CHECK FLIGHT CERTIFICATE

Westland Wasp HAS Mk1	**CFS 289A Issue 2**	Registration:

Date:	Crew:	Observer:

Performance Climb #1

Average Weight			Lbs
Average Altitude			ft
Average Temp.			˚C
Speed			KIAS
Achieved Rate			fpm
Scheduled Rate			fpm
Margin			fpm
Permitted Margin	-70		fpm

Airfield:

Start Weight Lbs:

Takeoff cg:

Performance:

SATIS/UNSATIS/NOT APPLICABLE*

*(delete as applicable)**

Defects

No.	Defect	-/R/FT	Action?

(use a continuation sheet as necessary)

Conclusions/Comments

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 airtests may conduct the test.

General notes on test conduct can be found in the CAA Handbook for Airworthiness Flight Testing.

This sheet replaces any flight test certificate given in the schedule.

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 Handbook for Airworthiness Flight Testing.

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 (or Permit to Fly) 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 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 Check Flights 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 Check Flight 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

Westland Wasp HAS Mk1	**CFS 289A Issue 2**

Registration		Test Date	

1. **INTRODUCTION**

This schedule is applicable to the Westland Wasp helicopter for the purpose of issue or reissue of Permit to Fly. It is based on the assumption that the every day operation of the helicopter serves as a continuous check on the correct functioning of all normal services.

The Check Flight 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.

WARNING

1. It is illegal to carry passengers on a test flight made without a valid Certificate of Airworthiness (or for flights carried out with a Permit to Fly restricted to the purpose of flight testing for the issue or renewal of a Permit to Fly), except passengers performing duties in the aircraft in connection with the flight. Although it may be legal to carry passengers on a test flight with a Certification of Airworthiness in force, it is strongly recommended, for Airworthiness Flight Tests and other tests entailing greater risk than normal flight, that:

   a) It is preferable to use ballast, and

   b) 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 Flight Manual (or equivalent) 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 Helicopter Flight Test Section at Airworthiness Division, Flight Section, Aviation House, Gatwick must be consulted.

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

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1. Pre-Flight Information

Aircraft Variant	Westland Wasp HAS 1 / Mk1B	Engine Variant	RR Nimbus 103/503/105

Registration		Engine Nr	
Airframe Nr		Hours total	
Airframe Hrs		TSO	
Operator/Maint. Organisation			
Airfield			

Pilot(s)	
Observer	

2. Loading

Note: The helicopter shall be loaded to maximum all up weight if possible. Any ballast must be securely installed

Take-off Weight		lb
Fuel		lb
CoG Position		in

3. General Flight Information

Airfield Press. Alt.		ft	QFE/QNH	/	
Wind	/		OAT		°C
Weather					

Engine Start		Land	
Take-Off		Shut down	

NOTE: Reference in this CFS to oil pressure torquemeter refer to Pre mod 1140 or post mod BNHL/TQ/01 [App]

4. Pre-Start Checks

		Satis.	Remarks
4.1	Carry out the normal external inspection		
	Record accumulator pressure		psi
4.2	Confirm correct functioning of external lighting		
4.3	Doors & windows : Condition & operation		
	Seats & harnesses		
	Placards : Legibility & accuracy		
4.4	Instrument marking: Legibility, general condition & accuracy of colour bands & marking.		
	ASI		
	Rotor Tachometer		
	Torquemeter (note for oil pressure torquemeter may over read by 25 – 30%)		
	JPT		
	N_c Tachometer		
	Engine Oil Pressure (Comp)		
	Engine Oil Pressure (Turb)		
	Oil Temp Triple Indicator		
	Collective pitch indicator		
4.5	Freedom, range of travel, friction of :		
	Collective control		
	Yaw control		
	Twist-grip throttle		
	HP Cock		
4.6	Select battery ON, check:		
	Warning lamps and dimmer		
4.7	Operate pilot and co-pilot cyclic beep trim in turn. Confirm satisfactory operation of longitudinal and lateral trim motors over full range of travel		

