

CHECK FLIGHT CERTIFICATE



AIRBUS A300-605R

CFS 305 Issue 1

Registration:

Date:	Crew:	Observer:
-------	-------	-----------

Performance	Climb #1	Climb #2	
Average Weight			Airfield:
Average Altitude			Start Weight Kg/Lbs*:
Average Temp.			Takeoff cg:
Speed			Performance: SATIS/UNSATIS/NOT APPLICABLE* <i>(delete as applicable)*</i>
Achieved Rate		fpm	
Scheduled Rate		fpm	
Margin		fpm	
Permitted Margin	-80	-120	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 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



AIRBUS A300-605R (with GE CF6-80C2 A5 engines)

CFS 305, ISSUE 1

Registration	
Flight Date	

INTRODUCTION

This schedule is applicable only to Airbus A300-605R 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.

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 airworthiness flight testing of Airbus A300-605R 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.

OXYGEN

Oxygen shall be available to all persons on board. All Passenger Service Unit oxygen mask covers should be taped before flight to allow the doors to open but to prevent full deployment of the masks.

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 Test 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.

LOADING

The aircraft is to be loaded with full wing tanks and 2 tonnes in the centre tank with cg as convenient within normal limits.

Record:

Ramp Weight	lb/kg
Ramp CG	% MAC

PRE-FLIGHT INFORMATION

Record: - Total airframe hours

Record:

- Engine serial no.

Port	Starboard

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 when aircraft handling is being assessed.

1. PRE FLIGHT CHECKS

1.1 Before Starting Engines

1.1.1 Flight deck placards, colour coding and labelling

Check the following for presence, legibility and accuracy :

Airframe limitations placards SAT/UNSAT

Engine instrument colour coding SAT/UNSAT

Labelling of controls, instrument panels and circuit breaker panels. SAT/UNSAT

Identification of circuit breakers. Check that the following C/Bs (and only these) are identified by distinctive caps:

L O/Head 21VU C2 C3 F2 F3 F4 J3 SAT/UNSAT
R O/Head 22VU B19 C23 C24 F18 F28

Record any unsatisfactory items.

--

1.1.2 Hydraulic Power

Carry out the following checks with the APU running to provide electrical power and pressurisation of the hydraulic reservoirs:

(a) Check AIR PRESS LO lights out in RSVR indicators SAT/UNSAT

(b) Select ELEC PUMPS ON

(c) Check correct indications on ECAM and green system pressure 2800-3200 psi. SAT/UNSAT

(d) Select green/blue PTU switch ON

(e) Check correct indications on ECAM and blue system pressure 2800-3200 psi SAT/UNSAT

(f) Select - green/blue PTU switch OFF

(g) Select green/yellow PTU switch ON

(h) Check correct indications on ECAM and yellow system pressure 2800-3200 psi SAT/UNSAT

(i) Select green/yellow PTU switch OFF

(j) Select ELEC PUMPS off

1.1.3 Standby Generator

Check the standby generator supplies both AC and DC power as follows:

ELECTRICAL NETWORK Supplied by External pwr or APU

If APU is not running: APU MASTER SW.. Check OFF

BAT FLOW BARS..... Check extinguished

GREEN HYD ELEC PUMPS ON

PTU Check OFF

FUEL PUMPS Check All OFF

STBY GEN OVRD

Check:

GEN FAULT light Extinguished

DC:

Using the ELEC IND DC rotary selector, check:

ESS BUS 22-29V (note ESS BUS may be orange on ECAM ELEC DC page)
SAT/UNSAT

ESS TR current Approximately 0 SAT/UNSAT

BAT FLOW BARS extinguished SAT/UNSAT

AC:

EMER BUS green on the ECAM ELEC AC page
SAT/UNSAT

AC EMER ON INV light is extinguished SAT/UNSAT

STBY GEN AUTO

GREEN HYD ELEC PUMPS OFF

1.1.4 Stall Warning and Slat Retraction Interlock

Carry out the following checks with the APU running to provide electrical power and green hydraulic pressure:

- (a) - Select slats/flaps 15/0
- Press and hold α probe TEST 1 on lateral panel
- Check - both stick shakers and stall audio warning operating. SAT/UNSAT
- Wait 3 seconds.
- move slat/flap lever to 0/0 position
- Check - α LOCK caption appears on SFPI SAT/UNSAT
- Return the slats/flaps lever to 15/0
- Release the α probe TEST 1 switch
- (b) - Press and hold α probe TEST 2 on lateral panel
- Check - both stick shakers and stall audio warning operating. SAT/UNSAT
- Wait 3 seconds.
- move slat/flap lever to 0/0 position
- Check - α LOCK caption appears on SFPI SAT/UNSAT
- Return the slats/flaps lever to 15/0
- Release the α probe TEST 2 switch
- Slats/flaps as necessary

1.2 After Starting Engines (APU kept running)

1.2.1 N₁ limit computer

Record:

Airfield pressure altitude on 1013 mb

	ft
--	----

OAT

	°C
--	----

Select - T.O. mode on N₁ limit computer
- engine air bleeds as indicated below

Record - scheduled and indicated N₁ limits

<i>Bleeds</i>	<i>Scheduled N₁</i>	<i>Indicated N₁</i>
All Off		
Conditioning On		
Conditioning and Nacelle Anti-Ice On		

Limits: scheduled ± 0.5% N₁ SAT/UNSAT

Reset all bleeds as required.

