

# CHECK FLIGHT CERTIFICATE



ROTORWAY EXEC, EXEC 90 & 162F

CFS 241 Issue 2

Registration:

Date:	Crew:	Observer:
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<b>Performance</b>  Average Weight Average Altitude Average Temp. Speed Achieved Rate Margin (previous/initial) Permitted Margin	Climb #1		Airfield:
			Start Weight    Kg/Lbs*:
		ft	Takeoff cg:
		°C	Performance:  SATIS/UNSATIS/NOT APPLICABLE*  (delete as applicable)*
		KIAS	
		fpm	
		fpm	
	-75/-100 (see para 9)	fpm	

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

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 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 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



CFS 241 Issue 2

Registration

Rotorway Exec, Exec 90 & 162F

Test Date(s)

## 1. INTRODUCTION

This schedule is applicable only to the Rotorway Exec, Exec 90 and 162F helicopters. 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 who has been specifically briefed on the Exec by a member of Flight Department. 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 to record the results of the tests. For initial flight test(s) following building or major maintenance, carriage of an observer is optional, however formal data recording on this schedule should not be attempted if an observer is not carried. A separate flight should then be conducted with an observer to record the data.

## WARNING

1. 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, it is illegal to carry a passenger except an occupant performing duties in the aircraft in connection with the flight. For the recording of data on this CFS, the observer is considered to be necessary for the safe operation of the flight.

Before accepting any passenger/observer 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 to be exceeded.
3. Unless exceptional circumstances prevail, the dual controls must be removed for the flight test to prevent the risk of control obstruction. The yaw pedals need not be removed.

Should there be any query about the required Flight Test or its results, the local CAA Surveyor or Flight Department at Airworthiness Division Head Office must be consulted.

2. **LOADING**

Load the helicopter to 1320 lbs. (Exec), 1425 lbs. (Exec 90 and Exec modified to 90 standard). 1500 lbs (Exec 162F). For Exec 90 approved to fly at 1500 lbs, load in the range 1425 to 1500 lbs aiming for a similar weight to the initial issue airtest.

**CAUTION #1**

Any ballast must be securely fastened. If this cannot be adequately achieved then it is permissible to take off below the weight specified above.

**CAUTION #2**

The C.G. position must *not* be in the restricted shaded zones shown in the Flight Manual.

Take-off Weight (actual)	
C.G. Position (actual)	
Fuel Contents	

3. **PRE-FLIGHT INFORMATION**

	Exec	Exec 90	Exec 162F
Helicopter Type			
Constructor's No.			
Total airframe hours			
Engine Type/No.			
Engine hours since new or overhaul			
Helipack fitted?			

Operator		
Place of test		
Pilot/Observer		

Weather, OAT			
Wind Speed/Direction			
QNH/Airfield pressure altitude			
Take off time/Landing time/Duration			

4. **PRE-FLIGHT INSPECTION**

Carry out the normal pre-flight inspection.

	<i>Sat</i>	<i>Remarks</i>
Doors & Transparencies: Condition & Operation		
Seats & Harnesses: Condition & Operation		
Cyclic Control: Freedom, Range of Travel, Friction		
Collective Control: Freedom, Range of Travel, Friction		
Throttle Control: Freedom, Range of Travel, Friction		
Yaw Controls: Freedom, Range of Travel, Friction		
Placarding: Legibility and Accuracy		
Instrument Marking: Legibility and Accuracy		

5. **START-UP**

Check for any difficulty or abnormality on start up, with special reference to clutch operation.

Check free wheel for normal operation.

	<i>Sat</i>	<i>Remarks</i>
Ease of Starting		

Check ignitions at the recommended EPRM for drop or rough running.

Ignitions Checked at \_\_\_\_\_ rpm Result \_\_\_\_\_

	<i>Sat</i>	<i>Remarks</i>
Cyclic Control/Rotor Response at 100% rotor speed		
Pedal/Yaw response		
Gyro Instruments Functioning		
Warning Systems Functioning		

With engine warm up completed and stabilised temperatures, check and record the following at 100% Rotor speed.