5. Starting

5.1 During engine start, note and record:

Residual JPT	°C
Time to light (<8 sec) (cold engine may take longer)	sec
Max JPT (<700°C pre mod 719 750ºC post mod 719)	ºC
Time to ground idle (35-45sec) (cold engine may take longer)	sec
Satisfactory acceleration to idle	
Strain Gauge Torquemeter 100% test ±1% (not applicable to oil pressure torquemeter).	%
Overtorque warning	

5.2 Record the following with the engine stabilised at ground idle

N_c		%	Turb Oil Press		Psi
JPT		°C	Comp Oil Press		Psi
Tq		%			

5.3 Select Engine Anti ice ON

Note JPT rise	ºC
Select Engine Anti-ice OFF	
Note JPT fall	ºC

5.4 Select Cabin Heat ON (if installed)

Note JPT rise	ºC	
Confirm satisfactory heater operation		
Select Cabin Heat OFF		
Note JPT fall	ºC	

NOTE if no JPT change noted repeat check with twist-grip fully open.

5.5 Advance twist-grip to fully open in 15-20 sec and confirm satisfactory acceleration and freedom from surge.

Confirm HYD LP extinguishes below $350N_R$		

5.6 With twist-grip fully open and collective fully down, check

Correct rotor disc response to ***small*** cyclic inputs:		
All indications in normal range		
All warning lights extinguished		

N_R (415 – 420 rpm) _____ rpm

Record the following:

N_c		%	Comp Oil Press		psi
JPT		°C	MRGBOT		ºC
Tq		%	Eng Oil Temp		ºC
Turb Oil Press		psi	Oil Tank Temp		ºC

5.7 With the throttle fully open, close the throttle rapidly to idle

Confirm engine does not flame out.		
Idle N_c = 46±2.5%		
Accelerate the rotor from 175N_R to Flight Idle in 15 sec. Confirm satisfactory acceleration with no tendency to surge.		

5.8 With throttle fully open, deselect flying control hydraulics. (Note no HYD caption)

Note satisfactory control loads and absence of stick stir. Reselect hydraulics.		

5.9 Carry out AP ground checks iaw Flight Reference Cards AP101C-0601-14A (If operational)

5.10 Check for correct functioning of:

Intercomm		
Radio		
Cockpit lighting (if possible)		

Complete all pre-flight checks as required.

6. Take off and Low Speed Envelope

Take off Time	

6.1 In a low hover, assess the vibration level, control response and position (adequate control margin) during the following manoeuvres (see Appendix 1 for test method)

Axial Turns	Left		
	Right		
Sidewards flight to 20 kt	Left		
	Right		
Rearwards flight to 20 kt			

7. Performance, 1 Hr Power Climb

With the altimeter set to 1013 mb (29.91 in hg), climb at 1 Hour Power (or 5 mins torque for oil pressure torquemeter) for 3 min. The climb should be carried out in stable, non-turbulent conditions away from cloud.

Associated Conditions (Do not exceed any of the following)

N_c	101.2%
JPT	570ºC pre mod 719 590°C post mod 719
IAS	60kt

Tq	100% (set slightly below for oil pressure torquemeter)
Engine Bleeds	OFF (unless specifically required)

When a stable condition has been established on a steady heading with zero yaw, and in as calm conditions as possible, record the following:

Fuel at start of climb

								Eng Oil	
Time	***Alt***	***OAT***	***IAS***	***Tq***	***N_c***	***JPT***	***N_R***	***Eng Oil Temp***	***Comp Press***
0									
0.30									
1.00									
1.30									
2.00									
2.30									
3.00									

Fuel at end of climb

After the climb, obtain an accurate OAT by flying at approx mid-climb altitude at climb speed for 1 min to allow OAT to stabilise.