1.2.2 Servo Control Shut Off Levers

(a) Select - blue SERVO CTL switch to OFF

Check - blue servo controls LO PR illuminated and associated ECAM caution appears. SAT/UNSAT

Select - blue SERVO CTL TEST on lateral panel

Check - the JAM light can be illuminate by sharply moving the controls in each of the three axes SAT/UNSAT

Select - blue SERVO CTL switch to ON

(b) Select - green SERVO CTL switch to OFF

Check - green servo controls LO PR illuminated and associated ECAM caution appears. SAT/UNSAT

Select - green SERVO CTL TEST on lateral panel

	Check - the JAM light can be illuminate by sharply moving the controls in each of the three axes	SAT/UNSAT
	Select - green SERVO CTL switch to ON	
(c)	Select - yellow SERVO CTL switch to OFF	
	Check - yellow servo controls LO PR illuminated and associated ECAM caution appears.	SAT/UNSAT
	Select - yellow SERVO CTL TEST on lateral panel	
	Check - the JAM light can be illuminate by sharply moving the controls in each of the three axes	SAT/UNSAT
(d)	Select - green SERVO CTL switch to OFF	
	Check - dual SERVO CTL LO PR warning on ECAM and continuous repetitive chime	SAT/UNSAT
(e)	Select - blue SERVO CTL switch to OFF	
	Check - all SERVO CTL LO PR captions are extinguished (note SERVO CTL switches will show OFF)	SAT/UNSAT
	Select - all three SERVO CTL switches to ON.	
	Check - all JAM lights out and other indications normal	
	Check - control operation	SAT/UNSAT

1.2.3 Brakes and Nosewheel Steering

Carry out the following checks while taxiing:

(a)	With all hydraulic systems pressurised and anti-skid selector switch at NORM:	
	Check - normal wheel braking	SAT/UNSAT
	Check - no indication on brake pressure gauge with brakes applied.	SAT/UNSAT
	Check - nose wheel steering.	SAT/UNSAT

- (b) Select - green hydraulic pumps to OFF and exhaust green system pressure.
- Check - wheel braking SAT/UNSAT
- Check - pressure indicated on brake pressure gauge with brakes applied. SAT/UNSAT

<p>CAUTION: NOSE WHEEL STEERING INOPERATIVE</p>

- (c) Select - BRK A/SKID switch to ALT/ON.
- Select - green hydraulic pumps ON.
- Select - yellow hydraulic pump to OFF and exhaust yellow system pressure.
- Check - wheel braking with pressure indicated on brake pressure gauge. SAT/UNSAT
- Apply sufficient braking to reduce yellow accumulator pressure.
- Check - operation of yellow system electric pump and that accumulator pressure restored to normal. SAT/UNSAT
- Select - yellow hydraulic pump ON
- Select - BRK A/SKID switch to NORM.

1.2.4 Take-off Configuration Warning

- (a) Select - slats/flaps 15/0
- Select - stabiliser in green band.
- Select - speed brakes retracted.

With T.O. CONFIG TEST push button depressed :-

- Confirm no warning in takeoff configuration SAT/UNSAT
- Select - slats retracted.
- Check - T.O. configuration warning sounds. SAT/UNSAT
- Check - CONFIG warnings illuminate on MWP. SAT/UNSAT

(b) Select - slats/flaps 15/15

With T.O. CONFIG TEST push button depressed :-

Select - slats/flaps 30/40

Check - T.O. configuration warning sounds. SAT/UNSAT

Check - CONFIG warnings illuminate on MWP. SAT/UNSAT

(c) Select - slats/flaps 15/15

Select - speedbrake lever out of stowed position.

With T.O. CONFIG TEST push button depressed :-

Check - T.O. configuration warning sounds. SAT/UNSAT

Check - SPEED BRAKE caption illuminates on SFPI. SAT/UNSAT

Check - CONFIG warning illuminates on MWP SAT/UNSAT

Select - speedbrakes retracted.

(d) With T.O. CONFIG TEST push button depressed:-

Select - stabiliser nose up, beyond green band.

Record - stabiliser position when T.O. configuration warning occurs.

	N.U. (2.5 N.U. nominal)	SAT/UNSAT
--	-------------------------	-----------

Check - CONFIG warning illuminates on MWP SAT/UNSAT

Select - stabiliser nose down, beyond green band.

Record - stabiliser position when T.O. configuration warning occurs.

	N.D. (2.5 N.D. nominal)	SAT/UNSAT
--	-------------------------	-----------

Reset the stabiliser for take-off

- (e) With the parking brake ON, set 65% N1 on both engines, then advance each throttle in turn until the T.O. configuration warning occurs

Record - N₁ on each engine when warning occurs.

LEFT %

RIGHT %

(Limits: not above 100% N₁)

SAT/UNSAT

ENSURE SLATS/FLAPS AND STABILISER SET
CORRECTLY FOR TAKE-OFF.

2. TAKE-OFF

Carry out a normal 15°/15° Flap, full thrust take-off.

Record any unusual characteristics :

Switch off Trim Tank pumps.

After take-off select 8,000 ft cabin altitude.

Keep APU running.

3. **ENGINE IDLE SETTINGS AND ACCELERATION TIMES**

Recommended FL 50
LIMITS 4,000 ft AGL to FL 80

- Conditions: - slats/flaps 30/40, gear down
- V_{REF}
 - pressurisation from APU
 - engine and airframe anti-icing OFF
 - PMC ON
 - TOGA on TRP
 - 90% N_1 for 6 mins then Flight Idle for no more than 20 sec.

Record :

Altitude	ft	SAT	°C
Weight	kg	V_{REF}	KIAS

Record:	Scheduled	Indicated	
V_{LS} (KIAS)			limits: $V_{trim} \pm 4$ KIAS (see attached figure)
Go-Around N_1			limits: scheduled $\pm 0.5\%$

For each engine in turn advance the throttle to the scheduled go-around N_1 and mark its position. Close the throttle and record the stabilised flight idle N_1 , then rapidly open the throttle to the marked position. Record the time to accelerate from idle to 2% N_1 below the scheduled go-around N_1 .