Manifold Pressure

--

Engine Oil Temp.

--

Engine Oil Press.

--

Water Temp.

--

Close the throttle and note engine idle rpm before engine and rotor re-synchronise. If a tacho reading below 80% is not fitted note satisfactory idle is achieved.

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## 6. HANDLING AND PERFORMANCE

Make a careful assessment of the handling characteristics and performance in the conditions of 6.1 to 6.7.

### 6.1 Hover

In a steady ground effect hover, record the following :

Manifold Pressure

--

ERPM/RRPM

--

Cyclic Force and Position

--

Collective Balance

--

Throttle Correlation

--

Engine Oil Temp

--

Engine Oil Press

--

Water Temp.

--

6.2 Low Speed Envelope

**CAUTION #1**

Aft cyclic margin may be small with the wind in the 5 to 6 o'clock sector especially at a forward CG position. Rearwards flight (or downwind hovering) must be carried out in a cautious incremental manner with adequate space to recover should aft cyclic reach the end stop or if yaw control is lost.

**CAUTION #2**

Similarly, right lateral cyclic margin may be small with a right wind. If the passenger's collective has not been removed the available right cyclic range may be reduced due to the pilot's right leg contacting the passenger's collective. It must be possible to achieve 15 kts right sideways flight without excessive restriction of the cyclic. If the passenger's collective has been removed, an estimate of the remaining right cyclic margin must be made to ensure that when the helicopter is flown with the passenger's collective fitted there will be adequate margin to allow 15 kts right wind. The remaining cyclic margin should be estimated by sight, not by actually moving the cyclic to the end stop.

**CAUTION #3**

The CG **must not be** in the restricted zone where only 10 MPH tailwind hovering is permitted.

See Appendix 1 for test method.

Assess the vibration level, control response and position (adequate control margin) during the following manoeuvres :-

	<i>Sat</i>	<i>Remarks</i>
Turns on the spot		
Sideways flight left and right up to an estimated 15 kts		
Rearward flight up to 15 kts		

### 6.3 Performance Climb

With the altimeter set to 1013 mb climb at 54 MPH (47 KIAS), maximum power (full throttle, 100% rotor speed ) for three minutes. The rate of climb will be compared with the previous renewal results and if possible the mid climb *density* altitudes should be similar.

When a stable condition is obtained on a steady heading with zero yaw, and in as calm conditions as possible, record the following :-

Fuel at start of climb

Time at start of climb

Time	Alt	OAT	IAS	Man Press	Engine Rpm	Water Temp	Eng	
							Temp	Press
0								
0,30								
1,00								
1,30								
2,00								
2,30								
3,00								

Helicopter Weight at mid point of climb

Note: If the helicopter is not fitted with an OAT gauge the variation of OAT with altitude should be determined from Met information.

6.4 Cruise Flight

With normal cruise power, trim the helicopter accurately for straight and level flight and record :-

IAS	
Altitude	
OAT	
Engine Oil Temperature	
Engine Oil Pressure	
Water Temperature	
Manifold Pressure	
Cyclic Force and Position	
Collective Balance	
Throttle Correlation	
Vibration Level	

Carry out steep turns (approx 30°) in both directions and check the controls for normal response and position, noting general vibration levels.

	<i>Sat</i>	<i>Remarks</i>
Steep Turns		
Vibration Levels		

6.5 Maximum Speed

At a safe altitude increase airspeed to maximum achievable *in level flight* at maximum power (full throttle, 100% rotor speed). Do not exceed  $V_{NE}$ .

**CAUTION**

The CG position **must not be** in the restricted zone where full  $V_{ne}$  is not permitted. Flight to  $V_{ne}$  should be carried out in low turbulence conditions.

