult to fly hands off.

14.2 At approximately 120 KIAS with both channels engaged check the aircraft returns to its original attitude, with a maximum of one slight overshoot, after the following disturbances:-

i) Pitch

a) Without re-trimming alter pitch attitude by 5° nose up in less than 2 seconds then release cyclic. (Note this is a 5° change of attitude not 5° nose up absolute).

b) Repeat nose down.

ii) Roll

a) Alter roll attitude by 10° left in less than 2 seconds then release cyclic.

b) Repeat 10° right.

iii) Yaw

Note satisfactory yaw channel functioning during i) and ii).

14.3 Repeat 14.2 with only one channel engaged.

i) Pitch Channel 1

a) 5° nose up.

b) 5° nose down

ii) Roll Channel 1

a) 10° left

b) 10° right

iii) Yaw Channel 1

Note satisfactory functioning.

i) Pitch Channel 2

a) 5° nose up.

b) 5° nose down

- ii) Roll Channel 2
 - a) 10° left
 - b) 10° right

- iii) Yaw Channel 2

Note satisfactory functioning.

Re-engage Channel 1.

- 14.4 During the flight test check that when making 30° bank turns without using the trim release or cyclic trimmer, the fly through capability is retained (control forces do not continue to increase during the manoeuvre).

- 14.5 ALTITUDE HOLD (2 CUE MODE)
- i) At a normal cruise speed check altitude is held ± 50 ft.

- ii) With heading hold also engaged gently reduce torque by about 20%. Check altitude is held within 100 ft of datum and then returning to datum ± 50 ft

- iii) a) From level flight at 120 KIAS, engage VS mode and select a rate of climb of 500 fpm. When rate of climb has stabilised, engage ALT mode and check altitude returns to the level at engagement after maximum of 100 ft overswing.

- b) Repeat with a 500 fpm rate of descent.

- 14.6 AIRSPEED HOLD (2 CUE)
- Disengage ALT and engage IAS.
- i) a) From trimmed level flight at 120 KIAS with fixed collective and heading hold, move cyclic aft against trim and establish approximately 100 KIAS. Release cyclic and check that the aircraft smoothly returns to the trimmed condition ± 5 kts.

- b) Repeat with forward cyclic to 140 KIAS (do not exceed V_{NE}).

14.7 HEADING HOLD (2 CUE)

- i) Check correct operation of heading hold during flight at normal cruise speed.

- ii) At 120 KIAS in level flight with feet off the pedals slowly increase and decrease collective to give a $\pm 20\%$ torque change, check heading maintained.

14.8 3 CUE MODE

At 130 KIAS engage IAS/VS/HDG modes and set a rate of descent of 500 ft/min. When stabilised engage ALT mode (AS/ALT/HDG), check altitude overshoot within 100 ft of datum and then returns to datum ± 50 ft.

Using the HSI bug alter heading by 90°. (IAS/ALT/HDG mode), check normal operation.

14.9 ALTITUDE PRESELECT (3 CUE)

- i) At 120 KIAS select an altitude approximately 1200 ft higher or lower than current altitude and ARM. Initiate the change of altitude using VS mode set to 1000 ft/min (provided torque/engine limits are not exceeded). Note operation of ALT PRE mode recording any overswing.

Altitude alert light illuminates (if installed) 1000 ft before selected altitude.

- ii) a) After stabilising at selected altitude increase collective to increase altitude. Alert light should illuminate at 250 ft deviation and tone should also be heard (if fitted).

- b) Repeat a) with 250 ft reduction in altitude.

14.10 4-WAY CYCLIC SWITCH

Deselect any flight director modes.

- i) At 120 KIAS check correct operation of fore/aft movement of cyclic switch in attitude mode (approximately 2°/second).

ii) Repeat with lateral movement:

a) Release switch below a roll angle of 6° from level - check aircraft returns to wings level.

b) Check that above 6° the roll attitude is maintained.

14.11 4-WAY COLLECTIVE SWITCH

Engage IAS/ALT/HDG, feet off pedals.

i) At cruise speed check ball centres with lateral movement.

14.12 SAS MODE

At a typical cruise speed check operation in SAS mode during straight flight and turns.

14.13 AFCS OUT

At 120 KIAS disengage the AFCS. Carry out turns, climbs and descents. Check smooth disengagement/re-engagement.

14.14 ILS (Optional Test)

Carry out a coupled ILS (3 cue) at 120 KIAS. Check correct operation of auto level and go-around mode.