CAUTION - ON OPENING THROTTLE ENSURE N_1 COMMAND POINTER DOES NOT EXCEED GO-AROUND N_1 . LIMIT THROTTLE TRAVEL IF NECESSARY. THROTTLE BACK AS SOON AS GO AROUND N_1 IS ACHIEVED.

Engine Idle N_1	1	2		
	%	%	(approx 30%)	SAT/UNSAT
Acceleration time	sec	sec	(limit: 8 sec max)	SAT/UNSAT

4. PERFORMANCE AND ENGINE RELIGHTING

4.1 Take-off Climb

Recommended Starting FL 50
Limits 4,000 ft AGL to FL 60

- Conditions
- gear up, slats/flaps 15/15
 - No. 1 engine idle
 - No. 2 engine go-around N_1
 - pressurisation from APU
 - engine and airframe anti-icing OFF
 - airspeed V_2 (see attached table)
 - Captain's altimeter set to 1013 mb

Carry out a 5 minute climb on a steady heading, clear of cloud and turbulence with the aircraft fully trimmed out. Adjust rudder trim as necessary during the climb to keep the wheel neutral and avoid any spoiler deflection.

Record:

Altitude ft TAT °C SAT °C

Scheduled go-around N_1 % (see attached table)

Indicated go-around % SAT/UNSAT

(Limits: scheduled $\pm 0.5\% N_1$)

If the go-around N_1 indicated on the TRP is outside limits, refer to the scheduled go-around chart used during the climb. Otherwise, observe the indicated N_1 .

Fuel used at start of climb 1 kg. 2 kg.

Aircraft weight at start of climb kg.

V_2 KIAS

Time	Altitude Captain's Altimeter	Speed Captain's EFIS	SAT	No. 2 N ₁
min	ft	KIAS	°C	%
0				
½				
1				
1½				
2				
2½				
3				
3½				
4				
4½				
5				

Trims: Stabiliser Rudder Aileron

ASI comparison CAPT KIAS F/O KIAS

(Max difference 5 knots) SAT/UNSAT

Engine 2 data:

EGT °C N₂ % Fuel Flow kg/hr

Fuel used at end of climb 1 kg 2 kg

Aircraft weight at end of climb kg

Check – fuel system crossfeeding

SAT/UNSAT

Select – pressurisation landing elevation to 8,000 ft.

4.2 V₂ Stability Augmentation (where fitted) Any convenient altitude

- Conditions - slats/flaps 15/15, gear up
- airspeed V₂
- symmetric power for level flight

Reduce speed to V₂ – 10 knots

Check – stabiliser moves nose down

SAT/UNSAT/
NOT FITTED

Increase speed to V₂ + 10 knots

Check – stabiliser moves nose up

SAT/UNSAT/
NOT FITTED

4.3 Engine Out En Route Climb Recommended starting FL150
Limits FL100 to FL170

NOTE: Leave No. 2 engine at idle for three minutes before shutting off fuel.

- Conditions - slats/flaps 0/0, gear up
- No. 2 engine shutdown
- No. 1 engine MCT
- pressurisation from No.1 engine (1 pack)
- engine and airframe anti-icing OFF
- engine out en route climb speed (see attached table)
- Captain’s altimeter 1013 mb.

Carry out a 5 minute climb on a steady heading, clear of cloud and turbulence with the aircraft fully trimmed out. Adjust rudder trim as necessary during the climb to keep the wheel neutral and avoid any spoiler deflection.

Record :

ALTITUDE ft TAT °C

Scheduled MCT N₁ % (see attached table)

Indicated MCT N₁ at the en route climb speed % SAT/UNSAT
(Limits: scheduled ±0.5% N₁)

If the indicated N₁ is outside tolerances, refer to the scheduled MCT values for use during the climb.

Fuel used at start of climb 1 kg 2 kg

Aircraft weight at start of climb kg

En route climb speed KIAS

Time	Altitude Captain's Altimeter	Speed Captain's EFIS	SAT	No. 1 N ₁
min	ft	KIAS	°C	%
0				
½				
1				
1½				
2				
2½				
3				
3½				
4				
4½				
5				

Trims: Stabiliser Rudder Aileron

ASI comparison CAPT KIAS F/O KIAS

(Max difference 5 knots) SAT/UNSAT

Engine 1 data:

EGT °C N₂ % Fuel Flow kg/hr

Fuel used at end of climb 1 kg 2 kg

Aircraft weight at end of climb kg

4.4 No. 2 Engine Relight

At the altitude prevailing at the end of the en route climb carry out a windmilling relight of No. 2 engine, at the minimum airspeed to give 15% N₂.

Record:

Altitude ft IAS KIAS

Engine windmilling speed N₁ % N₂ %

Time to EGT rise sec (limit 45 sec) SAT/UNSAT

Maximum EGT during relight °C (750°C continuously,
750°-870°C for up
to 40 seconds)

Time to idle N₁ sec (limit 90 sec) SAT/UNSAT

Leave No. 2 engine at idle for one minute before opening the throttle.

APU - Shutdown

5. **PRESSURISATION**

Not above FL200 Limits FL 150 to FL 170
--

Check - crew oxygen masks for flow and microphones SAT/UNSAT

Select - MANual PRESSurisation control and increase cabin altitude

Check and record:

- manual control of pressurisation SAT/UNSAT
- select both packs OFF
- reselect auto pressurization as any limits are approached
- ECAM warnings appear SAT/UNSAT

ft (limits: 9200 to 9900 ft) SAT/UNSAT

- cabin altitude at which cabin signs illuminate

ft (limits: 10800 to 11800 ft) SAT/UNSAT

- cabin altitude at which passenger oxygen dropout occurs

ft SAT/UNSAT
(limits 13,200 to 14,300 ft)

- location of any oxygen stowages that failed to open.