Alt		ft
OAT		°C

NOTE The climb performance must be analysed and compared with the schedule performance. See Section 15 of this document.

8. Autorotation

8.1 Perform a gentle entry to a steady autorotative descent at 50kt with the collective lever fully down.

Note: It will be necessary to close the throttle to 68% - 70% Nc to ensure the freewheel is disengaged

Note: Controllability on entry		

When stabilised, record the following (preferably passing through 2000 ft):

P. Alt	OAT	IAS	N_R	N_c	Fuel	AUW
Ft	ºC	Kt	rpm	%	lb	lb

Open throttle fully

DO NOT EXCEED POWER-OFF ROTOR RPM LIMITATIONS (330⇒440RPM)

8.2 Carry out 20º banked turns left & right in a Flight Idle Glide		

8.3 Enter autorotation at 70kt with the throttle fully open. Flare to increase N_R to 430rpm approx

Note Flight Idle N_c (71-75%)		%

9. Rapid Engine Acceleration

Confirm throttle is fully open.

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 80% torque.

NOTE 2

Do not reduce below N_R limit **380 rpm**

Ensure N_c > 75%, with 1-2% residual torque indicated. Increase collective to approximately 80% torque in not less than 3 sec (approx). Repeat the test and note below:

Minimum N_R (a)	rpm	rpm
Steady state N_R, post recovery (b)	rpm	rpm
Transient rotor droop (b-a)	rpm	rpm
Engine response and absence of surge		

10. Power Performance Index

With all bleeds OFF, establish a climb through 2000ft PA at 90kt at 1Hr power (or 5 mins torque for oil pressure torquemeter). Do not exceed any of the following limitations:

N_c	101.2%
JPT	Pre mod 719 570ºC Post mod 719 590°C

Tq	100%(set slightly below for oil pressure torquemeter)

Record the following when passing through 2000 PA:

N_c	%	Tq	%
JPT	ºC	N_R	Rpm
P Alt	Ft	OAT	ºC

Note The PPI results must be analysed and compared with the schedule. See section 15 of this document (refer to AP101C-0601-5M).

11. Handling

NOTE: If the helicopter is fitted with an operational ASE the following tests should be carried out with ASE engaged. (See Section 12 for specific ASE/AP tests.)

11.1 At 60kt, 2000ft approx, carry out the following checks:

11.1.1 Stabilised level flight

Record the following when stabilised:

P. Alt		ft	Tq		%
OAT		°C	IAS		Kt

Note:	Vibration level		
	Control response		
	Lack of pedal creep		

11.1.2 Steep turns left & right

Note:	Vibration level		
	Control response		

11.1.3	Confirm satisfactory operation of both cyclic trim switches	

11.2 Manual Flying Control Check

At 60kt, deselect flying control hydraulics. Trim out cyclic loads. Confirm satisfactory flying qualities and rotor track, absence of stick stir and control load feedback in gentle manoeuvres

Reselect hydraulics and retrim.

11.3 Governor Static Droop Check

Reduce airspeed to 50kt. Climb through 2000ft PA at 100% torque (or slightly less if oil press torquemeter) and record:

N_R	rpm	(401 - 403 for new governors, or 398 - 403 for used)
N_c	%	
JPT	ºC	

Reduce power and recover to level flight

11.4 Increase airspeed to 100kt (or V_{NE} if lower). Record the following when stabilised:

11.4.1 Stabilised level flight

P. Alt		ft	Tq		%
OAT		°C	IAS		Kt
Fuel		lb	AUW		lb

Note:

Vibration level		
Control response		
Lack of pedal creep		

11.4.2 At Vne - 10 to 15 kt, steep turns left & right

Note:

Vibration level		
Control response		

11.4.3 Select Engine Anti ice ON

Note JPT rise ºC

Select engine Anti-ice OFF

Note JPT fall ºC

11.5 At a safe altitude, increase speed progressively to V_{NE} using max. continuous power (observe placarded V_{NE} limits)

