CHECK FLIGHT CERTIFICATE

M^c^Donnell Douglas MD600N **CFS 163c Issue 1**

Date:	Crew:	Observer:	Registration:

Performance Climb #1

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

Airfield:

Start Weight Kg/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 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

M^c^Donnell Douglas MD600N CFS 163C issue 1

Registration		Test Date	

1. **INTRODUCTION**

This scheduled is applicable to the MD 600N helicopter equipped with the RR Allison 250-C47M engine. 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 Flight Test must be carried out by an experienced pilot acceptable to the CAA, in accordance with this schedule and the general guidance given in the CAA Handbook for Airworthiness Flight Testing. 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 current Certificate of Airworthiness 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 C of A in force, it is strongly recommended, for Check Flights 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 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. Consideration should be given to removing the dual controls if flying with an inexperienced observer.

Should there be any query about the Flight Test or its results, the local CAA Surveyor or the Helicopter Flight Test Section at 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 ink in the spaces provided.

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Paragraph

1. Pre-flight Info.
2. Loading
3. General Flight Info.
4. Pre-start Checks
5. Starting/Pre-flight Checks
6. Hover Checks
7. Performance Climb
8. Autorotation
9. Handling/ Engine power Check
10. Landing
11. Shut Down
12. Post-flight Action

Appendix 1 Hover Handling

Appendix 2 Autorevs

Fig 1 – 5 Climb Performance

1. Pre-Flight Information

Aircraft Variant	MD600N	Engine Variant	RR Allison 250-C47M

Registration		Engine Nr	
Airframe Nr		Hours total	
Airframe Hrs		TSO	
Landing Gear		E.g. High/low skid, flotation	
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. Additionally, it will be necessary to land and reduce weight to <3000lb enable the autorotative rotor rpm to be checked.

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	

4. Pre-Start Checks

		Satis.	Remarks
4.1	Carry out the normal external inspection		
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 (where fitted).		
	ASI		
	Rotor/N_P Tachometer		
	Torquemeter		
	TOT		
	N_1 Tachometer		
	Engine Oil Pressure		
	Engine Oil Temperature		
4.5	Freedom, range of travel, friction of :		
	Cyclic control		
	Collective control		
	Fuel flow control (collective twistgrip)		
	Flight idle stop		
	Yaw control		
	Fuel shut off control		
4.6	Select battery ON, check:		
	Correct self-test of EMIS, Dual Tacho and fuel contents		
	Battery voltage		
	Warning lamps and dimmer		
	Voice warning device		
4.7	Operate pilot and co-pilot cyclic beep trim in turn. Confirm satisfactory operation of longitudinal and lateral trim motors		

4.8 Pull FADEC c/b. Confirm:

FADEC SYSTEM MANUAL	Illuminated		
ECU FAIL	illuminated		
ECU MANUAL voice warning sounds			
Reset FADEC c/b and confirm cautions extinguish.			

<u>Complete pre-start checks as required</u>

5. <u>Starting</u>

5.1 Move throttle to idle position. Wait longer than 60 sec and attempt a start

Confirm starter latching inhibited		
Return throttle to shut-off position to reset starter latching		

5.2 Carry out a normal engine start. Note and record:

Residual TOT	°C
Max TOT	ºC
N_1 at start of rotor rotation (max 25%)	%
Satisfactory acceleration to idle	
Starter disengage > 50% N_1	

5.3 Carry out an ECU Manual check thus:

Confirm throttle is at idle and N_1 = 61±1%		

<u>WARNING</u> **<u>If the throttle is not at idle when MANUAL is selected, engine and rotor rpm may rise very rapidly</u>**

Select ECU mode switch to MANUAL			
Confirm	FADEC SYSTEM MANUAL	Illuminated	
"ECU MANUAL" voice warning sounds			
Open throttle **slowly** and confirm engine responds			
Return throttle to idle			
Select ECU mode switch to AUTO			
Confirm	FADEC SYSTEM MANUAL	extinguished	

5.4 Advance twistgrip to fully open and, with collective fully down, check

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

5.5 Select Engine Anti ice ON

Note TOT rise		ºC
Select engine Anti-ice OFF		
Note TOT fall		ºC

5.6 Select Cabin Heat ON (if installed)

Note TOT rise		°C
Confirm satisfactory heater operation		
Select Cabin Heat OFF		
Note TOT fall		°C

5.7 Snap the twistgrip to idle

Confirm engine does not flame out		
Allow to stabilise and record idle N_1 (61±1%)		%
Repeat with Co-Pilot twistgrip (if fitted)		
Open throttle fully. Slowly close throttle and confirm low rotor rpm audio at 95±1% N_R ***Return throttle to fully open.***		

5.8 Cyclic One-Way lock

At 100% N_R, move the cyclic beeper aft with no aft pressure on cyclic control. Confirm cyclic **does not** move		

5.9 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 17 kt (20mph)	Left		
	Right		
Rearwards flight to 17 kt			

6.2 Engine Power Check

With the aircraft in a low stabilised hover, confirm _____

Cabin Heat and Engine Anti-ice	OFF
Particle separator SCAV AIR	OFF
Engine bleed valve	CLOSED (if possible)
Electrical load	40A approx
Record the following when stabilised:	