Max Speed	
Altitude	
Manifold Pressure	

	<i>Sat</i>	<i>Remarks</i>
Cyclic Force and Position		
Collective Balance		
Control Response in Turns		
Vibration Level		

Increase speed to  $V_{NE}$  in a shallow dive.

$V_{NE}$	
Altitude	

	<i>Sat</i>	<i>Remarks</i>
Cyclic Force and Position *		
Control response in gentle turns		
Vibration Level		

\*A minimum of 5 cm estimated forward cyclic margin should be available.

6.6 Autorotation

Enter autorotation at 60 MPH (52 KIAS) Exec or 65 MPH for Exec 90 and 162F. The first entry should be slow followed by moderate and rapid entries. The nose should pitch up on entry especially at higher entry rates but should be easily controlled with a small amount of forward cyclic. A rapid pitch up is unsatisfactory and an investigation of the aircraft balance and horizontal stabiliser angle will be required followed by further flight tests. If the characteristics at the lower speed were satisfactory further checks should be carried out at cruise speed (approx. 90 MPH, 80 KIAS).

**CAUTION**

Care should be taken that the rapid entries to autorotation do not result in a significantly low 'g' condition.

60 MPH (Exec), 65 MPH (Exec 90 & 162F) Controllability on Entry (established autorotation not required)

		<i>Sat</i>	<i>Remarks</i>
Slow	Entry		
Moderate	Entry		
Rapid	Entry		

Cruise Speed (approx 90 MPH, 80 KIAS)

		<i>Sat</i>	<i>Remarks</i>
Slow	Entry		
Moderate	Entry		
Rapid	Entry		

In established autorotation at 60 MPH (Exec), 65 MPH (Exec 90 & 162F) note the following :-

	<i>Sat</i>	<i>Remarks</i>
Freewheel Operation		
Vibration Levels		
Medium Turns		

6.7 Autorotation RPM Check

If possible the weight for the autorotation rpm should be:

Exec approximately 1300 lbs.

Exec 90 approximately 1400 lbs.

Exec 162F approximately 1470 lbs.

Enter autorotation and note the approximate height of the end of the collective above the floor which gives a steady rotor RPM of about 104%.

<i>P. Alt</i>	<i>OAT</i>	<i>IAS</i>	<i>Coll Height</i>	<i>RRPM</i>	<i>ERPM</i>	<i>Weight</i>

Note:

Do not exceed RRPM limitations

During the re-engagement, check that the throttle and collective pitch correlation is acceptable.

**7. FUNCTIONING TESTS**

Make functioning tests of the following items, where applicable, at appropriate times during the flight.

Check also any items of system fitted which is not specifically mentioned.

	<i>Sat</i>	<i>Remarks</i>
Internal and External Lighting (including emergency lighting)		
ASI		
Altimeter		
VSI		
Slip ball		
D.I.		
Attitude Indicator		
Compass		
Tachometers		
Fuel Gauges		
Voltmeter		
Engine Instruments		
Cabin Heating and Ventilation		
Landing Gear		
Fuel Shut Off Control		
Rotor Brake (If fitted)		

On touch down, check that there is no tendency for ground resonance or lateral padding and the landing gear functions satisfactorily.

**8. SHUT DOWN**

Exec and Exec 90: shut down the engine using the fuel shut off valve noting the time to stop at idle power. Do not carry out this test on the EXEC 162F as damage to fuel pump could result.

Engine stops in  seconds.

9. **POST FLIGHT ACTIONS**

Performance Climb

The climb results must be plotted on the analysis sheet provided and the average rate of climb determined. Note that density altitude must be determined from pressure altitude and OAT.