Select - pressurisation landing elevation to sea level

Check - AUTO PRESS control

- operation of AUTO PRESS RATE LIMIT selector SAT/UNSAT

Reset rate to NORM

6. **AIRCRAFT TRIM, CONTROLS AND TRIMMERS**

In climb to FL 350

Trim the aircraft for a normal two-engine climb at 300 kt/0.78 M. Continue the climb to FL 350.

Check and record :

- trim settings : stabiliser

- rudder (limits $\pm 1.5^\circ$) SAT/UNSAT

- aileron (limits $\pm 2^\circ$) SAT/UNSAT

- primary controls for backlash, breakout, centring, forces and responses :

- elevator SAT/UNSAT
- aileron SAT/UNSAT
- rudder SAT/UNSAT

Give details of any unsatisfactory characteristics :

--

Check trimmers for normal operation (not above 280 kt.):

- stabiliser using electric trim switches and each pitch trim system in turn:
 - No. 1 pitch trim SAT/UNSAT
 - No. 2 pitch trim SAT/UNSAT

- reinstate both pitch trims. Apply manual input to trim wheel. Confirm that both pitch trims trip OFF and normal operation of manual trim. SAT/UNSAT

Reinstate both pitch trim systems

- rudder, including RESET function SAT/UNSAT
- aileron SAT/UNSAT

- engage 1 autopilot in CMD and check :

- both pilots' pitch trim switches inoperative SAT/UNSAT
- roll trim inoperative SAT/UNSAT

7. **APU RELIGHT AND PRESSURISATION**

FL 350

Relight APU

SAT/UNSAT

With landing elevation set to sea level and AUTO PRESS control, check and record :

- aircraft altitude ft
- cabin altitude and differential pressure with ECON FLOW selected and packs as follows :

	CAB ALT	DIFF. PRESS. (8.40 ± 0.4 PSI)	
both packs AUTO			SAT/UNSAT
No. 1 pack CLOSE, No. 2 AUTO			SAT/UNSAT
No. 1 pack AUTO, No. 2 CLOSE			SAT/UNSAT

- cabin rate of climb with both packs OFF, as shown on ECAM PRESSurisation page.

ft/min
(limit: 2000 ft/min)
SAT/UNSAT

Reset both packs and landing elevation as required.

8. **HIGH MACH**

Recommended start FL 350
Not below FL 270 throughout

- (a) Trim the aircraft for level flight at 0.8 IMN.

	Capt	F/O	
Altitude			
IAS			
IMN			
Indicated V_{MO}			(Scheduled ± 3 knots) SAT/UNSAT

SAT
°C
TAT
°C

- (b) Accelerate the aircraft to 0.84 IMN using MCT.

Record - Mach No. at high speed warning onset from each EFIS

CAPT
IMN
F/O
IMN

- (Limits 0.825 to 0.84 IMN and not below indicated V_{MO}) SAT/UNSAT
- handling qualities at 0.84 IMN SAT/UNSAT
 - operation of speedbrakes at 0.84 IMN SAT/UNSAT

9. **No. 1 ENGINE RELIGHT, ELECTRICAL FUNCTIONING**

FL 350-FL300

NOTE: Leave No. 1 engine at idle for three minutes before shutting it down. Select at least one oven on to check galley loads are shed.

- (a) Select - APU generator OFF
 - No. 1 engine shutdown
- Check - galley load automatically shed SAT/UNSAT
 - remaining electrical loads supplied by No. 2 generator. SAT/UNSAT

- (b) Select - APU generator ON
- Check - galley load reset SAT/UNSAT
 - normal operation of electrical system using No. 2 and APU generators SAT/UNSAT
- Select - No. 2 generator OFF
- Check - electrical loads (except galley) supplied by APU generator SAT/UNSAT
- Select - No. 2 generator ON

(c) After three minutes shutdown, and not above FL 300, relight No. 1 engine using the windmilling technique. Record airspeed at which $N_2 = 15\%$ and relight engine at that speed.

Record: Altitude ft IAS kt.

Engine windmill speeds N_1 % N_2 %

Time to EGT rise sec (limit: 45 sec) SAT/UNSAT

Maximum EGT during start °C (limit: 750°C continuously
750°-870°C for up to 40 seconds)

SAT/UNSAT

Time to idle N_1 sec (limit: 90 sec) SAT/UNSAT

Leave No. 1 engine at idle for one minute before opening the throttle.

ENSURE ELECTRICS RESET TO NORMAL
AND ALL OVENS ARE OFF

10. **APU AIR BLEED AND SHUTDOWN ON FIRE HANDLE** FL 200

- Initial conditions
- both engine bleed valves AUTO
 - air X FEED valve AUTO
 - both pack valves AUTO
- Select
- APU bleed switch ON
- Check
- both engine bleed valves close SAT/UNSAT
 - air X feed valve opens SAT/UNSAT
 - operation of conditioning/pressurisation from APU SAT/UNSAT
- Select
- air X FEED to Man
- Check
- air X FEED can be closed SAT/UNSAT
 - No. 2 pack valve closes after short delay SAT/UNSAT
- Select
- air X feed to open and AUTO
 - APU air bleed OFF/R
 - conditioning/pressurisation reset as required

Shutdown the APU on the fire handle

- Check
- APU fuel ISOL VALVE closes (lateral panel) SAT/UNSAT
 - APU LP fuel valve closes (overhead panel) SAT/UNSAT

Reset fire handle and select APU switch OFF

11. **HIGH SPEED V_{MO} CHECK** FL 200 or Below

Trim the aircraft at 190 KIAS, with MCT, then accelerate to 350 KIAS.
Do not re-trim until operation of V_C trim has been confirmed.
Thereafter, the aircraft may be trimmed up to V_{MO} , but not above.