P. Alt		ft	OAT		°C
Tq		%	TOT		ºC
N_P/N_R		%	N_1		%

Note: The engine power check results must be analysed and compared with the schedule data in the Flight Manual. See section 12 of this document

7. Performance, Maximum Continuous Power Climb

With the altimeter set to 1013 mb (29.91 in hg), climb at MAXIMUM CONTINUOUS POWER at V_y 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_1	105%
TOT	727ºC
Tq	530Q
Engine Bleeds	OFF (unless specifically required)
IAS	85kt @ SL reducing in accordance with FM Section 5

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

Time	*Alt*	*OAT*	*IAS*	*Tq*	*TOT*	*N_1*	*N_P/N_R*	*Eng*	
								Temp	*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 12 of this document.

8. Autorotation

See Appendix 2 for measurement of rotor rpm in autorotation

8.1 Perform a gentle entry to a steady autorotative descent at 85kt with the collective lever fully down.

Note: It may be necessary to reduce the engine speed to achieve a full "needles split" autorotation.

DO NOT EXCEED POWER-OFF ROTOR RPM LIMITATIONS (90⇒106.4%)

Note: Controllability on entry		

8.2 Carry out turns left & right in autorotation		

8.3 Carry out a rapid recovery from autorotation (N_P/N_R needles just joined) to approx 400Q Tq in approx 3 sec.

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

9. Handling

9.1 Cruise Checks

With all engine bleeds OFF, establish level flight at maximum continuous power ***(do not exceed V_{NE})***.

9.1.1 Stabilised level flight

Record the following when stabilised:

P. Alt		ft	N_1		%
OAT		°C	Fuel		Lb
Tq		%	AUW		Lb
TOT		ºC	IAS		kt

Note:			
	Vibration level		
	Control response		
	Lack of pedal creep		

Set collective friction to minimum.

9.1.2 Steep turns left & right (approx 30° at Max. Continuous Power)

Note:			
	Vibration level		
	Control response		
	Collective balance (friction released)		

Reset collective friction as desired.

9.1.3	Confirm satisfactory operation of both cyclic trim switches		

9.2 Maximum speed test

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

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

Note:			
	Vibration level		
	Control response		

9.2.2 Carry out gentle turns left & right (approx 10º)

Note:			
	Vibration level		
	Control response		
	No excessive cyclic or collective feedback		

9.3 Manual Engine Control

NOTE: The following must only be carried out in calm conditions
With the aircraft stabilised in level flight at aprox 90kt, carefully close the throttle until rotor rpm just starts to reduce.

Do not move the collective

Select ECU mode switch to MANUAL

Confirm FADEC SYSTEM MANUAL Illuminated

ECU MANUAL voice warning sounds

WARNING Be prepared to compensate for N_R variations

Confirm satisfactory manual control of engine/rotor rpm.

Ensure N_R/$_{NP}$ approximately 100%, and select ECU mode switch to AUTO

Return throttle to FLY detent

Confirm satisfactory return to automatic engine control

10. 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.

11. Shut down

11.1 Carry out a PMA integrity test thus:
Confirm $N_R/_{NP}$ > 85%

Pull FADEC c/b

Confirm [RESTART] Illuminates after30 sec [ ] [ ]

WARNING If the PMA has failed, the engine will go directly to manual due to total loss of electrical power. Be prepared to react to a possible rapid increase in N_R

Reset FADEC c/b

11.2 Confirm satisfactory functioning of the overspeed protection system thus:
Close throttle to idle
Open throttle slightly and depress OVSPD TEST for 1 – 10 sec
Confirm engine does not shut down [ ] [ ]

Close throttle to idle and carefully raise collective more than 10%. Depress OVSPD TEST as above
Confirm engine does not shut down [ ] [ ]

Lower collective

Confirm throttle at idle and N_1 = 61±1%, collective fully down.
Depress and hold OVSPD TEST for 15 sec.
Release and confirm engine does not shut down [ ] [ ]

Depress OVSPD TEST for <1 sec
Release and confirm engine does not shut down [ ] [ ]

Depress OVSPD TEST for 1-10 sec
Release and confirm engine shuts down satisfactorily. [ ] [ ]

Shut down time [ ]

11.3 Apply rotor brake at 41% N_R and confirm satisfactory performance [ ] [ ]

12. Post-flight Action

12.1 Performance Climb (see para 7)

Plot the data and determine the achieved rate of climb. The scheduled performance must be obtained from Fig 1 – 5 of this document and compared with the achieved performance.

Achieved RoC (a)		fpm
Scheduled RoC (b)		fpm
Delta ROC (b-a)		fpm

Tolerance = - 20 fpm, no action required, up to – 70 fpm investigation required but may be acceptable. Greater than – 70 fpm not acceptable.

12.2 Engine Power Check (see para 6.2)

Use the power check chart in the flight manual to analyse the engine condition

Observed Tq		psi
Schedule Tq		psi

12.3 Autorotation (see Appendix 2)

Use the information provided to determine the minimum scheduled autorevs.

