CHECK FLIGHT CERTIFICATE

EMBRAER 145
Allison A 3007A and A1/1 Engines

CFS 296 Issue 1

Registration:

Date:	Crew:	Observer:

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	-80	-100	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 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 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

EMBRAER 145 CFS 296 Issue 1
Allison A 3007A and A1/1 Engines

Operator/Maintenance Organisation		
Aerodrome		
Altitude	Temperature	QFE/QNH
Registration		
Flight Date		
Pilots		
Observer		

INTRODUCTION

This schedule is applicable only to Embraer 145 aircraft. The schedule is based on the assumption that the everyday operation of the aircraft serves as a continuous check on the functioning of all normal services. On these test flights, however, the crew are expected generally to monitor the behaviour of all equipment and to report any unserviceable items. In addition to completing all the required tests in the schedule, any characteristics which are considered unsafe or undesirable must be recorded.

Except where otherwise indicated the flight techniques are those associated with normal operation of the aircraft, for example yaw damper engaged. Fuel symmetry must be maintained, particularly during and after the single engine climbs.

MINIMUM CREW

The minimum flight crew shall be increased by one observer to record the results of the tests. The pilot conducting the tests shall be specifically approved by the CAA(SRG) for carrying out Check Flights on Embraer 145 aircraft.

PASSENGERS

While it is legal to carry passengers on a test flight of an aircraft with a valid Certificate of Airworthiness, the practice is not recommended. If passengers are carried, however, they should be informed that the risk is greater than on an ordinary flight.

TEST SCHEDULE

The pilot conducting the tests must be familiar with the contents of this schedule before flight. All members of the required minimum crew must be provided with copies of the schedule for use in flight.

The data contained in this schedule is correct at the time of writing, but might not be in agreement with subsequent Flight Manual amendments; in cases of conflict, the Flight Manual is overriding, and CAA(SRG) Flight Department must be informed. The altitude conditions in the schedule must be observed to ensure adequate safety and validity of the test results. The tests should, if possible, be carried out in the sequence as written.

PRE-FLIGHT PREPARATION

Oxygen shall be available to all persons on board. All passenger oxygen drop out masks should be latched before the flight.

LOADING AND CALCULATION OF WEIGHT

The aircraft is to be loaded to approximately 16000 Kg, with the C.G. within the Flight Manual limits.

Record:	- Ramp weight		Kg
	- cg		% MAC

PRE-FLIGHT INFORMATION

Record:	- total airframe hours	

Record:		**Port**	**Starboard**
- each engine serial	S/N		
and total hours run	Hrs		

1. PRE-FLIGHT CHECKS

1.1 Take-off configuration warning checks:

Note: Hydraulic power is required for the speed brake functions.

Parking Brake	SET
Flaps	9°
Speed Brake Lever	CLOSE
Pitch Trim	T.O. RANGE

Press TOCW Test Button

Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Brakes'	SAT/UNSAT

Release Parking Brake and hold aircraft on brakes for the remainder of the test.

Flaps	UP	
Press TOCW Test Button.		
Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Flaps'	SAT/UNSAT
Flaps	22°	
Press TOCW Test button		
Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Flaps'	SAT/UNSAT
Flaps	9°	
Speed Brake Lever	Open	
Press TOCW Test Button		
Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Spoiler’	SAT/UNSAT
Speed Brake Lever	Close	
Pitch Trim	Outside T.O. Range ND	
Press TOCW Test Button		
Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Trim'	SAT/UNSAT
Pitch Trim	Outside T.O. Range NU	
Press TOCW Test Button		
Check:	EICAS Message	SAT/UNSAT
	Audio 'Take-off - Trim'	SAT/UNSAT

Reset Parking Brake, Flaps and Trim as required.

Hydraulic power as required.

1.2 Back Up Pitch Trim

Exercise the pitch trim using the Backup Pitch Trim. SAT/UNSAT

1.3 Crew Oxygen Masks

Check crew oxygen masks for flow and intercomm. SAT/UNSAT

2. AFTER ENGINE START

2.1 Take-Off Configuration Warning

With aircraft configured for take-off but with parking brake ON, advance each power lever in turn until TOCW activates.