- Record:
- indicated V_{MO} (335 KIAS) SAT/UNSAT
 - pitch trim operation (stabiliser moves nose up as speed increased above 200 KIAS) SAT/UNSAT
 - IAS at onset of overspeed warning, (warning message on ECAM, continuous repetitive chime audio)
 - KIAS (338-347 KIAS) SAT/UNSAT
 - handling characteristics at 350 KIAS SAT/UNSAT
 - operation of speedbrakes at 350 KIAS SAT/UNSAT

12. α - FLOOR, STALLING, FLAP AND GEAR FUNCTIONING

FL 150 to
Not below 10,000 AGL

The following checks must be carried out clear of cloud and significant turbulence. In each required configuration the aircraft should be trimmed to fly with hands off the controls at the scheduled speed with the engines at idle in a shallow decent. The aircraft should then be decelerated smoothly with idle thrust at around 1 knot/second until the stick shaker/aircraft stalls. No attempt should be made to maintain constant altitude; clearance should be obtained to operate in an altitude block of about 5000 ft. Once the operation of the alpha floor has been noted it should be cancelled using the Instinctive Disconnect button on the throttles, and the steady idle thrust deceleration continued. The throttles may be held at the idle position noting the PFD and TRP indications as the system is activated. The stall checks are to be terminated and recovery action taken if a speed of 5 knots below the lowest speed scheduled is seen.

(a) Clean configuration

- Select
- ATS armed
 - CLB on TRP

	Scheduled kts	Achieved kts	Allowable Tolerance
Vtrim		-----	-----
V α -floor			\pm 8 kts
Vstick shaker			\pm 7 kts

(b) Slats/flaps 15/15, gear up.

Record - slat/flap operating times at 200 KIAS :

slats 0-15	sec	(12 sec max)	SAT/UNSAT
flaps 0-15	sec	(26 sec max)	SAT/UNSAT
- aircraft weight			kg

- Select
- ATS armed
 - MCT on TRP

	Scheduled kts	Achieved kts	Allowable Tolerance
Vtrim		-----	-----
V α -floor			\pm 7 kts
Vstick shaker			\pm 5 kts

Where V₂ Stability Augmentation is fitted - check pitch trim operation (stabiliser moves slowly nose down as speed reduced below trim speed) SAT/UNSAT/
NOT FITTED

(c) Slats/flaps 30/40, gear down

Select - ATS OFF

Record - gear and slat/flap operating times at 170 KIAS

gear down sec (18 sec max) SAT/UNSAT

slats/flaps 15/15 to 30/40

sec (11 sec max) SAT/UNSAT

	Scheduled kts	Achieved kts	Allowable Tolerance
Vtrim		-----	-----
Vstick shaker			± 4 kts

On recovery from stall, change configuration if necessary. Alternatively, increase power and maintain the landing configuration in preparation for the next test.

13. **HIGH IAS AND CONFIGURATION
OVERSPEED WARNINGS**

Not below
8000 ft AGL

With MCT set, in each configuration in turn, starting in the landing configuration:

- record the limit speed indicated on EFIS (V_{LE}/V_{FE} as appropriate)
- accelerate slowly to, and record, the speed at which the overspeed warning (warning message on ECAM and continuous repetitive chime) occurs (but NOT ABOVE LIMIT SPEED + 5 KNOTS)
- decelerate to the speed shown for the next configuration change
- record the operating time for the configuration change

Configuration/ Test	Scheduled V _{LE} /V _{FE}	Indicated V _{LE} /V _{FE}	Overspeed Warning	Operating Time	
30/40, Gear Down	175		176-182 KIAS	-	SAT/UNSAT
Slats/Flaps to 15/20 at 170 KIAS	-	-	-	(7 sec max)	SAT/UNSAT
15/20, Gear Down	205		206-212 KIAS	-	SAT/UNSAT
Slats/Flaps to 15/15 at 185 KIAS	-	-	-	(4 sec max)	SAT/UNSAT
15/15, Gear Down	215		216-222 KIAS	-	SAT/UNSAT
Slats/Flaps to 15/0 at 200 KIAS	-	-	-	(18 sec max)	SAT/UNSAT
15/0, Gear Down	250		251-257 KIAS	-	SAT/UNSAT
Slats Retract at 235 KIAS	-	-	-	(12 sec max)	SAT/UNSAT
0/0, Gear Down	270		(271-277 KIAS)	-	SAT/UNSAT
Gear Retraction at 230 KIAS	-	-	-	(20 sec max)	SAT/UNSAT

14. **GEAR GRAVITY EXTENSION**

Any convenient altitude

With the normal gear at neutral, operate the free fall crank handle to lower the gear.

Check - gear extension and normal indication (3 reds, 3 SAT/UNSAT
ambers and 3 greens)

Rotate free fall handle counter clockwise to return to normal.
Select normal gear lever down.

Check - gear red and amber lights extinguish within 3 sec. SAT/UNSAT

Select - gear up on normal system

15. **PRESSURISATION AND RAM AIR VALVE**

Below FL80

Set 8000 ft landing altitude

With cabin ΔP not above 1 psi :

Select - both PACK VALVES OFF
- RAM AIR OPEN

Check - both outflow valves fully open SAT/UNSAT
- ram air ventilation SAT/UNSAT

Reset both packs and the ram air valve. Use pressurisation as necessary.

16. **RAT EXTENSION**

Any convenient
Altitude

Carry out the following test on the approach to land.

Select - yellow hydraulic pump OFF and depressurise
yellow system.