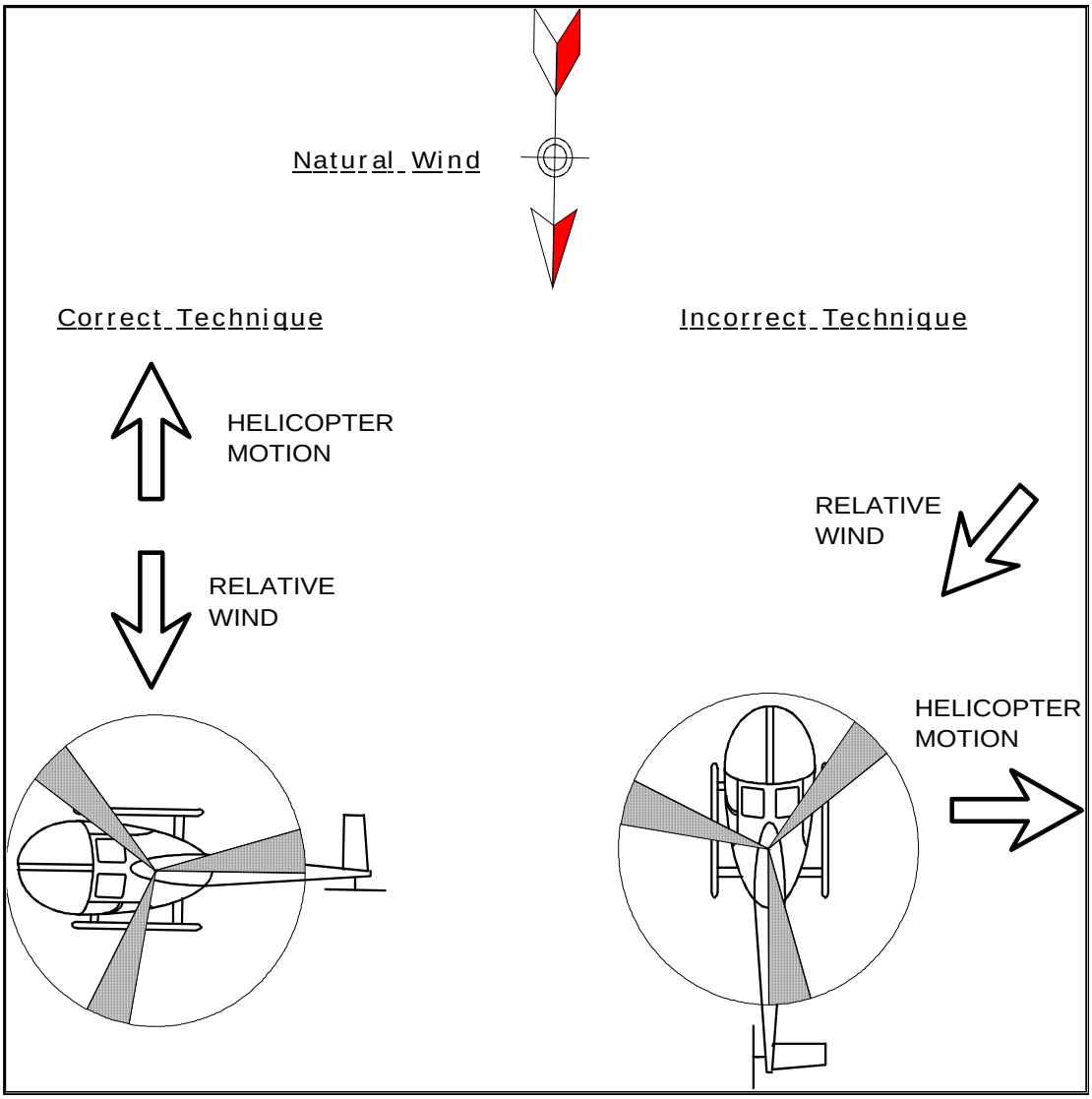
Achieved autorevs		%
Schedule autorevs		%

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.



Appendix 2

Rotor rpm in Autorotation

This test will normally be performed as a separate flight. The aircraft weight must be less than 3000lb

At an acceptable altitude, lower the collective to enter autorotation at 85 kt. Allow to stabilise with the collective fully lowered and record:

DO NOT EXCEED POWER-OFF ROTOR RPM LIMITATIONS (90⇒106.4%)

P. Alt	OAT	IAS	N_R	N_P	Fuel	AUW
Ft	ºC	Kt	Rpm	%	lb	lb

The following table is extracted from the MD600N Maintenance manual, Revision 23

AUW (lb)	Density Altitude (ft)					
	Sea level	1000	2000	3000	4000	5000
2500	93.8 - 95.8	94.6 - 96.6	95.4 - 97.4	96.3 - 98.3	97.1 - 99.1	98.0 - 100.0
2600	95.6 – 97.6	96.4 - 98.4	97.3 - 99.3	98.1 - 100.1	99.0 - 101.0	99.9 - 101.9
2700	97.4 - 99.4	98.2 - 100.2	99.1 - 101.1	100.0 - 102.0	100.9 - 102.9	101.8 - 103.8
2800	99.2 - 101.2	100.0 - 102.0	100.9 - 102.9	101.8 - 103.8	102.7 - 104.7	103.6 - 105.6
2900	101.0 - 103.0	101.8 - 103.8	102.7 - 104.7	103.6 - 105.6	104.6 - 106.4	
3000	102.7 - 104.7	103.6 - 105.6	104.5 - 106.4	105.4 - 106.4		