11.5.1 Note the following:

P. Alt		ft	OAT		°C
Fuel		lb	Placard V_{NE}		kt
AUW		lb	IAS		kt

Vibration level		
Control response		

11.5.2 Carry out gentle turns left & right (approx 10-15º)

Note:	Vibration level		
	Control response		

12. Autostabilisation / Autopilot (if operational)

12.1 Basic Stabilisation

At approx 60kt, level flight, engage ASE in cruise mode. Note any control disturbance or excessive engagement error. Pitch and roll servos should be approximately null in cruise and manoeuvre modes

a) Without retrimming, displace the cyclic to alter pitch angle by 5° nose up. Release cyclic and check pitch attitude returns to datum ±1° with minimal overshoot.

b) Repeat a) for 5° nose-down.

c) Repeat a) for 10° left roll

d) Repeat a) for 10° right roll

12.2 Increase airspeed to 90kt, trimmed S&L.

a) Depress Manoeuvre Button and, without retrimming, displace the cyclic to alter pitch angle by 5° nose up. Release cyclic and check pitch attitude returns to datum ±1° with minimal overshoot.

b) Repeat a) for 5° nose-down.

c) Repeat a) for 10° left roll

d) Repeat a) for 10° right roll

12.3 Pitch Authority

Increase speed to 100kt in Manoeuvre Mode (Do not exceed V_{NE}) Confirm pitch null indication is approx 20% right

Reduce speed to 50kt in Manoeuvre Mode (Do not exceed V_{NE}) Confirm pitch null indication is now approx 20% left.

12.4 Roll Authority

a) At 80kt S&L in cruise mode, use roll trim wheel to roll the aircraft into a turn to port. Note roll angle at which ASE saturates (full scale null indication) – typically 7-9°

b) Repeat for a turn to starboard

c) At 80kt S&L, trim the roll null indication to zero. Press the Manoeuvre Button and roll the aircraft into a 30° turn to port. Null indication should be approx 75% right.

d) Repeat for a turn to starboard. Null indication should be approx 75% left

12.5 Heading Hold

a) At 60kt, trimmed S&L, ASE engaged in cruise mode, engage heading hold. Note any yaw engagement error.

b) Operate Manoeuvre switch. Note any changeover error

c) In cruise mode, make power changes from low pitch to 1hr power. Heading should be held within ±5°

d) Carry out 30° turns in manoeuvre mode. Confirm that pedal breakout loads are not excessive

Left

Right

12.6 ASE Disengaged

Disengage Heading Hold and ASE. Note satisfactory disengagement and normal aircraft behaviour

12.7 Bar Alt Hold

a) At 80kt, trimmed S&L, ASE engaged in cruise mode, collective friction applied, engage Bar Alt hold.
Confirm height held within ± 50ft.

b) Using ASE pitch trimmer, slowly increase IAS by 5kt. Confirm height is maintained within 50 ft of datum and collective servo does not saturate

c) Repeat for a 5kt speed decrease

Deselect Bar Alt Hold

13. Landing

Landing Time	

Confirm no tendency to ground resonance during a smooth landing with a slow gentle collective lowering		

NOTE: Should any divergent oscillations be noted, lift off immediately, reposition the aircraft and carry out a normal landing.

14. Shut down

Shut down time	

Shut down the engine in accordance with normal procedures.
Note:

14.1	Satisfactory shut down	
14.2	Apply rotor brake at 150 rpm and note satisfactory brake performance	sec
14.3	Engine run down time (45 sec approx)	sec

15. Post-flight Action

15.1 Performance Climb (see para 7)

Plot the data and determine the achieved rate of climb. The scheduled performance must be obtained from the Operating Data Manual (ODM) AP101C-0601-16, compared with the achieved performance and results recorded on the front page.