- RAT extended.

Check - Yellow system operation during configuration
changes and system pressure 3000 ± 200 psi, with no
significant loads applied, at speeds down to 140 KIAS SAT/UNSAT

Select - yellow hydraulic pump ON prior to landing

17. LANDING

Carry out a normal landing using not more than reverse idle after landing with the RAT extended. If weather conditions permit:

- Before landing, select
- autobrakes LO
 - ground spoilers NOT armed *

* In gusty or crosswind conditions ground spoilers should be armed.

On landing, check :

- autobrake operation and cancelling on brake pedals SAT/UNSAT
- ground spoilers deploy when reverse idle selected SAT/UNSAT
- ground spoilers re-stow when forward thrust selected SAT/UNSAT

Record - any other unusual characteristics :

18. ELECTRICS

Carry out the following checks with the aircraft stationary and with communications established as necessary using VHF 1.

- Select
- APU GEN OFF/R
 - OVRD SUPPLY 1 and 2 ON

Check - AC ESS BUS supplied directly by No. 1 generator as indicated by the following equipment remaining functional :

- VHF SAT/UNSAT
- PA system SAT/UNSAT
- fuel reserve level detection (check by selecting FAULT SIM and LO LVL L and R on lateral panel). SAT/UNSAT
- engine 1 and 2 fire detection SAT/UNSAT
- engine 1 bleed air control SAT/UNSAT
- crew oxygen control SAT/UNSAT
- cabin pressurisation system 1 SAT/UNSAT
- ADC 1 SAT/UNSAT
- IRS 1 or 3 (1 and 3 if ER aircraft) SAT/UNSAT
- all spoilers inoperative SAT/UNSAT
- slats and flaps inoperative SAT/UNSAT

Select - LAND RECOVERY

Check that the following additional items are now supplied:

- spoiler panels 2, 3, 5 and 7 on each wing SAT/UNSAT
- slats and flaps [except Krugers] SAT/UNSAT

Reset electrics to normal.

19. ENGINE SHUTDOWN ON FIRE HANDLES

- Select
- both PACK VALVES auto
 - APU bleed off/R
 - both ENG BLEED VALVES AUTO
 - lateral panel ANN LT selector to READ
 - No1 engine HYD PUMPS OFF

Shutdown No. 1 engine by pulling the fire handle. As the engine starts to run down, select the HP fuel valve to OFF and reset the fire handle.

- Check
- ENG 1 LP VALVE closes SAT/UNSAT
 - ENG 1 HYD PWR FIRE VALVES SHUT (lateral panel) SAT/UNSAT
 - ENG 1 HP BLEED VALVE closes SAT/UNSAT
 - ENG 1 HP VALVE closes SAT/UNSAT
 - PACK VALVE 1 closes SAT/UNSAT
- Reset No1 engine HYD PUMPS
- Recycle ENG BLEEDS to clear 'FAULTS'

- Select
- ENG 1 FIRE handle re-stowed
 - PACK VALVE 1 to AUTO
 - No2 engine HYD PUMPS OFF

Shutdown No. 2 engine by pulling the fire handle. As the engine starts to run down, select the HP fuel valve to OFF and reset the fire handle.

- Check
- ENG 2 LP VALVE closes SAT/UNSAT
 - ENG 2 HYD PWR FIRE VALVES SHUT (lateral panel) SAT/UNSAT
 - ENG 2 BLEED VALVE closes SAT/UNSAT
 - ENG 2 HP VALVE closes SAT/UNSAT
 - PACK VALVE 2 closes SAT/UNSAT
- Reset No2 engine HYD PUMPS
- Recycle ENG BLEEDS to clear 'FAULTS'

- Select
- ENG 2 FIRE handle re-stowed
 - PACK VALVE 2 to AUTO
 - Reset the lateral panel

20. POST-FLIGHT ACTIONS

- 21.1 Complete the statement of defects and sign the Check Flight Certificate and state whether or not the aeroplane needs to be re-flown.
- 21.2 Plot the results of the performance climbs and compare the measured rates of climb with the gross data scheduled in Flight Manual.
- 21.3 Pass the completed Check Flight Schedule and Certificate to the CAA.

Climb Speeds

Weight 1,000 kg.	V_2 15/15	V_{ER}
130	151	224
125	147	220
120	144	215
115	141	211
110	138	206
105	135	201
100	132	197

Stall Speeds:

- Trims $1.3 \times V_S$
- 30% MAC : add 2% per 10% MAC forward

Stall Speeds and V_{LS}

Weight	Clean			15/15				30/40 Gear Down			
	Trim	α floor	V_{SW}	Trim	α floor	V_{SW}	V_S	Trim & V_{LS}	α floor	V_{SW}	V_S
130	197	176	171	148	129	124	114	131	118	109	101
125	193	172	168	144	127	122	111	130	117	107	100
120	189	169	165	142	125	120	109	127	115	105	98
115	185	165	162	139	122	117	107	125	113	103	96
110	181	161	159	137	120	115	105	121	110	100	93
105	176	157	156	133	118	112	102	118	108	98	91