Check: EICAS Message SAT/UNSAT

2.2 Emergency Brakes SAT/UNSAT

Check emergency brakes work satisfactorily while taxying in a level area clear of obstructions.

SAT/UNSAT

LEAVE APU RUNNING

3. TAKE-OFF

Carry out a normal take-off using MAX-TO Thrust.

Record any unusual characteristics:

Set 8000 ft landing altitude in preparation for later test.

4. PERFORMANCE

Start Altitude 3000 ft agl - FL60

4.1 Take-off Climb

Carry out an engine out take-off climb for 5 minutes, on a constant heading, clear of cloud and significant turbulence. Commence the climb from not below 3000 ft above terrain. Start recording when in a stabilised trimmed condition at the scheduled speed using not more than 5 degrees bank towards the operative engine. Aim to maintain IAS within 2 knots of the scheduled speed.

Configuration	Flap	9°
	Gear	UP
	Speed	V2 for weight and test altitude (Fig 1)
	No.1 Engine	Idle (thrust lever fully closed)
	No.2 Engine	MAX-TO (Fig 2)
	Engine Bleed Valves	OFF
	Pressurisation	ON (from APU)
	Airframe and Engine Anti-ice	OFF
	Captains Altimeter	Set to 1013 mb

Engine Idling Take-off Climb

			TARGETS
RAMP WEIGHT	Kg		
FUEL GONE	Kg	N_1%	
START CLIMB WEIGHT	Kg	V_2 KIAS	

TIME	ALTIMETER ft	ASI P1 KIAS	SAT °C	No.2 N_1 %
0				
0.5				
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

Trim Positions Stab [ ] Aileron [ ] Rudder [ ]

Bank Angle [Deg. L/R]

ENGINE DATA AT 3 MINUTES

N_1%		FUEL FLOW kg/hr	
ITT °C		OIL PRESSURE psi	
N_2%		OIL TEMPERATURE °C	

RAMP WEIGHT	Kg
FUEL GONE	Kg
END CLIMB WEIGHT	Kg

AVERAGE CLIMB WEIGHT [Kg]

ASI COMPARISON AT ONE INSTANT

P1	P2

(max difference 5 kts)

WEATHER [ ]

4.2 Engine Out En-Route Climb

Start above FL150

Set No.2 engine at Flight Idle for at least 3 minutes before shutting it down.

Carry out en-route climb as follows:

Flap	UP
Gear	UP
Speed	One engine En-Route climb speed (Fig 3)
No.1 Engine	CON
No.2 Engine	Windmilling
Air Conditioning	From No. 1 Bleed
Airframe and Engine Anti-ice	OFF
Captains Altimeter	Set to 1013 mb

Engine Out En-Route Climb

			TARGETS
RAMP WEIGHT	Kg		
FUEL GONE	Kg	N_1%	
START CLIMB WEIGHT	Kg	Speed KIAS	

TIME	ALTIMETER ft	ASI P1 KIAS	SAT °C	No. 1 N_1 %
0				
0.5				
1.0				
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

Trim Positions Stab [ ] Aileron [ ] Rudder [ ]

Bank Angle [Deg. L/R]

ENGINE DATA AT 3 MINUTES

N_1 %		FUEL FLOW kg/hr	
ITT °C		OIL PRESSURE psi	
N_2%		OIL TEMPERATURE °C	

RAMP WEIGHT	kg
FUEL GONE	kg
END CLIMB WEIGHT	kg

AVERAGE CLIMB WEIGHT [kg]

ASI COMPARISON AT ONE INSTANT

P1	P2

(max difference 5 kts)

WEATHER [ ]

5. **NO. 2 ENGINE RELIGHT** **Above 10,000 ft**

On completing the climb, with ITT below 210°C, relight the No.2 engine at 150 KIAS using starter assist technique.