	<i><b>This Flight Test</b></i>	<i><b>Previous Flight Test</b></i>
Rate of Climb		
Mean Pressure Altitude		
Mean OAT		
Mean Density Altitude		
Mean Weight		

There is no published schedule rate of climb data for any Exec model. Therefore the rate of climb can only be compared with the previous year's result. If the climbs were carried out at similar weight/altitude and OAT then similar rates of climb can be expected. If the result is significantly (more than 75 ft/min) worse than the previous result, investigative actions must be taken. If the climbs were carried out in significantly different conditions or weights then the climb should be repeated in more appropriate conditions. As a guide, an increase in *density* altitude of 1000 ft. may reduce the rate of climb by approximately 100 ft/min. An increase of weight of 100 lbs. may reduce the rate of climb by approximately 180 ft/min.

The results from this flight test should be corrected using the above values in order for a more accurate comparison of the climbs to be carried out (see Appendix 2 for an example of the procedure).

Measured RoC from this test	
Total Correction	
Corrected RoC	
$\Delta$ RoC compared to previous year	
$\Delta$ RoC compared to <i>initial</i> test	

If the difference in rate of climb is worse than 75 fpm between the current test and the previous test or 100 fpm worse than the initial issue test (cumulative total) then investigative action must be taken.

For the initial issue no comparison of rate of climb is possible but is assumed to be the 'base line' for future comparison.

Autorotation RPM

The steady state autorotation RPM determined in Section 6.7 is intended as a check that the collective rigging will allow an autorotation to be carried out at a safe RPM without the collective being in an abnormal position i.e. too high or too low.

As a guide, at 104% RRPM, 2000 to 3000 ft Density Altitude the end of the collective should be:

Exec                                      about 1.5 to 5 inches above the floor at approximately 1300 lbs.

Exec 90                                    about 1.5 to 5 inches above the floor at approximately 1400 lbs.

Exec 162F                                about 1.5 to 5 inches above the floor at approximately 1470 lbs.

Radio Check (Optional Check)

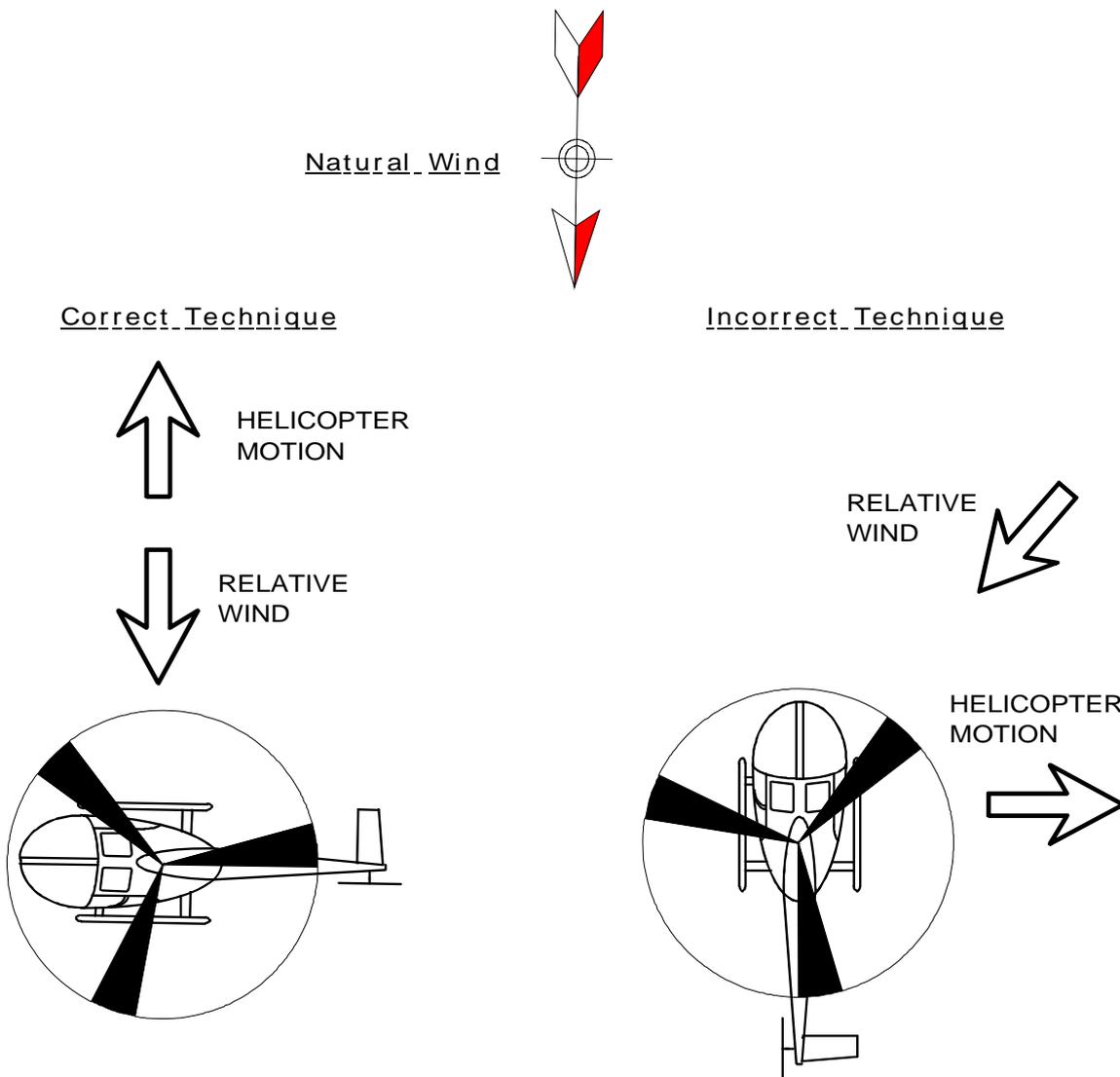
If a radio check has been carried out, note the results below:

<b>RADIO TYPE</b>	<b>GROUND STATION</b>	<b>FREQ.</b>	<b>DISTANCE FROM STATION</b>	<b>ALT</b>	<b>SIGNAL TX</b>	<b>SIGNAL RX</b>

**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.



In the absence of scheduled climb data for the Exec models it is necessary to correct the data measured from this flight test in order to compare it with previous results to ensure that the performance has not deteriorated below an acceptable value. A comparison with the previous year’s results *and* the original test (for first issue of the Permit) should be carried out; this is to ensure that a small degradation each year does not result in a total reduction of an unacceptable magnitude after a number of years.

The measured RoC should be corrected by 100 fpm for 1000 ft density altitude difference and 180 fpm for 100 lbs difference.

Example Abbreviations: *RoC = rate of Climb*  $\Delta = \text{difference between two values}$

Box		Initial Issue	1 <sup>st</sup> Renewal	2 <sup>nd</sup> Renewal	3 <sup>rd</sup> Renewal
1	Measured RoC	800	775	905	710
2	Mean Density Altitude	2500	3000	2000	2500
3	Mean Weight	1450	1400	1380	1420
4	Correction for altitude (compared to previous year)		+50	-100	+50
5	Correction for weight (compared to previous year)		-90	-36	+72
6	Total correction (box 4 + box 5)		-40	-136	+122
7	Corrected RoC		735	769	832
8	$\Delta$ RoC compared to previous year		-65	-6	-73
9	$\Delta$ RoC compared to initial issue		-65	-71	-144

In this example the 3<sup>rd</sup> renewal would be within the -75 fpm permitted compared to the 2<sup>nd</sup> renewal but is outside of the permitted -100 fpm margin for cumulative total degradation.

Notes on calculation:

Box 4 1<sup>st</sup> renewal is 500 ft higher altitude than initial issue giving a difference of 50 fpm, i.e the helicopter would have climbed 50 fpm more if the climb had been carried out at 2500 ft and not at 3000 ft. Therefore + 50 fpm.

Box 5 2<sup>nd</sup> renewal is 20 lbs lighter than 1<sup>st</sup> renewal giving a difference of  $20 \div 100 \times 180 = 36$  fpm. The helicopter would have climbed 36 fpm *less* if the climb had been carried out at 1400 lbs and not at 1380 lbs. Therefore -36 fpm.