A300-600
FLIGHT MANUAL

PERFORMANCE > ENGINE MANAGEMENT

CF6-80C2A5 TAKE OFF N1 NO AIR BLEED MACH=.100		N1 CORRECTIONS FOR AIR BLEED (APPLICABLE TCC OFF)										
		AIR CONDITIONING ON										- .700
		ENGINE ANTI-ICE ON										- .600
		ENGINE ANTI-ICE AND WING ANTI-ICE ON										-1.100
SAT (C)	ALTITUDE (FT)											
	-1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	8500.	
-40.0	96.4	97.2	97.8	98.4	99.1	99.7	100.3	100.8	101.3	101.7	102.1	
-30.0	98.5	99.2	99.9	100.5	101.2	101.8	102.4	102.9	103.4	103.8	104.3	
-20.0	100.4	101.2	101.9	102.5	103.2	103.8	104.5	105.0	105.5	105.9	106.4	
-10.0	102.4	103.2	103.8	104.5	105.2	105.9	106.5	107.0	107.5	108.0	108.4	
-5.0	103.3	104.1	104.8	105.5	106.2	106.8	107.5	108.0	108.5	109.0	109.4	
.0	104.3	105.1	105.8	106.4	107.1	107.8	108.5	109.0	109.5	110.0	110.4	
2.0	104.7	105.5	106.2	106.8	107.5	108.2	108.9	109.4	109.9	110.4	110.8	
4.0	105.0	105.9	106.5	107.2	107.9	108.6	109.3	109.8	110.3	110.8	111.2	
6.0	105.4	106.2	106.9	107.6	108.3	109.0	109.7	110.2	110.7	111.2	111.6	
8.0	105.8	106.6	107.3	108.0	108.7	109.4	110.0	110.6	111.1	111.6	112.0	
10.0	106.2	107.0	107.7	108.4	109.1	109.8	110.4	111.0	111.5	112.0	112.4	
12.0	106.5	107.4	108.1	108.7	109.5	110.1	110.8	111.4	111.9	112.4	112.8	
14.0	106.9	107.7	108.4	109.1	109.8	110.5	111.2	111.7	112.3	112.8	112.9	
16.0	107.3	108.1	108.8	109.5	110.2	110.9	111.6	112.1	112.6	112.6	112.7	
18.0	107.6	108.5	109.2	109.9	110.6	111.3	112.0	112.5	112.4	112.4	112.5	
20.0	108.0	108.8	109.5	110.2	111.0	111.7	112.3	112.3	112.2	112.2	112.1	
22.0	108.4	109.2	109.9	110.6	111.3	112.0	112.0	112.0	111.9	111.8	111.8	
24.0	108.7	109.6	110.3	111.0	111.7	111.7	111.7	111.6	111.5	111.4	111.4	
26.0	109.1	109.9	110.6	111.3	111.4	111.4	111.3	111.3	111.2	111.0	111.1	
28.0	109.4	110.3	111.0	111.0	111.0	111.0	111.0	110.9	110.8	110.7	110.7	
30.0	109.8	110.7	110.6	110.7	110.7	110.6	110.6	110.5	110.4	110.3	110.3	
32.0	110.2	110.2	110.2	110.3	110.3	110.3	110.2	110.1	110.0	109.9	110.0	
34.0	109.8	109.7	109.8	109.9	109.9	109.9	109.8	109.7	109.6	109.5	109.6	
36.0	109.4	109.3	109.5	109.5	109.5	109.5	109.4	109.3	109.2	109.1	109.1	
38.0	109.0	109.0	109.1	109.2	109.1	109.1	108.9	108.9	108.8	108.7	108.7	
40.0	108.7	108.6	108.7	108.8	108.7	108.6	108.5	108.5	108.4			
42.0	108.3	108.3	108.4	108.4	108.3	108.2	108.2	108.1				
45.0	107.8	107.7	107.8	107.8	107.7	107.7	107.6					
50.0	106.9	106.8	106.9	106.8								
55.0	106.1	106.1										

01 FEB 88 } REF
1-05

REF } 5.02.00
Page 1
Ref.05

PERFORMANCE - ENGINE MANAGEMENT

CF6-80C2A5		N1 CORRECTIONS FOR AIR BLEED (APPLICABLE TCC OFF)									
GO AROUND N1 AIR CONDITIONING ON MACH=.225		AIR CONDITIONING OFF									.700
		ENGINE ANTI-ICE ON									-.600
		ENGINE ANTI-ICE AND WING ANTI-ICE ON									-1.500
SAT (C)	ALTITUDE (FT)										
	-1000.	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	8500.
-40.0	96.0	96.7	97.4	97.9	98.5	99.0	99.6	100.1	100.5	101.0	101.4
-30.0	98.0	98.8	99.4	100.0	100.6	101.1	101.7	102.2	102.7	103.1	103.5
-20.0	100.0	100.8	101.4	102.0	102.6	103.1	103.8	104.3	104.7	105.2	105.6
-10.0	101.9	102.7	103.4	104.0	104.6	105.1	105.8	106.3	106.8	107.3	107.7
-5.0	102.9	103.7	104.4	105.0	105.6	106.1	106.8	107.3	107.8	108.3	108.7
.0	103.8	104.6	105.3	105.9	106.6	107.1	107.8	108.3	108.8	109.3	109.7
2.0	104.2	105.0	105.7	106.3	106.9	107.5	108.2	108.7	109.2	109.7	110.1
4.0	104.6	105.4	106.1	106.7	107.3	107.9	108.5	109.1	109.6	110.1	110.5
6.0	105.0	105.8	106.5	107.1	107.7	108.3	108.9	109.5	110.0	110.5	110.9
8.0	105.3	106.2	106.8	107.5	108.1	108.7	109.3	109.9	110.4	110.9	111.3
10.0	105.7	106.5	107.2	107.9	108.5	109.0	109.7	110.2	110.8	111.3	111.7
12.0	106.1	106.9	107.6	108.2	108.9	109.4	110.1	110.6	111.1	111.6	112.1
14.0	106.4	107.3	108.0	108.6	109.2	109.8	110.5	111.0	111.5	112.0	112.2
16.0	106.8	107.6	108.3	109.0	109.6	110.2	110.9	111.4	111.9	111.9	112.0
18.0	107.2	108.0	108.7	109.4	110.0	110.6	111.2	111.8	111.7	111.7	111.7
20.0	107.5	108.4	109.1	109.7	110.4	110.9	111.6	111.5	111.5	111.4	111.4
22.0	107.9	108.8	109.5	110.1	110.7	111.3	111.3	111.2	111.2	111.1	111.1
24.0	108.3	109.1	109.8	110.5	111.1	111.0	111.0	110.9	110.8	110.7	110.7
26.0	108.6	109.5	110.2	110.8	110.8	110.7	110.6	110.5	110.4	110.3	110.4
28.0	109.0	109.8	110.6	110.5	110.4	110.3	110.2	110.2	110.1	109.9	110.0
30.0	109.4	110.2	110.2	110.2	110.1	109.9	109.9	109.8	109.7	109.5	109.6
32.0	109.7	109.7	109.7	109.8	109.7	109.5	109.4	109.4	109.3	109.1	109.2
34.0	109.3	109.2	109.3	109.4	109.3	109.1	109.0	109.0	108.9	108.7	108.8
36.0	108.9	108.8	109.0	109.0	108.9	108.7	108.6	108.5	108.4	108.4	108.4
38.0	108.5	108.5	108.6	108.7	108.5	108.3	108.2	108.1	108.1	108.0	108.0
40.0	108.2	108.2	108.3	108.3	108.1	107.9	107.8	107.8	107.7		
42.0	107.9	107.8	107.9	107.9	107.7	107.5	107.4	107.4			
45.0	107.3	107.3	107.3	107.3	107.1	107.0	106.9				
50.0	106.4	106.4	106.4	106.3							
55.0	105.7	105.6									