14.15 GO-AROUND MODE

a) Align the heading bug with present heading.

b) Set up 120 KIAS, 700 fpm descent (IAS/VS mode).

c) Engage HDG mode.

d) Rotate heading bug left or right 90° to establish 20° to 25° bank angle.

e) Engage GA mode when bank angle is 20° to 25°.

f) Check GA disengages HDG, commands wings level (and then constant heading) at 75 KIAS or more at 700 to 750 fpm climb.

g) Re-engage HDG, rotate heading bug left or right 30° and check new heading is acquired.

15. **(Reserved)**

16. **FUNCTIONING**

16.1 Heating and Ventilation

Check that the heating can be satisfactorily controlled and that the ventilation is adequate.

16.2 Landing Gear

With gear up record speeds at which landing gear warning system operates by reducing speed then increasing speed. LDG GEAR UP caution light - ON. Warning tone should be heard in headset. Reset tone. System should trigger at 65 ± 7 knots.

Check functioning of rad alt gear up warning system

At 130 KIAS record

Extension time

Retraction time

Maximum time 15 seconds

17. **AUTOROTATION HANDLING**

See Paragraph 18 for measurement of rotor RPM in autorotation.

Carry out a gentle entry to autorotation at 75 kts.

Check handling/vibration levels in turns left and right to 30° AOB in autorotation.

18. **AUTOROTATION RPM**

18.1 After reducing weight to approximately 9000 lbs carry out a steady autorotative descent at 80 kts with the collective lever fully down and gear up. Record the following when stabilised.

NOTE : Do not exceed power off rpm limits (115).

<i>PRESS ALT</i>	<i>OAT</i>	<i>NR</i>	<i>FUEL</i>		<i>WEIGHT</i>

Satisfactory needle split. (It may be necessary to slightly retard the engine levers to achieve this).

--

19. **LANDING**

Time

--

19.1 Confirm no tendency to resonance during a smooth landing with a gentle collective lowering.

--

NOTE Should any divergent oscillations be noted, lift off immediately and carry out a normal landing, consider repositioning the helicopter.

19.2 Cabin Address System (If fitted)

Operate cabin address system and ensure it functions adequately for use in directing an emergency evacuation.

--

19.3 Emergency Load Shed

AC generator on line.

Switch off both DC generators and check that both DC GEN and BUS TIE lights illuminate. Switch from NORMAL to SHED (If aircraft fitted with load shed system) and check essential services maintained by battery.

--

19.4 Switch both DC generators back on.
Retard each engine in turn to idle stop.

ENG.1

ENG.2

N1 at ground idle 50% ± 2%

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T5 at ground idle

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19.5 Internal and External Lighting

Internal

Flight Instrument Lights

Secondary lights (glare shield)

Lower console lights

Standby compass and OAT lights

Cockpit floodlight

Wander light and cabin dome lights

External

Anti-collision lights

Position lights

Search light

Landing light

Strobe lights

19.6 Emergency Radio/Intercom Systems

Check the function of the auxiliary ICS system as follows:

Connect each headset in turn into the emergency socket and ensure correct operation through the other pilot's station box is possible.

--

20. **SHUTDOWN**

20.1 T-handle Checks

Complete Pre Shutdown Checks

- a) Check both DC generators ON, the Fire Extinguisher Test switch OPEN, and both engine levers at IDLE.
MASTER START ON Autopilot OFF

- b) **CAUTION**

If an internal engine fire occurs as indicated by a rapid increase in T_5 , immediately pull engine lever fully OFF and engage starter to minimise high T_5 and put out fire.

If a bay or baggage fire is indicated, the Extinguisher Test switch must be re-selected to NORM.

Pull the No.1 T-handle back one inch, observe the No. 1 DC GEN Caution Light goes ON, continue pulling the No.1 T-handle back fully to shutdown the No.1 engine. Shutdown should be immediate when T-handle is fully aft.

- c) Repeat check (b) for the No.2 T-handle.

- d) Apply rotor brake below 65% NR, check for smooth operation and normal characteristics.

Reset T-handles forward after shutdown.
Reset extinguisher test switch to NORM.

- e) With both engines shutdown have ground personnel inspect for leaks or other discrepancies.

Fuel quantity

Totaliser reading

The totaliser reading should agree to within 5% of the actual amount consumed.

21. **POST FLIGHT ACTION**

21.1 Performance Climb

Plot out the data on the analysis sheet (Appendix 2) and determine the achieved rate of climb for each engine. The scheduled performance must be obtained from Appendix 3 and compared with the achieved performance and recorded on the front sheet.

