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|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--|---------|--------|
| <br><b>A340-600</b><br>Flight Crew Operating Manual | MULTI PHASE RELATED PROCEDURES |  | 4.04.30 | P 2    |
|                                                                                                                                   | OTHER FUNCTIONS                |  | SEQ 001 | REV 14 |

### In flight

The predicted altitude is equal to the aircraft altitude (depending on the barometer setting), plus (or minus) the height you must attain to reach the waypoint in the applicable mode (climb or descent).

– In climb :

Altitude predictions and constraints are displayed as altitude in feet above mean sea level (AMSL) at, or below, the transition altitude, and as flight level above it.

For example : If the transition altitude is 5000 feet, and you insert an altitude constraint as 8000 feet, the MCDU F-PLN A page shows it as FL80.

– In descent :

If “STD” is selected on the control panel of the EIS altitude predictions, and constraints above the transition level are displayed as flight levels, and those below the transition level are displayed as altitude AMSL.

If sea level pressure (QNH), or field elevation pressure (QFE option), is selected on the EIS control panel, altitude predictions and constraints are displayed as altitudes AMSL, regardless of the transition altitude.

For example : If the transition level is FL50 and you insert an altitude constraint of 8000 feet in the descent profile, the MCDU F-PLN A page will display it as FL80 if “STD” is selected, and as 8000 feet if the “QNH” or “QFE” option is selected.

### TARGET ALTITUDE ON PFD

The PFD target altitude may either be :

- The FCU-selected altitude, or
- A flight management altitude constraint, if the climb mode or descent mode is engaged, and the system predicts a level-off at a constraint that is achieved prior to reaching the FCU altitude.

The PFD target altitude depends on the barometer setting :

- If “STD” is selected, the target is a flight level.
- If “QNH” or “QFE” is selected, the target is an altitude or a height.

The aircraft will level off accordingly.

**Note :** *If the pilot changes the barometer pressure during ALT\* or ALT CST\*, the aircraft may overshoot the target altitude, because the current value has been changed. However, the ALT\* and ALT CST\* modes allow the aircraft to regain the FCU altitude.*

*As a general rule, avoid changing the barometer setting when in ALT\* or ALT CST\*.*

**NOTE FOR AIRCRAFT WITH QFE (Field Elevation Pressure) pin program**

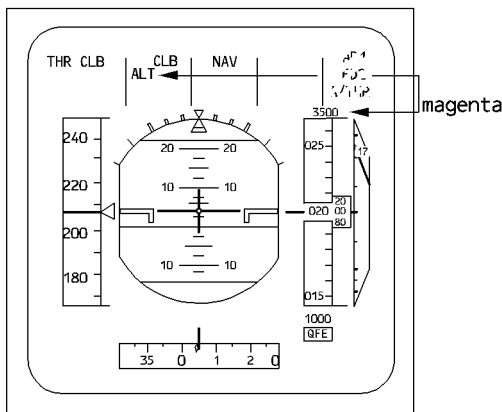
If QFE is selected on the EFIS control panel :

- The MCDU predictions follow the basic rules (altitudes are AMSL below the transition level, flight levels above it).
- The altitude constraints on the MCDU follow the basic rules.
- The target altitude on the PFD is QFE related :
  - If the target altitude has been selected by the FCU, the aircraft will level off there.
  - If the target altitude is an altitude constraint, the PFD automatically shows that constraint as corrected by the airport elevation.

e.g FCU set at 8000 feet  
F-PLN ALT CSTR 4000 ft(AMSL)  
Airport Elevation 500 ft  
QFE selected

FCU = 8000 feet

3500 feet QFE



**PFD DISPLAY**

**PROCEDURES**

- a) The altitude constraints in departure and arrival procedures should be defined in the navigation database or by the pilot on the MCDU :
  - in terms of altitude AMSL below the transition altitude
  - in terms of flight level above the transition altitude

If a departure procedure defines an altitude constraint as an AMSL altitude above the transition altitude, you must convert it to flight level, because the system and guidance will treat it as a flight level whenever you select the standard barometer setting.
- b) In climb you should switch from QNH (or QFE) to STD on both EFIS control panels simultaneously when you reach the transition altitude.  
All MCDU altitude predictions and altitude constraints and all PFD altitude targets will be displayed as flight level.
- c) In descent, when ATC clears you to an altitude below the transition altitude, you can select QNH (or QFE) on both EFIS control panels simultaneously.  
All MCDU altitude predictions and constraints and PFD targets are now altitude AMSL.