01 FEB 88 } REF
1-05 }

REF { 5.02.00
Page 5
Ref.05

PERFORMANCE - ENGINE MANAGEMENT

CF6-80C2A5		N1 CORRECTIONS FOR AIR BLEED (APPLICABLE TCC OFF)									
		MAXIMUM CONTINUOUS N1 AIR CONDITIONING ON VC=230 KT									
		AIR CONDITIONING OFF								.900	
		ENGINE ANTI-ICE ON								-.500	
		ENGINE ANTI-ICE AND WING ANTI-ICE ON								-1.500	
TAT (C)	ALTITUDE (FT)										
	0.	4000.	8000.	12000.	16000.	20000.	24000.	28000.	32000.	36000.	40000.
-40.0	92.0	94.3	96.2	99.5	100.6	101.7	102.5	103.6	103.6	103.6	102.0
-35.0	92.9	95.3	97.2	100.5	101.6	102.8	103.6	104.7	104.7	104.7	103.1
-30.0	93.9	96.2	98.2	101.6	102.7	103.9	104.7	105.8	105.8	105.8	104.2
-25.0	94.9	97.2	99.2	102.6	103.7	104.9	105.8	106.9	106.9	106.9	105.3
-20.0	95.8	98.2	100.2	103.6	104.8	106.0	106.8	107.9	107.9	107.9	106.3
-15.0	96.7	99.2	101.2	104.6	105.8	107.0	107.9	109.0	109.0	107.2	106.6
-10.0	97.7	100.1	102.1	105.6	106.8	108.1	108.9	109.7	108.6	106.1	105.4
-8.0	98.0	100.5	102.5	106.0	107.2	108.5	109.3	109.3	108.1	105.8	104.9
-6.0	98.4	100.9	102.9	106.4	107.6	108.9	109.1	109.0	107.8	105.4	104.5
-4.0	98.8	101.2	103.3	106.8	108.0	109.3	108.7	108.7	107.5	105.1	104.2
-2.0	99.1	101.6	103.7	107.2	108.4	109.7	108.3	108.4	107.2	104.7	103.8
.0	99.5	102.0	104.1	107.6	108.8	109.7	108.2	108.1	106.9	104.3	103.4
2.0	99.9	102.3	104.4	108.0	109.2	109.6	108.0	107.8	106.5	104.0	103.1
4.0	100.2	102.7	104.8	108.4	109.6	109.5	107.8	107.6	106.2	103.5	102.7
6.0	100.6	103.1	105.2	108.8	110.0	109.5	107.6	107.3	105.8	102.9	102.3
8.0	100.9	103.5	105.6	109.2	110.3	109.5	107.4	107.0	105.5	102.4	101.9
10.0	101.3	103.8	105.9	109.6	110.6	109.4	107.2	106.7	105.0		101.3
12.0	101.6	104.2	106.3	109.8	110.4	109.3	107.0	106.4	104.4		100.7
14.0	102.0	104.5	106.7	109.6	110.0	109.1	106.8	106.1			
16.0	102.4	104.9	107.1	109.4	109.8	108.9	106.6	105.5			
18.0	102.7	105.3	107.4	109.2	109.5	108.6	106.4	105.0			
20.0	103.1	105.6	107.5	109.1	109.3	108.4	106.0				
22.0	103.4	106.0	107.5	109.0	109.0	108.2	105.5				
24.0	103.7	106.3	107.4	108.7	108.8	108.0	104.9				
26.0	104.1	106.4	107.2	108.4	108.5	107.7					
28.0	104.4	106.1	106.9	108.0	108.3	107.4					
30.0	104.8	105.7	106.6	107.7	108.0	107.1					
32.0	105.1	105.4	106.3	107.4	107.8						
34.0	104.9	105.0	105.9	107.0	107.7						
36.0	104.6	104.7	105.6	106.7	107.5						
38.0	104.2	104.5	105.2	106.3							
40.0	104.0	104.2	104.9	106.0							
45.0	103.3	103.5	103.9								
50.0	102.8	102.9									
55.0	102.2	101.1									

01 FEB 88 } REF
1-05 }

REF } 5.02.00
Page 3
Ref.05