21.2 Autorotation RPM

Determine the scheduled rotor speed in autorotation (in the Flight Check Procedures Manual). and compare with the achieved value

Actual NR - Scheduled NR =

21.3 Engine Power Assurance

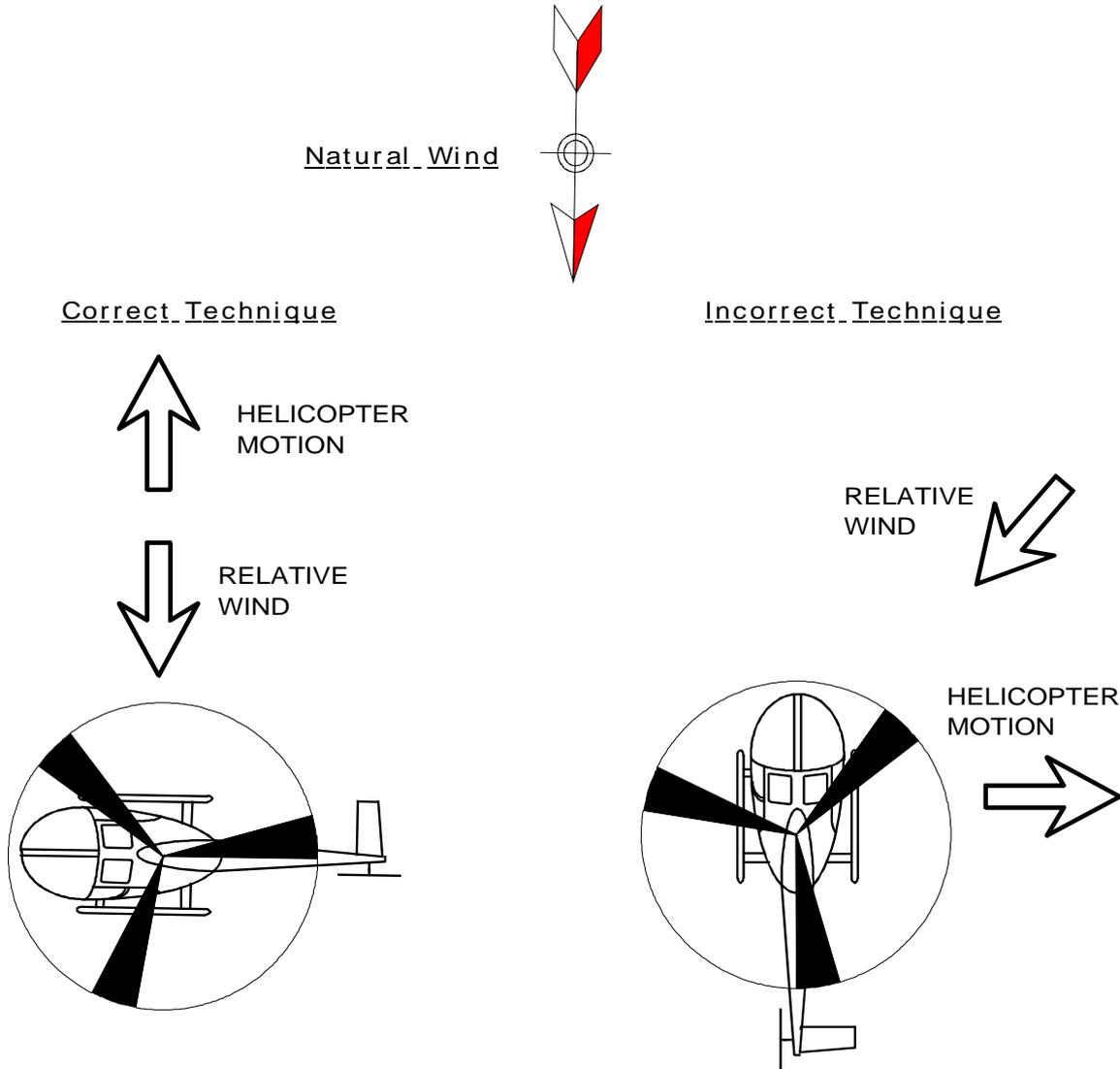
Determine power margin from Section 2 of the Flight Manual.