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## **CLEAR KEY (CLEARING FUNCTION)**

### **CLEARING THE SCRATCHPAD OF DATA OR MESSAGES**

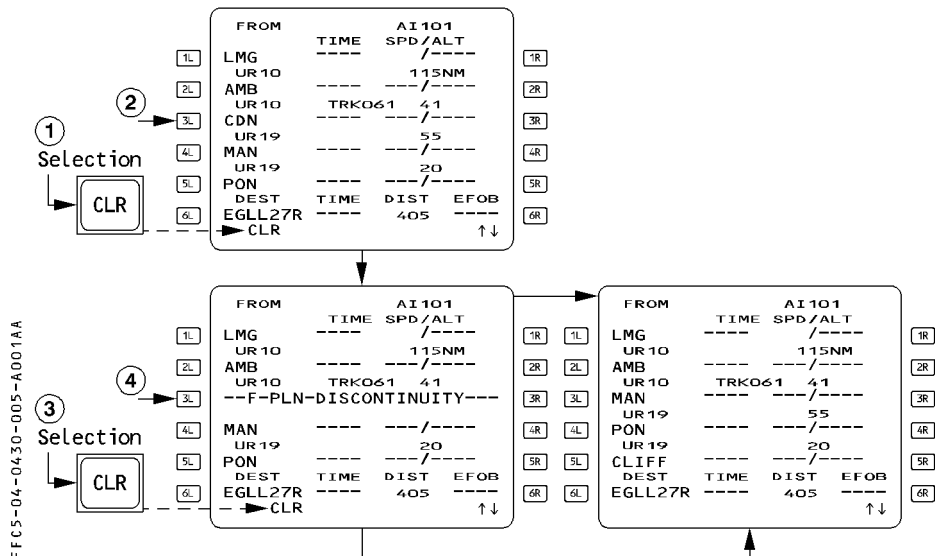
Press the “CLR” key with a single brief touch to erase the last alphanumeric character inserted in the scratchpad.

Press the key for more than three seconds to erase all the data inserted in the scratchpad. If the scratchpad is empty, it displays “CLR”.

### **CLEARING DATA FIELDS**

From a empty scratchpad, press the CLR key, then select the prompt for the field you want to clear (3L for example).

- You cannot clear all data fields :
  - If the field contains data that has a default value or a value computed by the FMGC, the data reverts to this value.
  - Any attempt to clear the defaulted value has no effect.
- Clearing a constraint on the F-PLN A page deletes both the speed constraint and the altitude constraint associated with the waypoint.
- If you clear a data field that is a waypoint in the flight plan (primary or secondary) you delete this waypoint from the flight plan and create a discontinuity. The discontinuity can also be cleared in a similar way.



FFCS-04-0430-005-A001AA

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|---------------------------------------------------------------------------------|----------------------------------------------------------|---------|--------|
|  | <b>MULTI PHASE RELATED PROCEDURES</b><br>OTHER FUNCTIONS | 4.04.30 | P 6    |
|                                                                                 |                                                          | SEQ 103 | REV 14 |

## ENGINE OUT

When the FMGS detects an engine-out condition, the following occurs :

### FLIGHT MANAGEMENT PART

- The managed target speeds is immediately set to a value that depends upon the flight phase.
- The system automatically calls up the current performance page, which has the E.O. CLR (engine-out clear) prompt displayed in the 1R field (except during takeoff, before the diversion point is reached).

If the pilot presses the E.O. CLR, the all engine operative predictions and performance will be restored. Reverting to one engine out performance again is not possible unless the system detects a new E.O. condition. Therefore, the pilot should not press the E.O. CLR key, if an actual engine-out is detected.