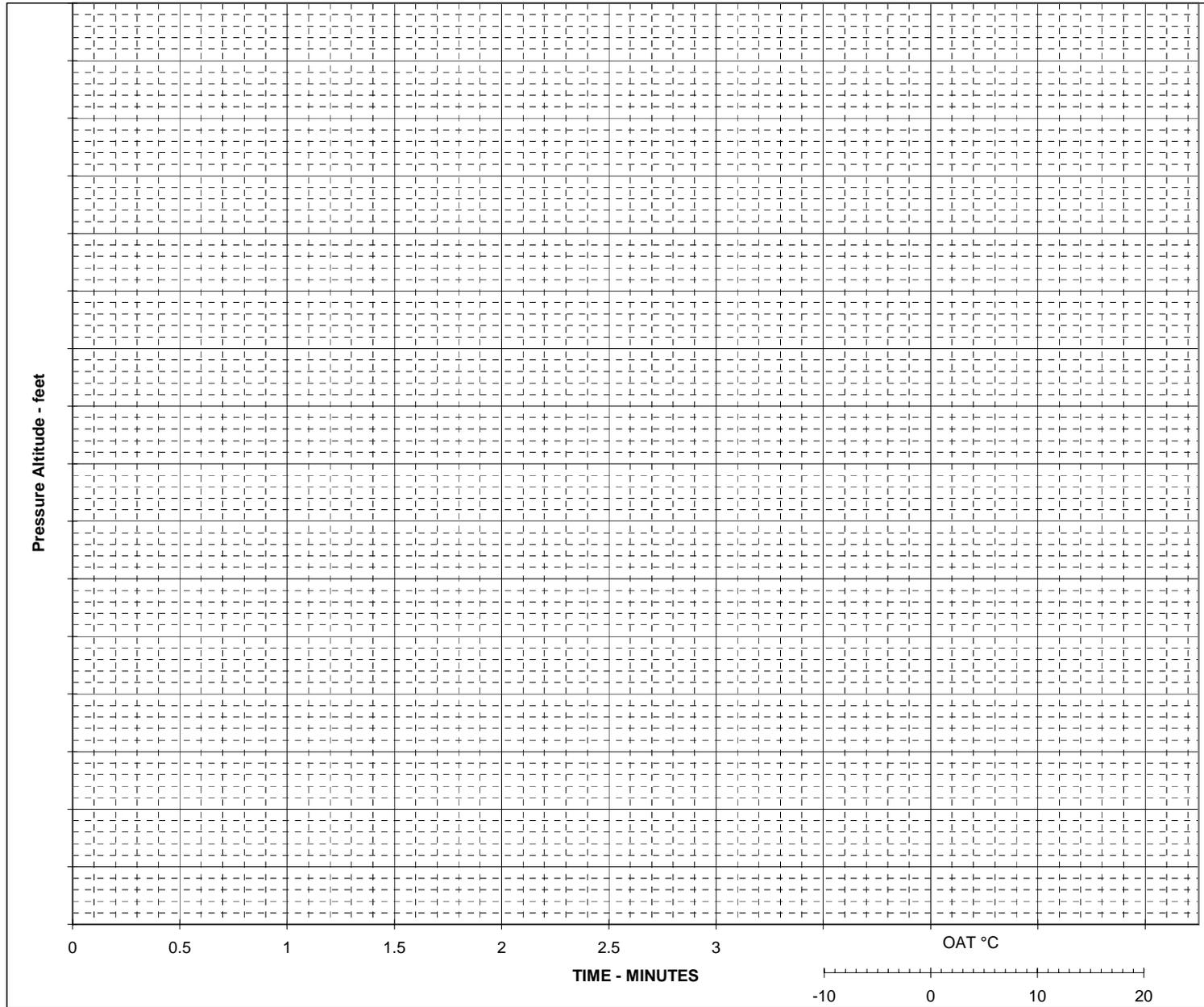
Box 8 For 2<sup>nd</sup> renewal, this is box 7 [of 2<sup>nd</sup> renewal] - box 1 [of 1<sup>st</sup> renewal] (769 - 775) *not* box 7(2<sup>nd</sup>) - box 7(1<sup>st</sup>) (769 - 735). This is because the comparison is to the previous year’s *measured* RoC, not in comparison to the previous year’s *corrected* RoC. The corrected RoC is what would have been achieved if the new climb had been carried out at the same density altitude and weight as the previous year’s climb