NOTE: Record achieved and schedule autorevs in section 12 of this document

Figure 1. MD-600N Maximum Continuous Power (727 deg C or 530 Q) Rate of Climb
Best Rate of Climb Airspeed, Particle Separator Installed - ISA + 20 deg C

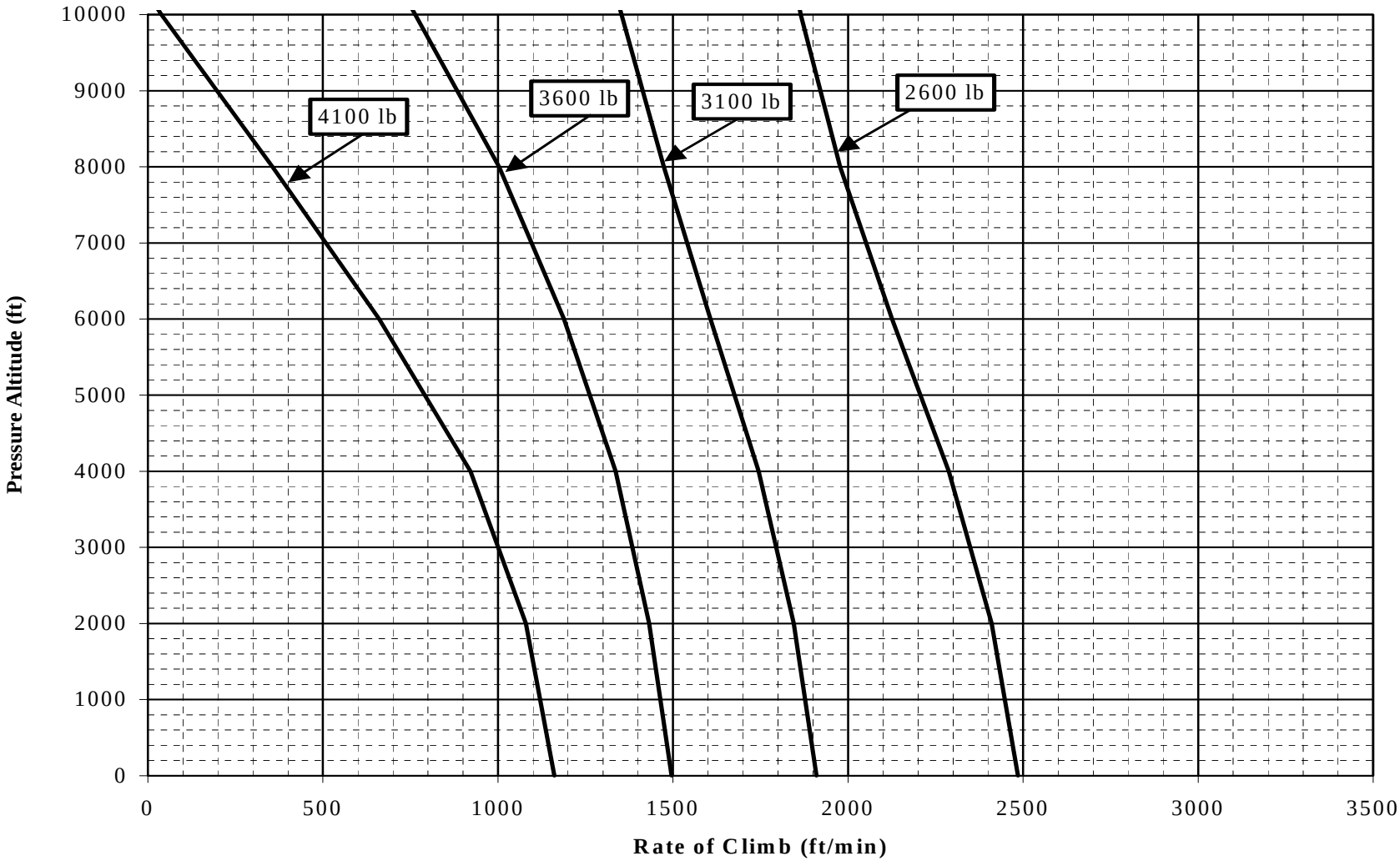


Figure 2. MD-600N Maximum Continuous Power (727 deg C or 530 Q) Rate of Climb
Best Rate of Climb Airspeed, Particle Separator Installed - ISA + 10 deg C