- The PROG page shows the engine-out maximum recommended (E.O. MAX REC) altitude.
- All preselected speeds, entered in the MCDU, are deleted. The crew can re-enter preselected speeds.
- Step climb (or step descent), if entered, is deleted.
- The time constraint is deleted.

### FLIGHT GUIDANCE PART

- All selected modes remain available (the “HDG/TRK”, “V/S”, and “OPEN” modes, for example).
- In the speed reference system (SRS) mode, the takeoff speed is the highest of V2 and current speed, but no more than V2 + 15.
- The system limits autopilot (AP) and flight director (FD) bank angles during takeoff and approach phases as follows :
  - 15° when the aircraft speed is below maneuvering speed (F, S, or Green Dot speed)
  - Normal AP/FD bank angle above maneuvering speed.

### AUTOTHRUST

The system extends the active range of the active engine from idle to maximum continuous thrust (MCT instead of CL thrust).

The Flight Mode Annunciator requests maximum continuous thrust on the live engine at a time that depends on when the engine-out occurs.

## ENGINE-OUT CONDITIONS

The FMGS considers the aircraft to be in an engine-out condition when one of the following conditions is present and the aircraft has commenced takeoff or is in flight :

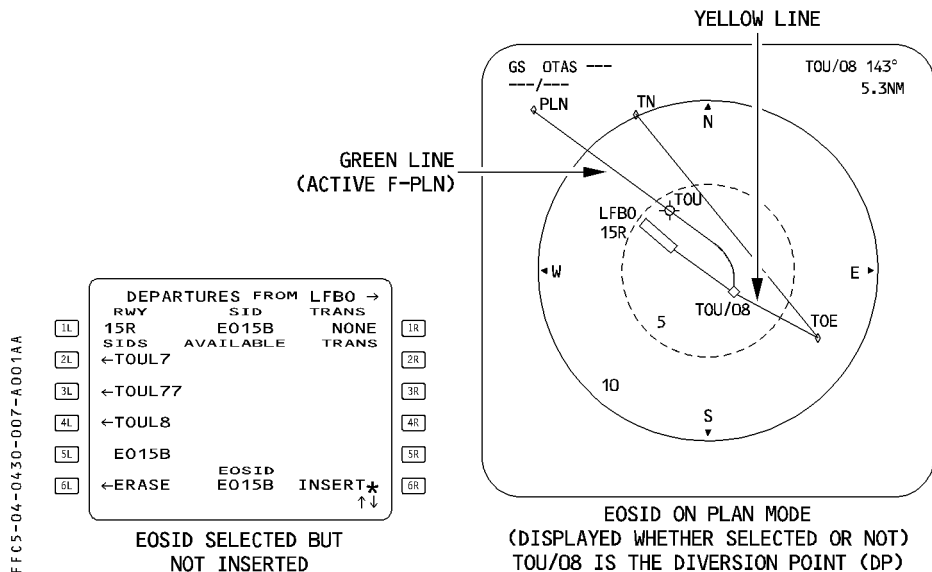
- One engine master switch off or
- N2 (or N3 for Rolls Royce engines) below idle or
- One thrust lever angle below 5° with one above 22° or
- The FADEC showing an engine fault.

## ENGINE-OUT SID OPERATIONS

An engine-out standard instrument departure (EOSID), when defined in the database, is always for a specific runway. It is indicated on the bottom line of the SID page for that runway, and you can select it manually.

The pilot can review the SID either by selecting the PLAN mode on the navigation display (solid yellow line) or by selecting it on the SID page. In the latter case, the navigation display shows the SID as a temporary flight plan.

The last point, if any, that is common to the SID and engine-out SID is called the diversion point (DP).

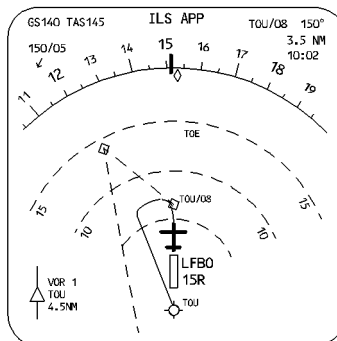


## WHEN AN ENGINE-OUT CONDITION OCCURS BEFORE THE DIVERSION POINT

The MCDU automatically shows the engine-out SID as a temporary flight plan on the F-PLN page and on the ND. The EOSID can be inserted or erased.