Windmilling N_1 [%] N_2 [%]

ITT Pre-start		°C
Time to ITT rise		sec.
Max ITT		°C
Time to stabilised Flight Idle		sec.
Any abnormality during relight, spool up		SAT/UNSAT

APU **Shutdown**

6. **PRESSURISATION - Part 1** FL 180

6.1 Cabin Altitude Warning

LANDING ELEVATION 14000 ft
Manual Controller HIGH RATE

Record : Cabin Altitude turns Amber

[ft] SAT/UNSAT
8100 - 9900 ft

Cabin Altitude turns Red

[ft] SAT/UNSAT
Above 10,000 ft

EICAS Message and Audio SAT/UNSAT

6.2 **Passenger Oxygen**

Continue to depressurise.

Check: Passenger oxygen deploys (it may be necessary to set Pressurisation Mode selector button to MANUAL to disable altitude limiter function.

Cabin Altitude [ft] SAT/UNSAT

Above 14,000 ft

Re-pressurise using 'MAN' mode, then re-establish normal pressurisation and set a low landing altitude.

Record : Position of any passenger masks which failed to deploy.

[ ]

SAT/UNSAT

Commence a climb to FL300 once control of pressurisation is assured

7. **CONTROLS AND TRIMMERS**

While in climb check flying controls for break out, backlash, weight and response. SAT/UNSAT

Check Backup Trim SAT/UNSAT

8. **PRESSURISATION - Part 2** [FL300]

When pressurisation is stable in AUTO
Record normal maximum cabin differential

[ ] psi SAT/UNSAT

7.7 ± 0.1

Re-establish normal pressurisation.

9. **HIGH MACH** **FL300 to FL270**

Increase speed slowly to 0.79M in a shallow dive, using a high thrust.
Do not trim in pitch beyond M_{MO}.

Record : IMN when 'HIGH SPEED' voice message sounds.

Capt.	M	SAT/UNSAT
F/O	M	SAT/UNSAT

0.78 - 0.79

Aircraft behaviour (no undue trim changes, buffet or vibration). SAT/UNSAT

With Thrust Levers forward of 50°.
Speed Brake Lever OPEN

Check no speed brake extension. SAT/UNSAT
Check EICAS Message 'SBK LVR DISAGREE' SAT/UNSAT

Retard Thrust Levers below 50°.
Check Speed brakes extend. SAT/UNSAT

Speed Brake Lever CLOSE

10. **APU RELIGHT** **FL250**

Any convenient airspeed.
Perform an APU Start.

Record:				
	Altitude		ft	
	SAT		°C	
	Maximum EGT		°C	
	Time to stable rpm		sec .	SAT/UNSAT

11. No.1 ENGINE SHUTDOWN AND RESTART — FL240

Set Flight Idle on No.1 engine for at least 3 minutes before shutting it down.
Speed 250 KIAS.
Crossbleed CLOSED
With ITT below 210°C, and N_2 above 10%, restart No.1 engine using the windmill start technique.

Windmilling N_1 [ ] % N_2 [ ] %

Pre-start ITT		°C
Time to ITT rise		sec.
Max ITT		°C
Time to stabilised Flight Idle		sec.
Any abnormality during relight, spool up		SAT/UNSAT

Leave APU running or shut down as required.

12. HIGH IAS — Below FL240

Carry out an acceleration away from significant turbulence using a convenient high power setting.

Slowly increase speed to 330 KIAS, recover using speed brake. Trim up to V_{MO} but not thereafter.

Check and record:

IAS at warning [ ] [ ] KIAS SAT/UNSAT
320-330 KIAS

Flying controls for weight and response SAT/UNSAT
(use only small control deflections)
General airframe behaviour SAT/UNSAT
Operation of speedbrake SAT/UNSAT
Engine behaviour when thrust levers closed SAT/UNSAT

13. FLAP AND GEAR FUNCTIONING — FL150

Airspeed 245 KIAS

Time Gear Extension [ ] sec. SAT/UNSAT
9.5 sec. max.