<i>ENGINE</i>	<i>POWER MARGIN</i>
1	
2	

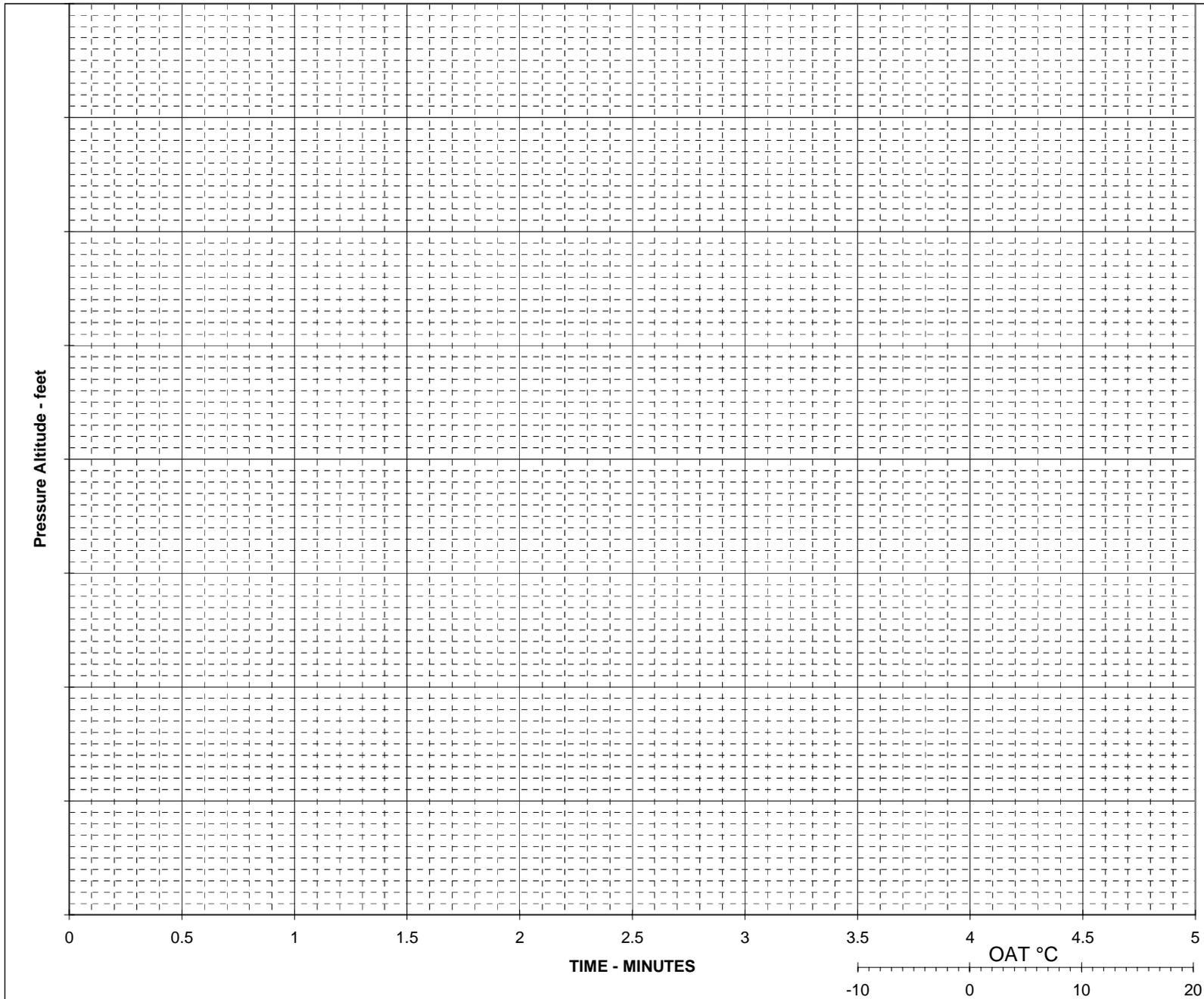
SIDEWAYS AND REARWARDS FLIGHT

For the sideways flight tests the helicopter should be rotated so that the natural wind is on the side of the aircraft and then gently accelerated into the wind and stabilised. The mean natural wind speed should be added to the estimated ground speed to give the required relative air speed.

For rearwards flight the helicopter should be lined up tail into wind and gently accelerated rearwards to achieve the required relative air speed.