FFCS-04-0430-008-A001AA

|    | FROM TMPY                 | AI101 → |             |
|----|---------------------------|---------|-------------|
| 1L | LFB015R                   | TIME    | SPD/ALT 490 |
| 2L | H146°                     | BRG143° | 5NM         |
| 3L | TOU/08                    | C118°   | TRK118° 13  |
| 4L | TOE←                      | C325°   | 31          |
| 5L | TN                        | ---     | ---         |
| 6L | ---F-PLN DISCONTINUITY--- |         |             |
|    | ←ERASE                    | INSERT★ | ↑↓          |



active F-PLN in green solid line  
EOSID in dashed yellow line

## WHEN AN ENGINE-OUT CONDITION OCCURS AFTER THE DIVERSION POINT

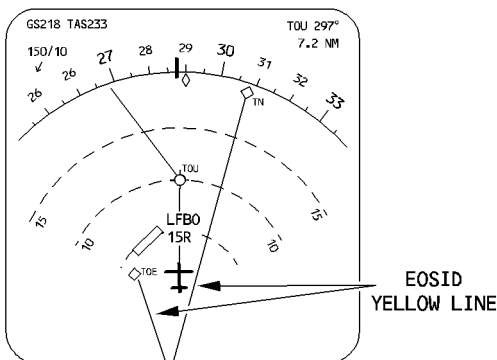
The navigation display shows the engine-out SID as a yellow line for your information.

If necessary :

- SELECT "DIR TO" a waypoint on the engine-out SID flight plan
- ADJUST the flight plan that results.

FFCS-04-0430-008-B001AA

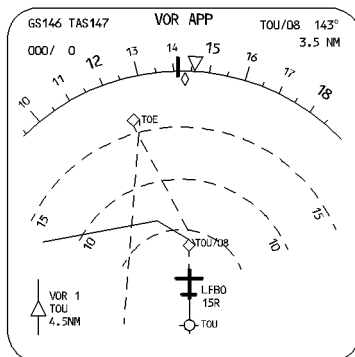
|    | TAKE OFF                |  |
|----|-------------------------|--|
| 1L | V1 FLP RETR EO          |  |
| 2L | 140 F=157 CLR★          |  |
| 3L | VR SLT RETR TO SHIFT    |  |
| 4L | 143 S=203 [M] 900       |  |
| 5L | V2 CLEAN FLAPS/THS      |  |
| 6L | 145 O=224 2/UP 3.4      |  |
|    | TRANS ALT FLEX TO TEMP  |  |
|    | 4800 35°                |  |
|    | THR RED/ACC ENG OUT ACC |  |
|    | 2000/3000 2865          |  |
|    | NEXT                    |  |
|    | PHASE>                  |  |



EOSID  
YELLOW LINE

## BELOW THRUST-REDUCTION (THR RED) ALTITUDE

- \* The managed target speed changes.
- \* The PROG page displays the engine-out maximum recommended altitude.
- \* The PERF TO page comes up on the display automatically with the “EO CLR” prompt in the 1R field.
- \* The MCDU and the navigation display show the engine-out SID as a temporary flight plan, or the navigation display shows it for information only, depending upon the diversion point location.
- \* The system computes the flight plan predictions when the aircraft sequences to climb phase.



FFCS-04-0430-009-A001A

### Procedure

When the aircraft reaches the engine-out acceleration altitude

- PUSH the ALT pushbutton on the FCU.

*The target speed jumps to the engine out long range cruise, limited by SPD LIM/SPD CSTR.*

- CLEAN up your configuration as the speed increases toward target speed.

*When the aircraft is clean and has reaches Green Dot speed , “LVR MCT” flashes on the FMA,*

- PUSH the altitude selector knob to resume the climb.