If the aircraft is fitted with oil pressure torquemeter and less than 100% torque was set the scheduled climb performance should be adjusted as follows:

$$\Delta RoC = \frac{\Delta Tq \times 685 \times 33000 \times 0.85}{\text{Weight (mid climb)}} \qquad [100\ \%\ Tq = 685\ shp)$$

Example: Torque 97% $\Delta Tq = 100 - 97 = 3\%$ = 0.03
Weight = 5200 lbs
Scheduled RoC = 1340 fpm

$$\Delta RoC = \frac{0.03 \times 685 \times 33000 \times 0.85}{5200} = 110 \text{ fpm}$$

Corrected scheduled RoC = 1340 – 110 = 1230 fpm

15.2 Autorotation (see para 8)

Use the chart in AP101C-0601-5M to determine the minimum scheduled autorevs.

Achieved autorevs		rpm
Schedule autorevs		rpm
Achieved – Scheduled =		rpm

15.3 Power Performance Index (see para 10)

Use the power check charts from AP101C-0601-5M or AP102C-0603-1, Sect 4, Chap 3 to analyse the engine condition

PPI (N_c based)		%
PPI (JPT based)		%

If oil press torquemeter fitted and slightly less than 100% torque set then the actual PPI will be slightly lower.

Note JPT & Nc based PPI minimum acceptable limit is 90%
Ref: AP101C-0603-1, Sect 4, Chap 3.

Record of Changes

Changes from Issue 1 to Issue 2

Various formatting changes to 'tidy up' especially irregular box sizes. Add various references to oil pressure torquemeter.

Section No.

1 Add Permit to Fly.

4.4 Change Transmission to Engine Oil Pressure. Add rest value for oil pressure torquemeter.

4.5 Delete Cyclic control as check is performed in 4.7. Delete "and lock" as not applicable to Wasp.

4.6 Delete battery voltage as no voltmeter

5.1 Add note for time to light for cold start and not applicable for oil pressure torquemeter. Change JPT limits. Torquemeter test add tolerance, N/A for oil pressure gauge and add overtorque warning

5.2 Change Trans to Turb.

5.4 Add NOTE (applicable to 5.3. and 5.4).

5.6 Change Trans to Turb.

5.9 Add AP reference.

7 Specify particular engine temp and press to be recorded. change JPT limit for Mod 719.

8.1 Change to NOTE to state that throttle will need to be reduced but to 68% Nc rather than fully down to idle (to ease task and reduce chance of surge on re-engagement). Add open throttle.

8.2 Add Flight Idle Glide to differentiate from a true autorotation.

Old 8.3 becomes new 9 rapid engine acceleration (to disassociate the test from autorotation test) and add NOTE 1 and 2

Renumber subsequent sections

10 Delete first part of PPI (prediction of PPI from log card) to align with Scout PPI test. Change JPT limit to 570°C (was 590 = 5 min limit). Add 5 mins torque limit for oil pressure torquemeter.

11 Change bank angles for turns.

11 and 12 Add Note regarding ASE.

15.1 to 15.3 Add AP references. Add correction method for oil press torquemeter.