Box 9 The result is obtained by adding box 8 for each renewal to give a cumulative total (-65 - 6 - 73 = -144 fpm).

A blank table is attached. Previous results can be obtained from CAA Flight Department (01293 573113).

Box		Initial Issue	1 <sup>st</sup> Renewal	2 <sup>nd</sup> Renewal	3 <sup>rd</sup> Renewal	4 <sup>th</sup> Renewal	5 <sup>th</sup> Renewal	6 <sup>th</sup> Renewal	7 <sup>th</sup> Renewal
A	Mean Pressure Altitude								
B	Mean OAT								
1	Measured RoC								
2	Mean Density Altitude (from A & B)								
3	Mean Weight								
4	Correction for altitude (compared to previous year)								
5	Correction for weight (compared to previous year)								
6	Total correction (box 4 + box 5)								
7	Corrected RoC								
8	$\Delta$ RoC compared to previous year								
9	$\Delta$ RoC compared to initial issue								

Box		8 <sup>th</sup> Renewal	9 <sup>th</sup> Renewal	10 <sup>th</sup> Renewal	11 <sup>th</sup> Renewal	12 <sup>th</sup> Renewal	13 <sup>th</sup> Renewal	14 <sup>th</sup> Renewal	15 <sup>th</sup> Renewal
A	Mean Pressure Altitude								
B	Mean OAT								
1	Measured RoC								
2	Mean Density Altitude (from A & B)								
3	Mean Weight								
4	Correction for altitude (compared to previous year)								
5	Correction for weight (compared to previous year)								
6	Total correction (box 4 + box 5)								
7	Corrected RoC								
8	$\Delta$ RoC compared to previous year								
9	$\Delta$ RoC compared to initial issue								



<u>AIRCRAFT TYPE</u>	
<u>REGISTRATION</u>	
<u>DATE OF TEST</u>	
Measured ROC	ft/min
Mean Pressure Altitude	feet
Mean OAT	°C
Mean Density Altitude	feet
Mean Weight	lb/kg
Box 4	=
Box 5	=
Box 6	=
Box 7 (Corrected ROC)	ft/min
Diff compared to previous year	ft/min
Diff compared to initial issue	ft/min

## **Amendment Record**

Front Sheet. Alter performance summary to allow for lack of scheduled rate of climb and comparison to previous year's renewal result and initial issue. Remove 3 rows of defects list to increase size of comments box.

Para 1 Introduction. Change D&PS to Airworthiness.

Para 3. Add lines for whether helipack is fitted and for weather details etc.

Para 5. Delete clutch engagement rpm and mixture control.

Para 6.5 Add flight to Vne in low turbulence.

Para 6.7 Change 'Autorev' to Autorotation RPM. Add weights for each variant.

Para 7 Delete 'turn' from 'turn and slip'.

Para 8 Change to permit shut down with fuel shut off valve on Exec and Exec 90 only.

Paragraph 9. Performance climb result, add pressure and density altitude to clarify. Change reference from para 6.6. to 6.7, and insert range of values for collective height for all variants. Add table for (optional) radio check.

Various paragraphs. Increase size of boxes.

Appendix 2. Clarification of determination of box 8 rate of climb. Blank tables, add rows for recording pressure altitude and OAT.

Performance Climb Analysis Sheet. Add boxes for pressure altitude and OAT.