*The CLIMB mode engages, and the target speed is green dot.*

- MOVE the thrust lever(s) for the live engine(s) to “MCT” detent.

|                                                                                 |                                |  |         |        |
|---------------------------------------------------------------------------------|--------------------------------|--|---------|--------|
|  | MULTI PHASE RELATED PROCEDURES |  | 4.04.30 | P 10   |
|                                                                                 | OTHER FUNCTIONS                |  | SEQ 001 | REV 07 |

## ABOVE THRUST REDUCTION (THR RED) ALTITUDE

- \* The managed target speed changes.
- \* "LVR MCT" flashes white on the flight mode annunciator.
- \* The PROG page displays the engine-out maximum recommended altitude.
- \* The PERF TO page displays the "EO CLR\*" prompt in the 1R field.
- \* The navigation display shows the EOSID.

### Procedure

- MOVE the thrust lever(s) for the live engine(s) to the MCT detent.
- PUSH the ALT pushbutton on the FCU.  
*The target speed jumps to the engine out long range cruise, limited by SPD LIM/SPD CSTR.*
- CLEAN UP configuration as the speed increases.  
*When Green Dot speed is reached :*
- PUSH the altitude selector knob to resume the climb.  
*The CLIMB mode engages, and the target speed is green dot.*

**Note :** *If it is necessary, move the thrust lever(s) for the live engine(s) to the TOGA detent. The flight mode annunciator will display "LVR MCT" flashing amber when you reach Green Dot speed.*

|                                                                                 |                                                          |         |        |
|---------------------------------------------------------------------------------|----------------------------------------------------------|---------|--------|
|  | <b>MULTI PHASE RELATED PROCEDURES</b><br>OTHER FUNCTIONS | 4.04.30 | P 11   |
|                                                                                 |                                                          | SEQ 001 | REV 10 |

## **ENGINE-OUT IN CLB PHASE (above acceleration altitude)**

### **ENGINE-OUT OCCURS WHILE AIRCRAFT IS BELOW EO MAX ALT**

- \* The managed target speed changes to Green Dot speed.  
If the aircraft is in ALT or ALT\* mode, the speed target is the engine-out long range cruise speed at that altitude, limited by SPD LIM or SPD CSTR.  
The target speed change is gradual so as to prevent a strong thrust reduction.
- \* “LVR MCT” flashes amber on the Flight Mode Annunciator.
- \* The system computes the flight plan predictions down to the primary destination, assuming that the cruise phase will be flown at the lower of CRZ ALT or EO MAX ALT.
- \* The MCDU shows the PERF CLB page with an “EO CLR\*” (clear engine-out) prompt.
- \* The PROG page shows the engine-out maximum recommended altitude (EO MAX ALT).

#### **Procedure**

- MOVE the thrust lever(s) for the live engine(s) to the MCT detent.
- SET the altitude on the Flight Control Unit to an altitude below the engine-out maximum recovery altitude, as cleared by ATC.
- INITIATE a diversion, when cleared to do so.

### **ENGINE-OUT OCCURS WHILE THE AIRCRAFT IS ABOVE EO MAX ALT**

- \* “LVR MCT” (maximum continuous thrust) flashes amber on the Flight Mode Annunciator.
- \* The climb mode (if engaged) reverts to open climb (OP CLB).
- \* The system computes the flight plan predictions down to the primary destination, assuming that the aircraft immediately drifts from the current altitude down to the EO MAX ALT at green dot, and then cruises at this altitude

**Note :** *You cannot arm or engage CLB mode, above EO MAX ALT.*

#### **Procedure**

Same as engine-out in cruise phase (see next page)

## **ENGINE-OUT IN CRUISE PHASE**

The system sets the managed target speed to the long range engine-out cruise at that altitude. If the aircraft is above the Engine-Out Maximum Altitude (EO MAX ALT), the target speed is the long range engine-out cruise speed at EO MAX ALT. The target speed change is gradual, so as to prevent a strong engine thrust reduction.