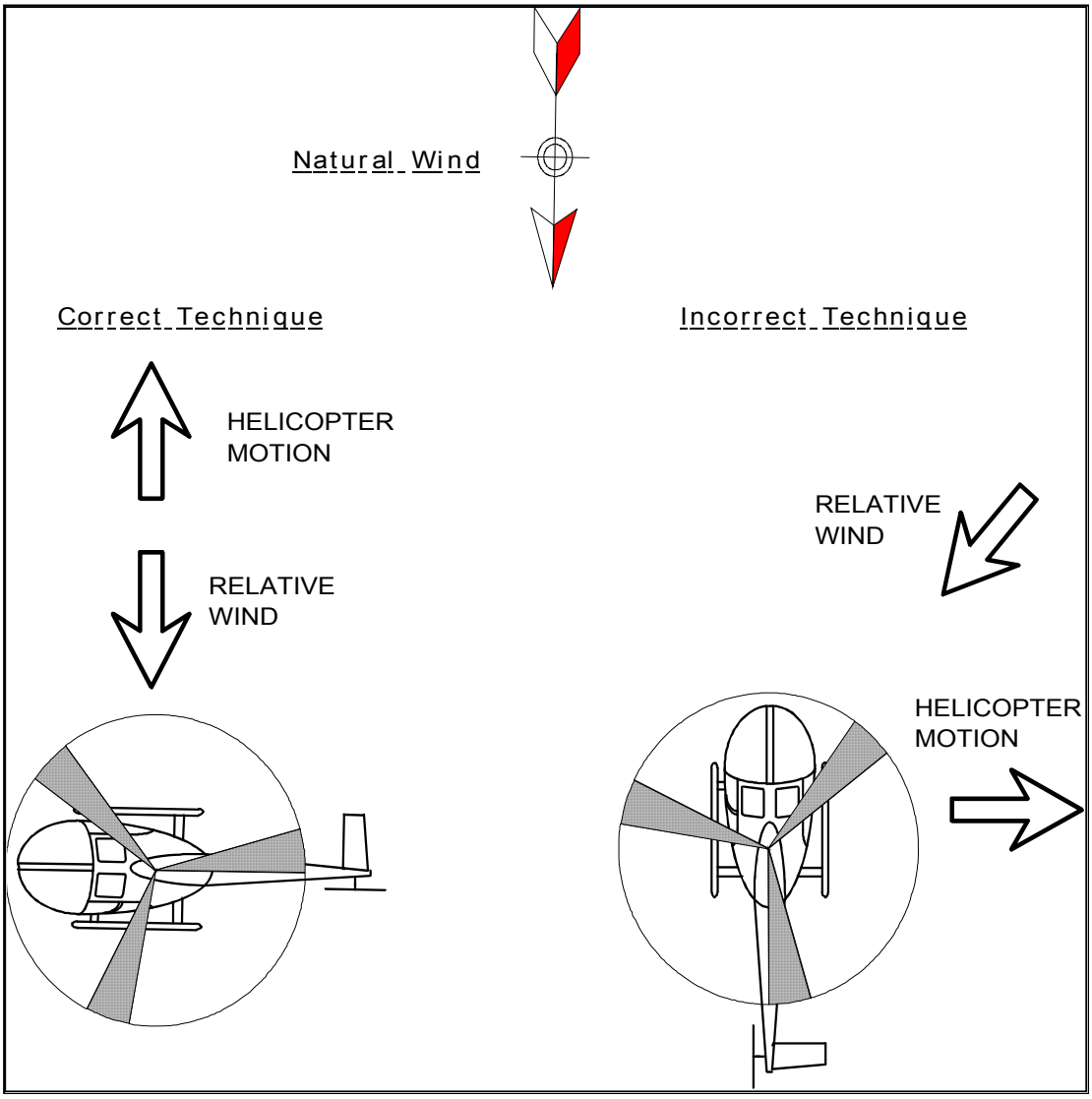
15.3 Add min PPI values.