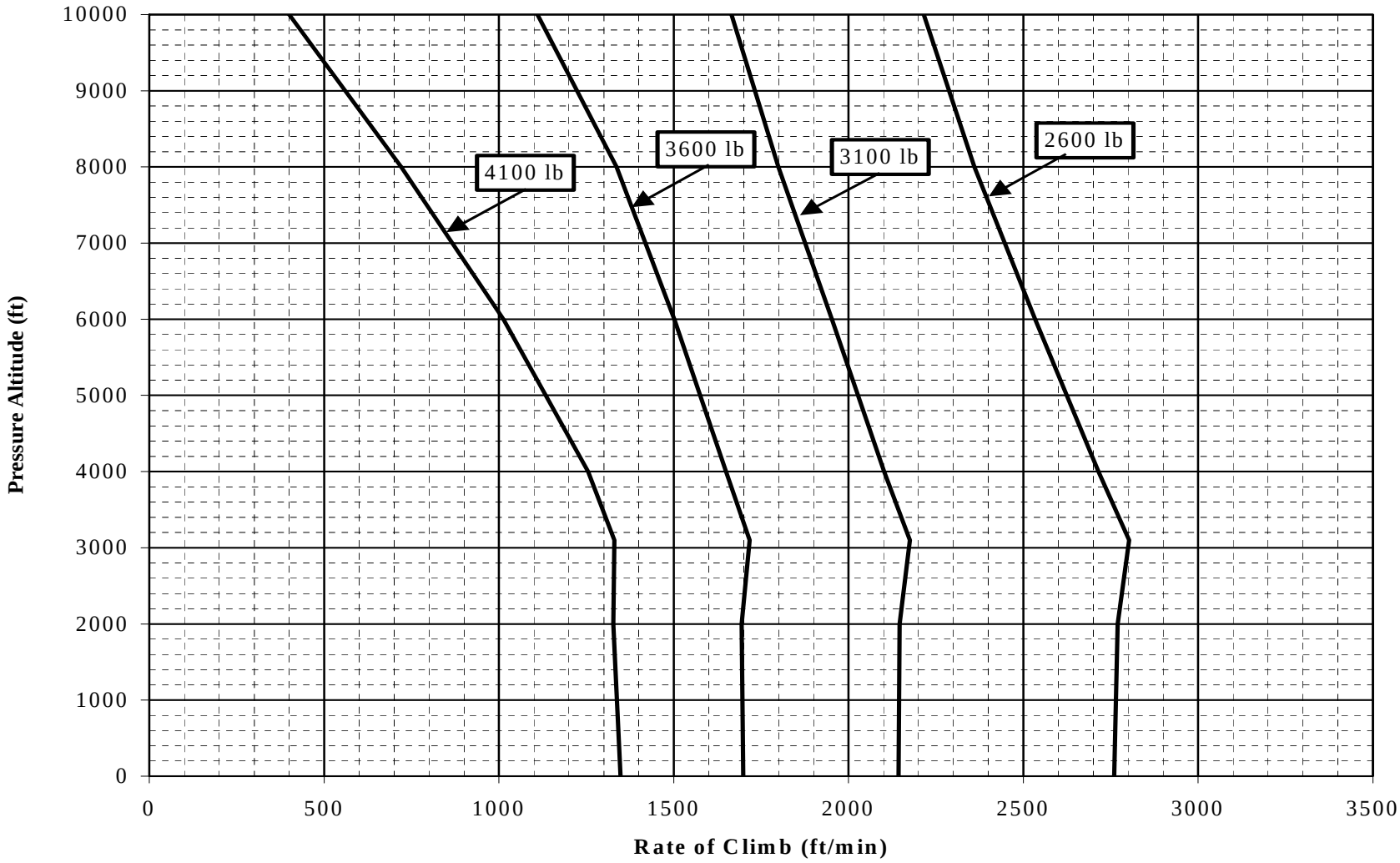


Figure 3. MD-600N Maximum Continuous Power (727 deg C or 530 Q) Rate of Climb
Best Rate of Climb Airspeed, Particle Separator Installed - ISA