- \* LVR MCT flashes on the Flight Mode Annunciator.
- \* The performance cruise page appears with the “EO CLR\*” (clear engine-out) prompt, and displays the level off altitude assuming descent and cruise at green dot speed (obstacle strategy).
- \* The progress page displays “EO MAX ALT”.
- \* The system computes the flight plan predictions down to the primary destination, assuming that the cruise phase at the lower of CRZ FL or EO MAX ALT.

### **Procedure**

- Perform engine-out abnormal procedure.
- Refer to FCOM volume 3 “SINGLE ENGINE OPERATIONS”
  - \* For standard strategy, use Chapter 3.06.30.
  - \* For obstacle strategy, use Chapter 3.06.40.
  - \* For fixed strategy (for A330 only), use Chapter 3.06.50.
- Initiate a diversion if necessary.

**Note :** – The engine-out descent strategy requires disconnection of the autothrust, and descent in OPEN DES mode.

Disconnecting the autothrust prevents an automatic setting of THR IDLE, therefore, the autopilot will fly the target speed in OP DES mode with a thrust manually selected by the crew.

When reaching the FCU-selected altitude, or whenever normal descent is resumed to a lower altitude, reengage the autothrust.

- DES mode is not available above EO MAX ALT.

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|----------------------------------------------------------------------------------|--------------------------------|--|---------|--------|
| <b>virgin atlantic</b><br><b>A340-600</b><br><i>Flight Crew Operating Manual</i> | MULTI PHASE RELATED PROCEDURES |  | 4.04.30 | P 13   |
|                                                                                  | OTHER FUNCTIONS                |  | SEQ 002 | REV 12 |

Approximate increase in fuel consumption compared to all engines operative :

|     | ≤ M. 82 or LRC | M.83   | M.84 |
|-----|----------------|--------|------|
| Add | + 15 %         | + 10 % | —    |

|                                                                                                                                   |                                       |  |         |        |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--|---------|--------|
| <br><b>A340-600</b><br>Flight Crew Operating Manual | <b>MULTI PHASE RELATED PROCEDURES</b> |  | 4.04.30 | P 14   |
|                                                                                                                                   | OTHER FUNCTIONS                       |  | SEQ 001 | REV 12 |

## **ENGINE OUT IN DESCENT PHASE**

- \* The managed target speed remains unchanged (ECON DES Mach number or speed, with any speed limitations).
- \* "LVR MCT" flashes on the Flight Mode Annunciator.
- \* The PERF DES page appears, showing the "EO CLR\*" prompt.
- \* The PROG page displays the engine-out maximum altitude (EOMAX ALT).
- \* The descent mode (if engaged) reverts to V/S if the aircraft is above the EO MAX ALT. If not, the descent mode is kept.

### **Procedure**

- MOVE the thrust lever(s) for the live engine(s) to the MCT detent.
- If necessary, SELECT a suitable flight mode for descent.
- DISCONNECT the autothrust and ADJUST thrust if necessary.

**Note :** *The system recomputes the descent and approach pathes, based on 2 or 3 engines model for A340, or on a single engine model for A330.*

## **ENGINE-OUT IN APPROACH PHASE**

- \* The aircraft maintains approach speed (VAPP).
- \* "LVR MCT" flashes on the Flight Mode Annunciator.
- \* The PERF APPR page appears, showing the "EO CLR\*" prompt.
- \* The PROG page displays the engine-out maximum altitude (EO MAX ALT).

### **Procedure**

- MOVE the thrust lever(s) for the live engine(s) to the MCT detent.
- SELECT a suitable flight mode as for an all engine approach.

## **CAUTION**

Below maneuvering speed (F, S, Green Dot), the autopilot or flight director (AP/FD) cannot order a bank angle greater than 15°. Above maneuvering speed, normal AP/FD bank angle is available.

## **ENGINE-OUT IN GO-AROUND PHASE**

The results and procedures for takeoff phase apply, however the displays do not show the engine-out SID.