At 140 KIAS, extend the flaps from UP to 45°.

Record: Extension Time [ ] sec.
30 sec. ± 3
SAT/UNSAT

Retract flaps and gear.

14. STALLING FL150 to 10,000 agl

Prior to each stall, trim the aircraft at the trim speed given in Fig. 4 with Thrust Levers at Flight Idle.

Reduce speed at 1kt per second until the stick pusher actuates.

Intentional stalling should be abandoned if there is any evidence of malfunctioning of the stall protection system and, in particular, the pilot should take stall recovery action and establish safe flight conditions if either of the following conditions are encountered:

1. The stall warning has not operated by 5kts below the scheduled stall warning speed

2. The stick push (stall identification) has not operated by 3kts below the scheduled stall speed

14.1 Flap 0°, Gear Up

Record:

Ramp Weight kg		
Fuel Gone kg		
Test Weight kg		
Scheduled Trim Speed		
Indicated Trim Speed	Capt.	F/O
Stabiliser Setting		
Stall Warning	Scheduled	Achieved
Stick Push	Scheduled	Achieved

Stall Characteristics:

SAT/UNSAT

14.2 Flap 9°, Gear Up

Record:

Ramp Weight kg				
Fuel Gone kg				
Test Weight kg				
Scheduled Trim Speed				
Indicated Trim Speed	Capt.		F/O	
Stabiliser Setting				
Stall Warning	Scheduled		Achieved	
AS APPLICABLE	*NO SPS ADVANCE*	*SPS ADVANCE*	*NO SPS ADVANCE*	*SPS ADVANCE*
Stick Push	Scheduled		Achieved	
AS APPLICABLE	*NO SPS ADVANCE*	*SPS ADVANCE*	*NO SPS ADVANCE*	*SPS ADVANCE*

Stall Characteristics:	SAT/UNSAT

14.3 Flap 45° Gear Down

Record:

Ramp Weight kg		
Fuel Gone kg		
Test Weight kg		
Scheduled Trim Speed		
Indicated Trim Speed	Capt.	F/O
Stabiliser Setting		
Stall Warning	Scheduled	Achieved
Stick Push	Scheduled	Achieved

Stall Characteristics:	SAT/UNSAT

15. **GEAR EMERGENCY FUNCTIONING** **Approx. 10,000 ft**

Airspeed	150 KIAS	
Flaps	9°	
Gear Elec Override Switch	DOORS	
Wait 3 sec.		
Gear Elec. Override Switch	GEAR	
Check:	Gear Down	SAT/UNSAT
Landing Gear Lever	DN	
Gear Elec. Override Switch	NORMAL	
Landing Gear Lever	UP	
Free Fall Lever	ACTUATE	SAT/UNSAT

Record: Gear Extension Time [ ] sec.

30 sec. Max SAT/UNSAT

Check : 3 Amber DN SAT/UNSAT

Landing Gear Lever	DN	
Check : 3 Green DN		SAT/UNSAT
Free Fall Lever	STOW	
Landing Gear Lever	UP	

16. **ENGINE ACCELERATIONS** **Recommended FL60**
Not above FL80

Engine Bleeds	CLOSED
Gear	DN
Flaps	45°
Speed	V_{REF} for the weight
Thrust Rating	MAX - TO

Record:

Altitude ft	**SAT °C**	**Target MAX-TO N_1%**	**EICAS MAX TO Target N_1**

On each engine in turn, retard to flight idle, note idling N_1 and N_2 and rapidly move thrust lever to THRUST SET.

Record:

	No.1	**No.2**
Idle N_1 %		
Idle N_2 %		
Acceleration Time (sec)		

SAT/UNSAT

17. LANDING

Carry out normal landing and record any unusual handling characteristics. SAT/UNSAT

18. POST-FLIGHT

18.1 Placards

Check all cockpit placards and warning notices for presence, accuracy and legibility. SAT/UNSAT

18.2 Performance Climb Analysis

Plot the results of the performance climbs and compare the measured rates of climb with the gross data scheduled in the Flight Manual. Attach plots to report and summarise results on the front sheet.