Performance Climb Analysis Sheet



<u>AIRCRAFT TYPE</u>
<u>REGISTRATION</u>
<u>DATE OF TEST</u>

Mean Weight	
No 1 _____	Kg
No 2 _____	Kg

Mean Altitude	
No 1 _____	feet
No 2 _____	feet

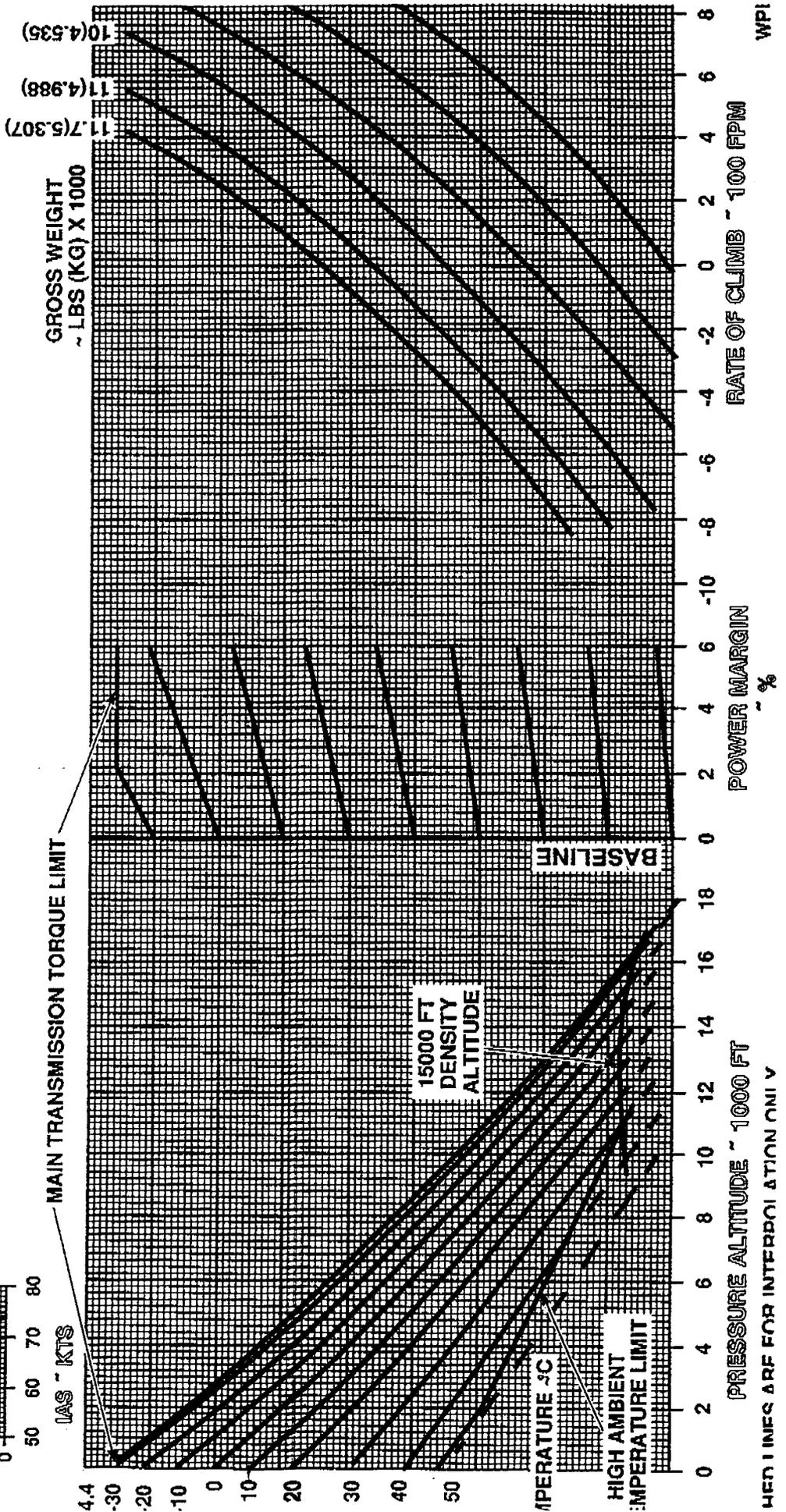
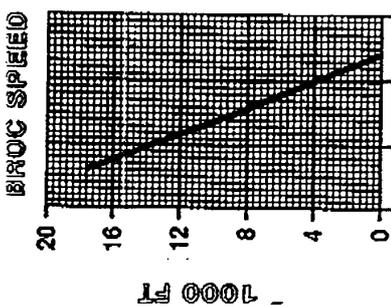
Mean OAT	
No 1 _____	°C
No 2 _____	°C