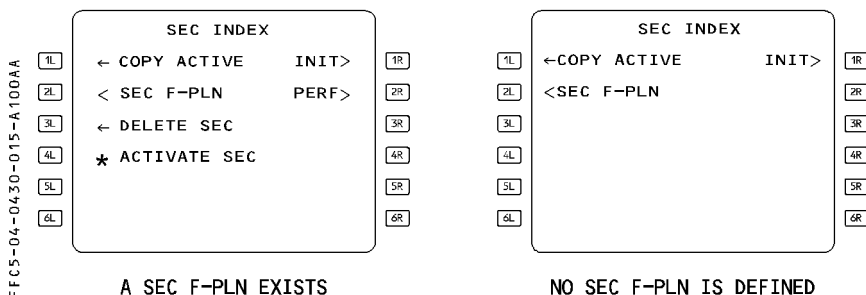
**Note :** *If ALT\* engages out of SRS mode and an engine out occurs simultaneously, an airspeed loss may be encountered during the altitude capture.*

## SECONDARY FLIGHT PLAN

The secondary flight plan is an alternative flight plan that you can activate when required.

With respect to the secondary flight plan, you can :

- Construct it independently (it can be created while a temporary exists).
- Copy it from the active flight plan.
- Delete it completely.
- Activate it as primary flight plan using ACTIVATE SEC prompt.



- The screen displays the “ACTIVATE SEC” prompt in flight :
  - when the heading (track) mode is engaged, or
  - when the navigation mode is engaged if the active legs of the primary and secondary flight plans are common.
- The screen displays the “INIT” prompt if the secondary flight plan is not a copy of the active flight plan. The secondary flight plan sequences with the active flight plan when it is a copy of the active. The navigation display shows the secondary flight plan in white.
  - In PLAN mode use the slew keys to review it (as you would for the primary flight plan).

### Predictions

The system computes predictions using the same performance methods and performance factor it uses for the active flight plan. However, it predicts pseudo waypoints only for the Multifunction Control and Display Unit not for the Navigation Display (ND).

### Use of secondary flight plan

The pilot will use the secondary flight plan in the following situations :

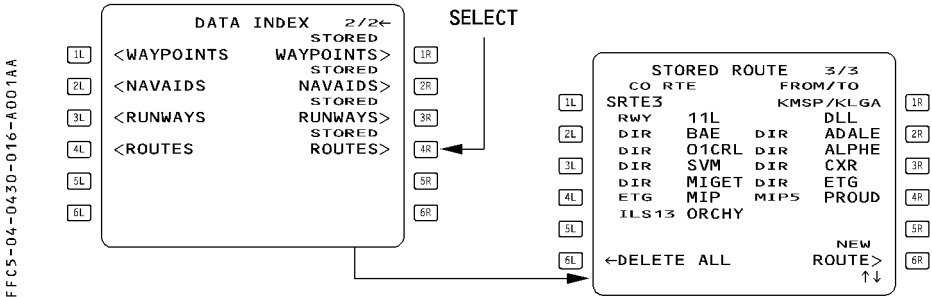
- \* When an alternate takeoff runway is probable
- \* To plan a diversion
- \* To prepare the next flight
- \* To compare predictions and evaluations.

**STORED ROUTE FUNCTION**

The stored route function allows the pilot to store or review as many as five different routes defined in an active or secondary flight plan.

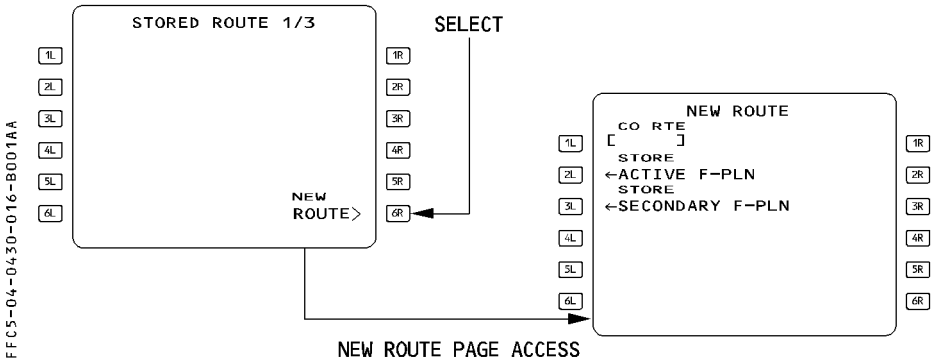
This also allows you to store a company route that is not yet in the database but is expected to be flown several times (a charter route, for example).