18.3 Flight Test Certificate

Complete the statement of defects and sign the Flight Test Certificate and state whether or not the aeroplane needs to be reflown.

18.4 Pass the completed Flight Test report to the Regional Manager of the CAA Regional Office.

Figure 1

Flap 9º V_2

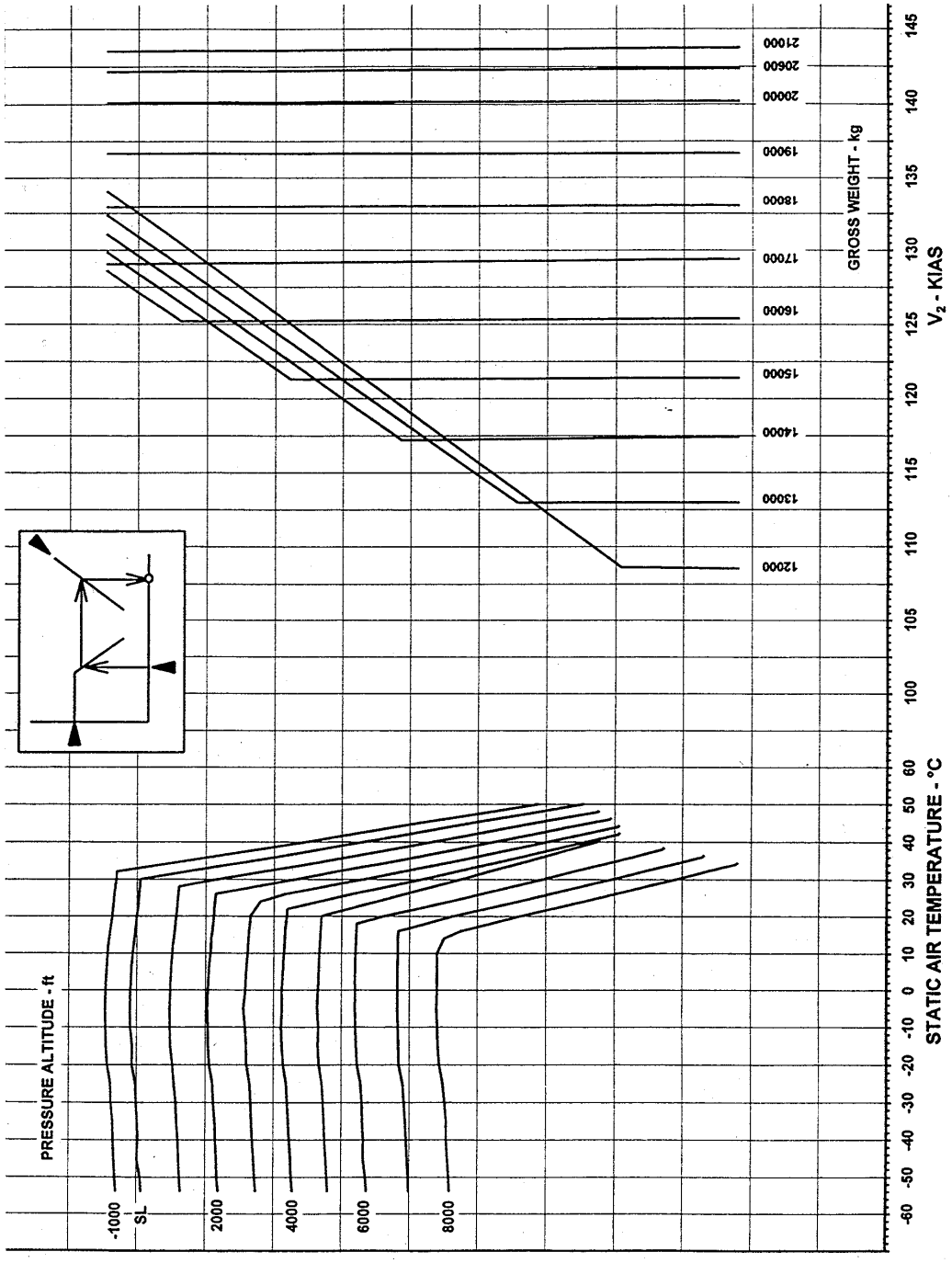

Figure 2

MAX T-O

Bleed CLOSED

Anti- Ice OFF

125 KIAS

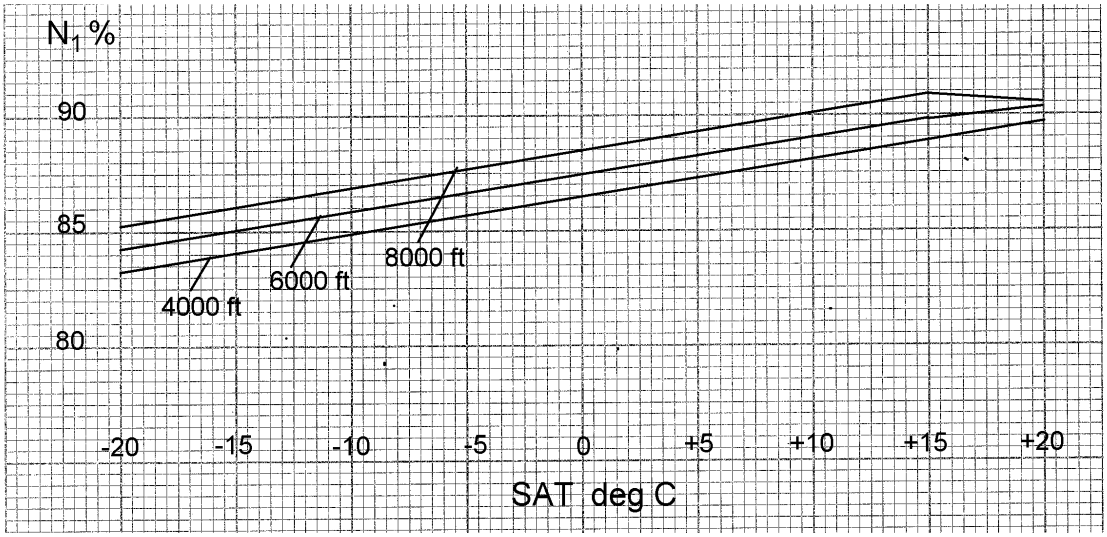

Figure 3

En-route Climb Speed

Weight Kg	$V_{E/R}$ KIAS
16000	152
15500	150
15000	147
14500	145
14000	142
13500	140
13000	137
12500	135
12000	132

Figure 4

Stall Trim, Shaker and Pusher Speeds

Speeds based on cg 16% MAC. Reduce shaker and pusher speeds by 1 Kt /10% MAC aftward shift.

** Increase Flap 9º Gear Up Shaker and Pusher Speeds by +6 Kt for 'Icing Reset'

Tolerance on Achieved speeds ± 3kt

	Flap 0 Gear Up			Flap 9 Gear Up **			Flap 45 Gear Down		
Weight Kg	**Trim KIAS**	**Shaker KIAS**	**Pusher KIAS**	**Trim KIAS**	**Shaker KIAS**	**Pusher KIAS**	**Trim KIAS**	**Shaker KIAS**	**Pusher KIAS**
16000	140	120	113	126	107	102	120	102	97
15500	138	118	111	124	105	100	118	100	95
15000	136	116	109	122	104	99	116	99	94
14500	133	114	107	120	102	97	114	97	92
14000	131	112	106	118	100	95	112	96	91
13500	129	110	104	116	99	94	110	94	89
13000	126	108	102	114	97	92	108	92	87
12500	124	106	100	112	95	90	106	90	86
12000	122	104	98	110	93	89	104	89	84