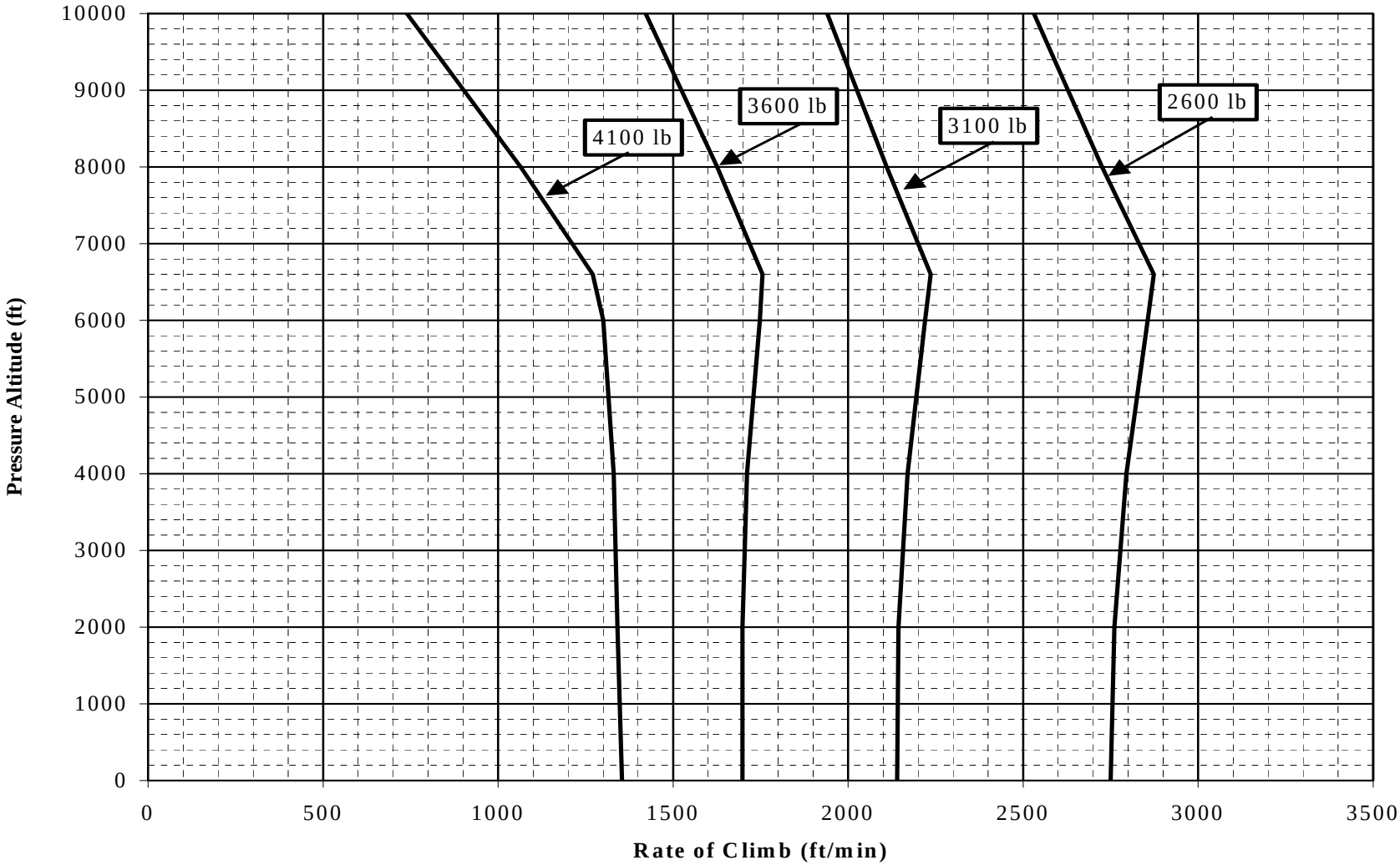


Figure 4. MD-600N Maximum Continuous Power (727 deg C or 530 Q) Rate of Climb
Best Rate of Climb Airspeed, Particle Separator Installed - ISA - 10 deg C