ACHIEVED ROC	
No 1 _____	ft/min
No 2 _____	ft/min

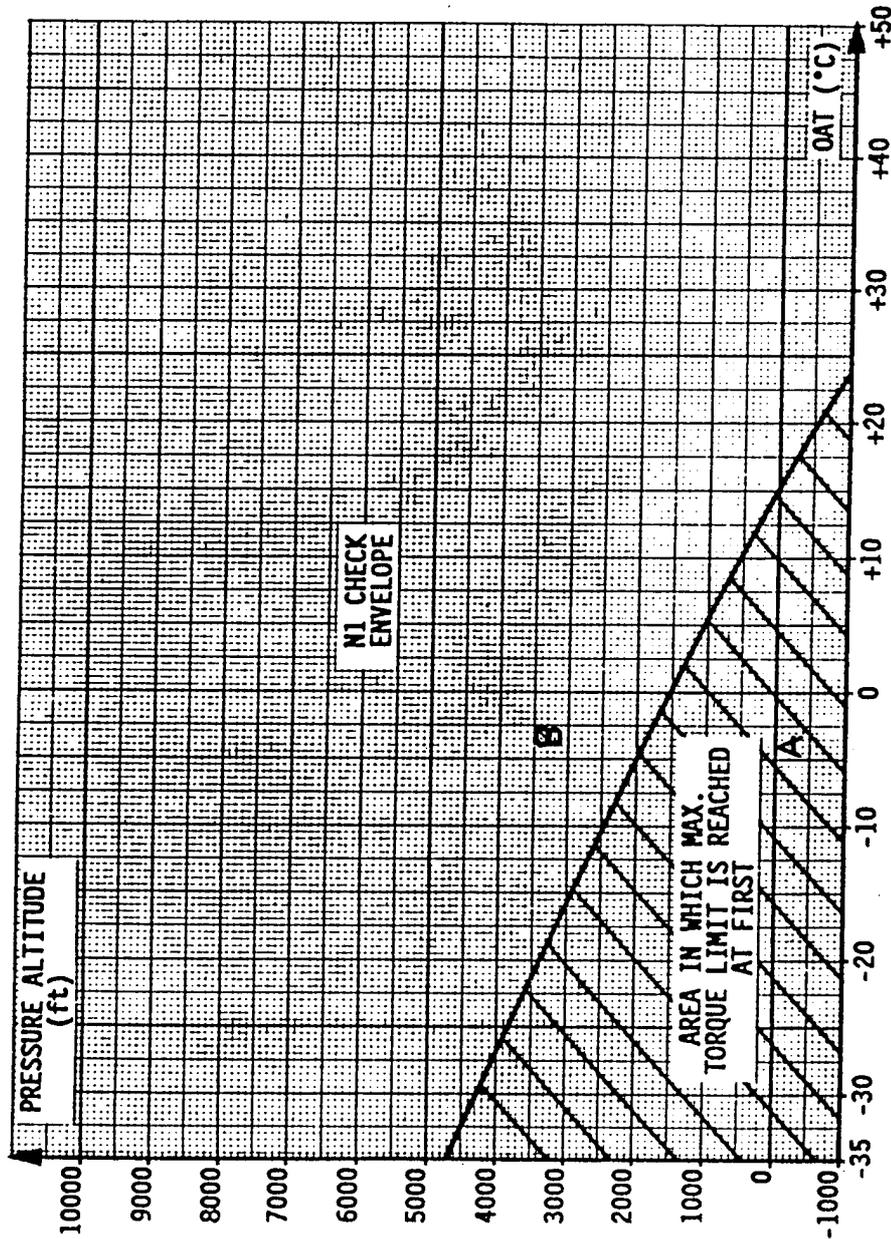
SCHEDULED ROC	
No 1 _____	ft/min
No 2 _____	ft/min

DELTA ROC	
No 1 _____	ft/min
No 2 _____	ft/min

S-76C
FORWARD CLIMB PERFORMANCE
SINGLE ENGINE 100% NT1 (UNBIASED) POWER
BEST RATE OF CLIMB SPEED 100% NR
EAAPS NOT INSTALLED OR INSTALLED AND OFF
ANTI-ICE OFF BLEED AIR OFF GEAR UP



S-76 / ARRIEL
 FLIGHT CHECK PROCEDURES MANUAL



N1 CHECK ENVELOPE FOR ROTORCRAFT
 WITH MAX. TORQUE LIMIT 115 %

Figure 1A

APRIL 10, 1989 3-100A/(100B BLK)

NOTE

This Figure is based on the Arriel 1S engine. For the 1S1 engine a higher altitude/OAT will be required to reach the N_1 limit.