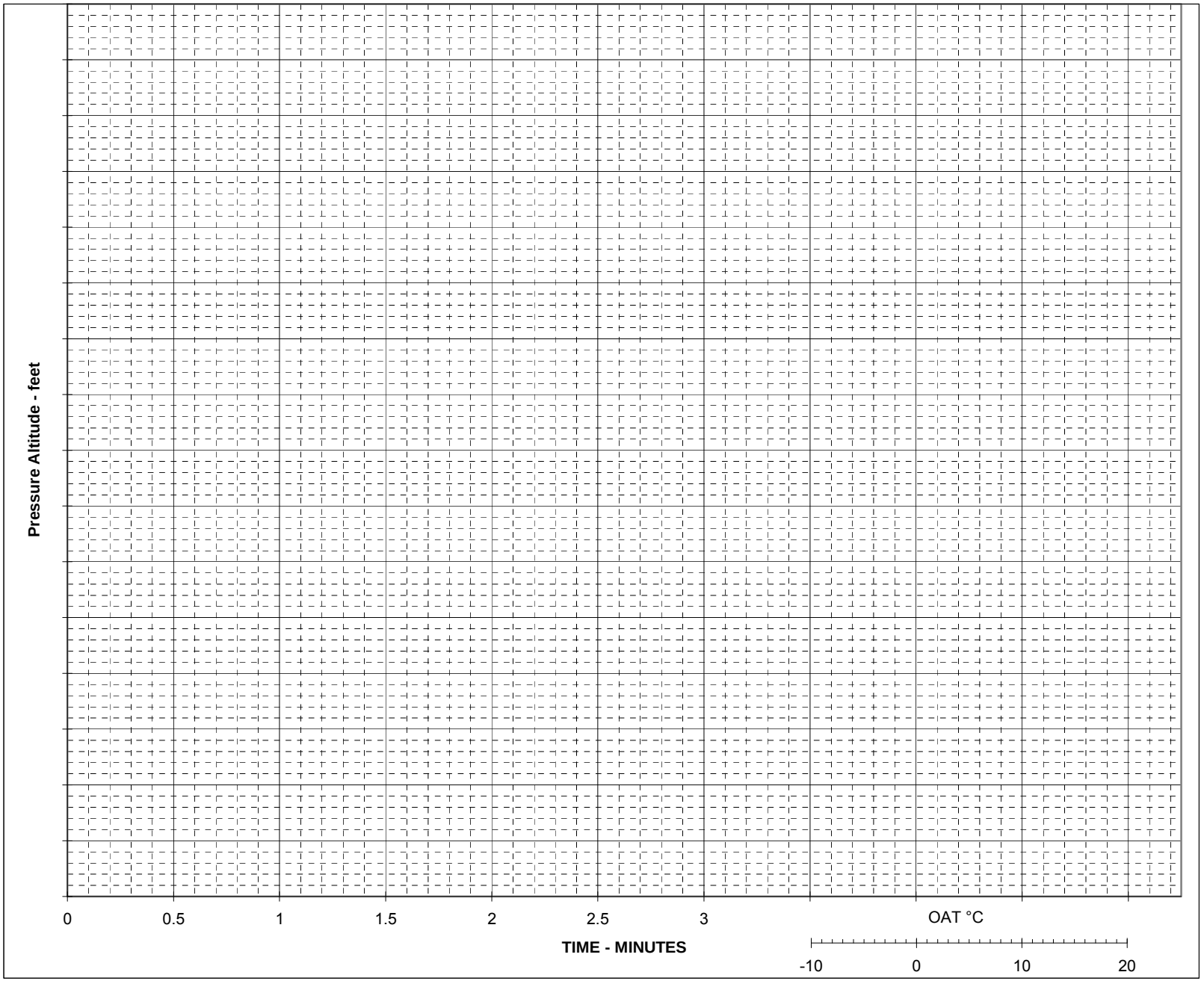
Appendix 1

Sidewards & Rearwards Flight

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

For rearwards flight the helicopter should be aligned tail into wind and gently accelerated rearwards to achieve the required relative airspeed.





AIRCRAFT TYPE

REGISTRATION

DATE OF TEST

Mean Weight

_____ lb

Mean Altitude

_____ feet

Mean OAT

_____ °C

SCHEDULED ROC

Basic _____ ft/min

Correction _____ ft/min
(if applicable)

Correction _____ ft/min
(if applicable)

Final SROC _____ ft/min

Observed ROC

_____ ft/min

Difference from Scheduled

_____ ft/min
(Observed ROC minus Final SROC)