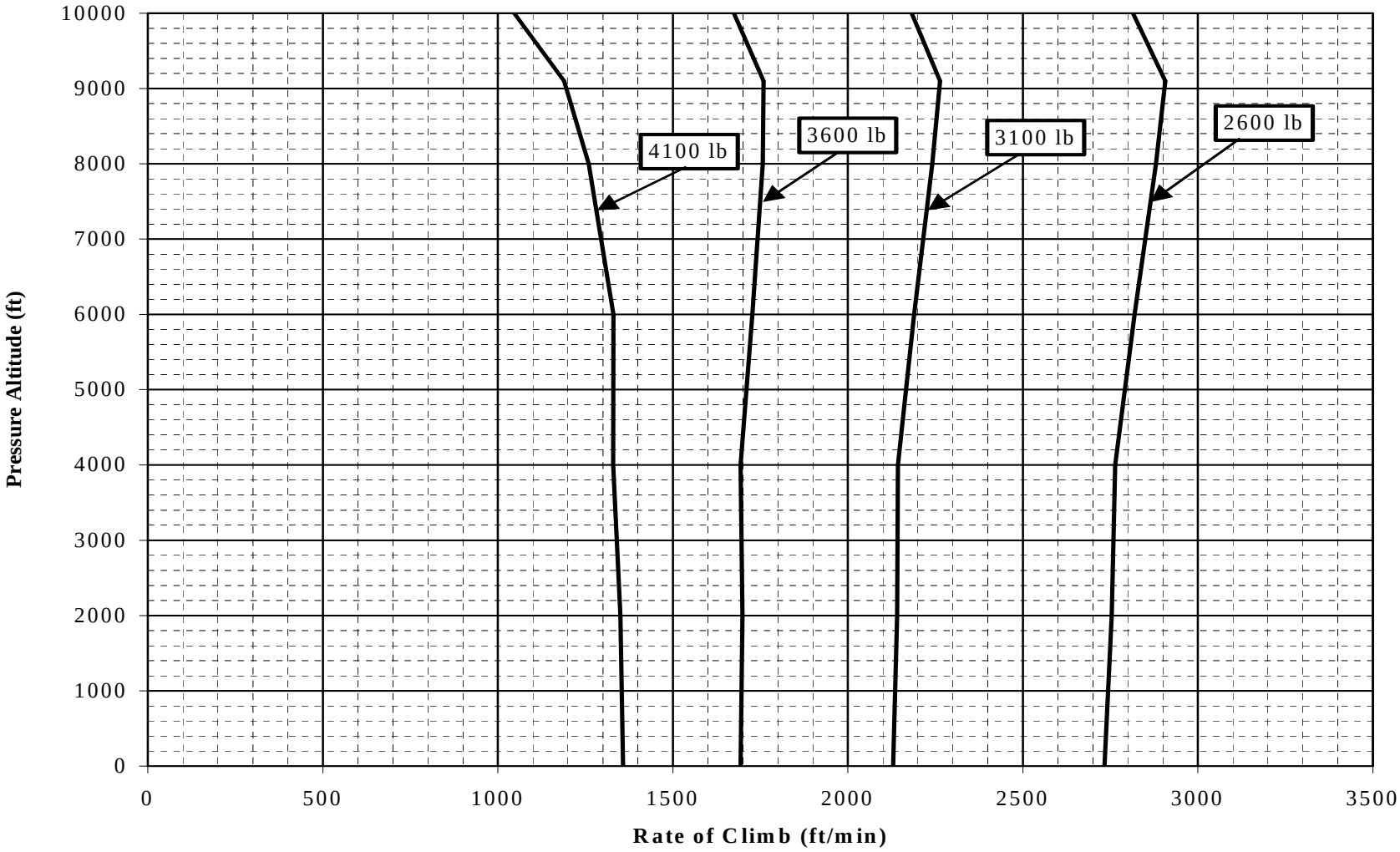
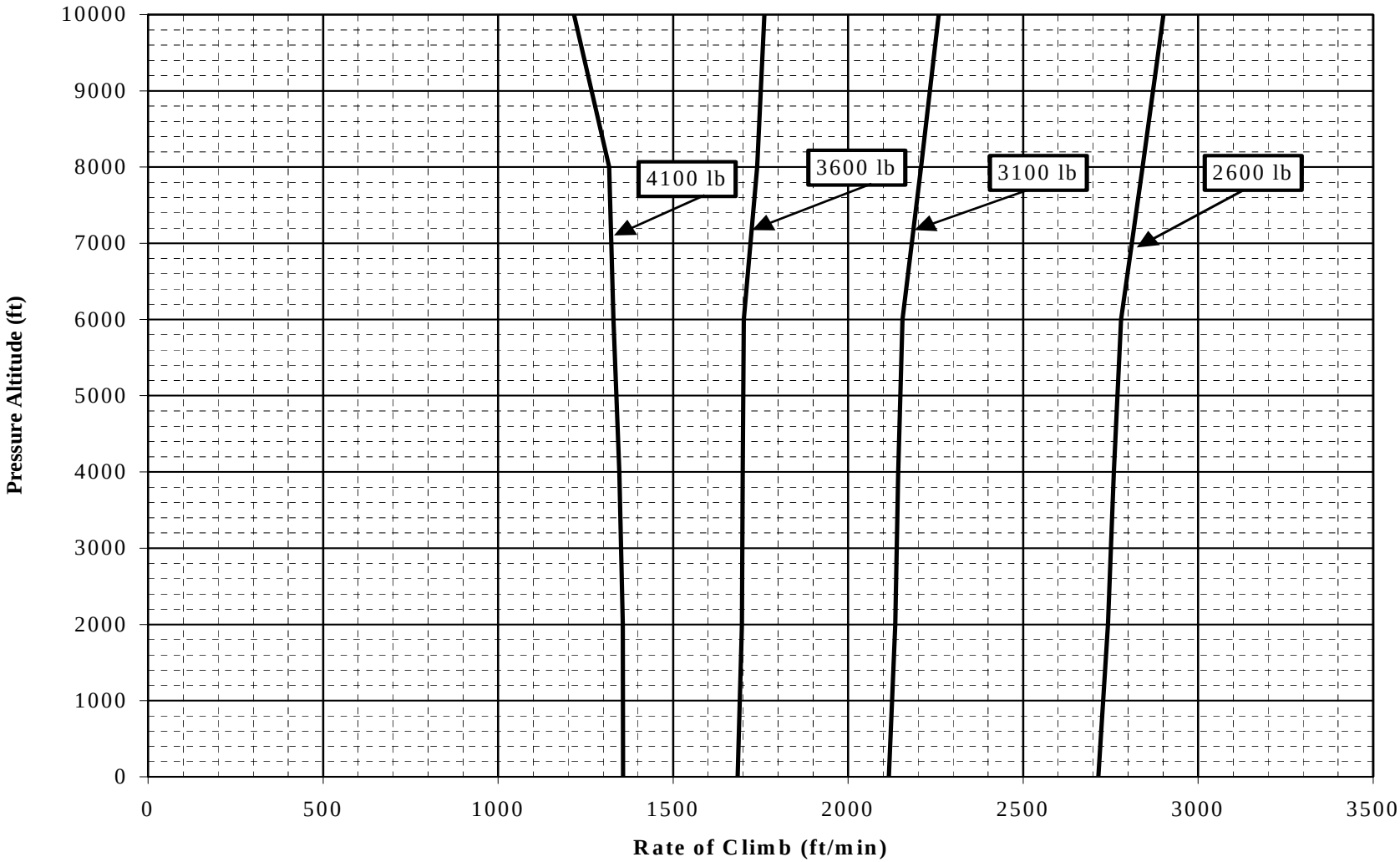
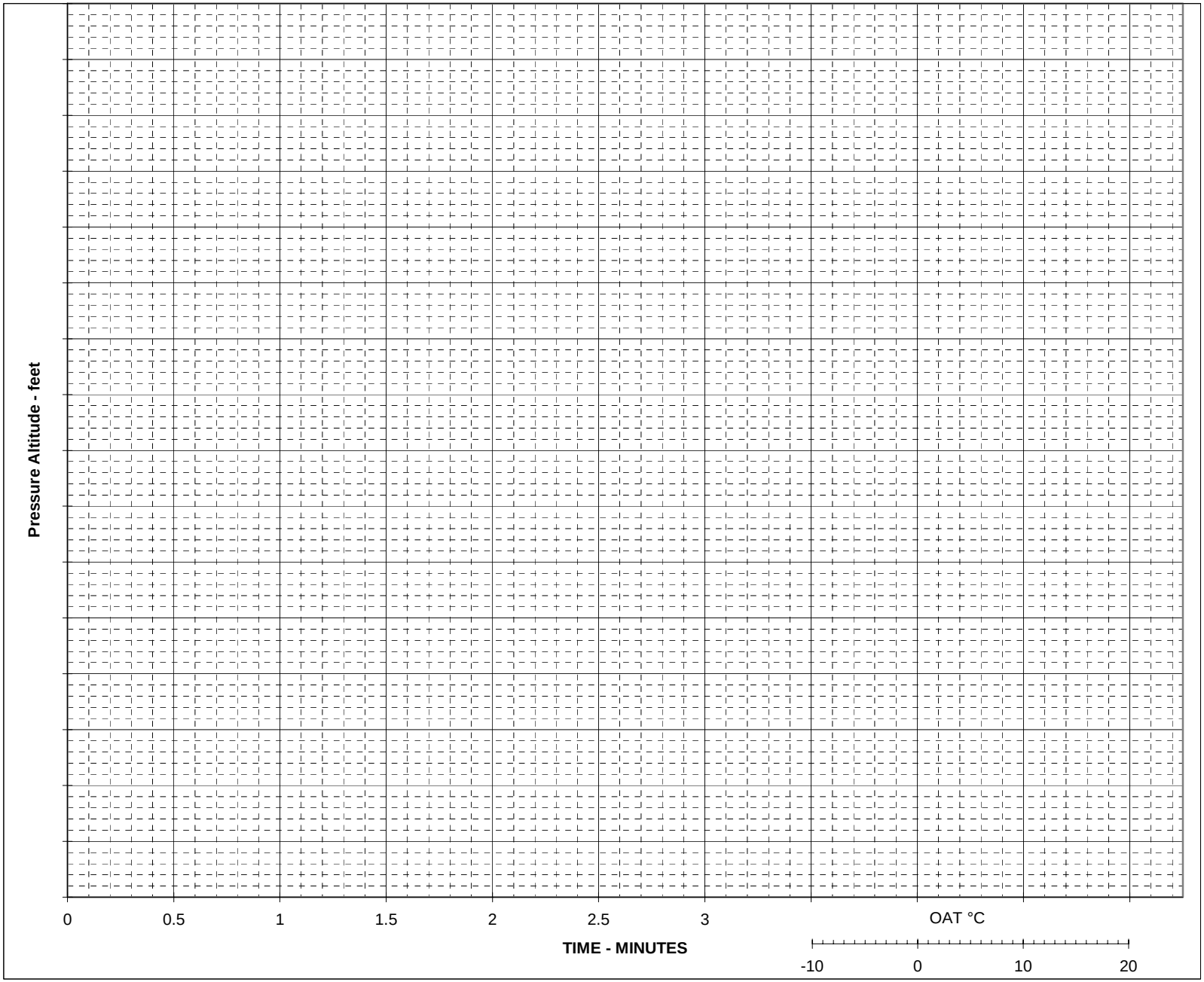


Figure 5. MD-600N Maximum Continuous Power (727 deg C or 530 Q) Rate of Climb
Best Rate of Climb Airspeed, Particle Separator Installed - ISA - 20 deg C





AIRCRAFT TYPE
REGISTRATION
DATE OF TEST

Mean Weight	_____ lb
Mean Altitude	_____ feet
Mean OAT	_____ °C
SCHEDULED ROC	
Basic	_____ ft/min
Correction (if applicable)	_____ ft/min
Correction (if applicable)	_____ ft/min
Final SROC	_____ ft/min
Observed ROC	_____ ft/min
Difference from Scheduled (Observed ROC minus Final SROC)	_____ ft/min

Record of changes

Issue 1 - initial issue August 2006.