Access the STORED ROUTES page from the DATA INDEX page.



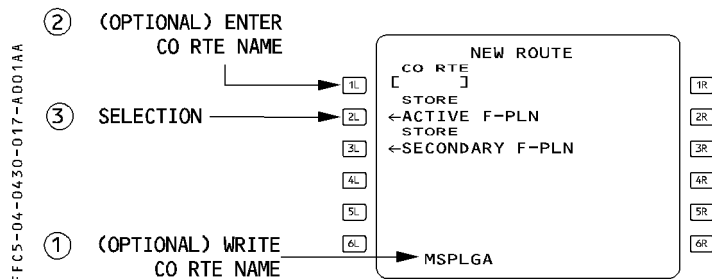
A stored route can be reviewed by using the slew key.

In order to store a new route, first define the route through the active flight plan (on the ground only) or the secondary flight plan (on the ground or in flight) then proceed as described below.



## HOW TO STORE THE ACTIVE FLIGHT PLAN (DURING PREFLIGHT ONLY)

- SELECT the DATA key on MCDU
- PRESS the next page key
- PRESS the "STORED ROUTES" key
- PRESS the "NEW ROUTE" key
- ENTER the company route name (optional)
- PRESS the "STORE ACTIVE F-PLN" key



## HOW TO STORE THE SECONDARY FLIGHT PLAN

- SELECT the DATA key on MCDU
- PRESS the next page key
- PRESS the "STORED ROUTES" key
- PRESS the "NEW ROUTES" key
- ENTER the company route name (optional)
- PRESS the "STORE SECONDARY F-PLN" key

|                                                                           |                                       |  |         |        |
|---------------------------------------------------------------------------|---------------------------------------|--|---------|--------|
| <b>virgin atlantic</b><br><b>A340-600</b><br>Flight Crew Operating Manual | <b>MULTI PHASE RELATED PROCEDURES</b> |  | 4.04.30 | P 18   |
|                                                                           | OTHER FUNCTIONS                       |  | SEQ 001 | REV 07 |

**Note :** – In either case, you may store a company route only if the active or secondary flight plan is complete from origin to destination.

– If you do not enter a name, the Flight Management Guidance System names the stored route automatically as “SRTE 1 (or 2 ...)” when it is stored.

– The system does not retain several elements of the flight plans when you store them :

- \* Pilot-entered holds
- \* Offsets
- \* Pilot-entered constraints
- \* Modifications to a terminal procedure
- \* Pseudo waypoints

When this happens, it displays “REVISIONS NOT STORED”.

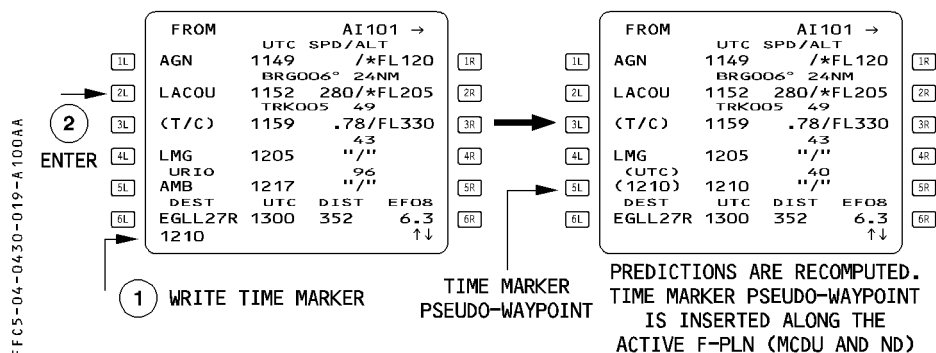
– If you already stored five routes, the system will reject a new entry and display “STORED ROUTES FULL” on the MCDU. Delete one stored route by clearing the CO RTE name before inserting a new one.

## TIME MARKER

The pilot can enter a time marker in the F-PLN A or B page. Once entered, the FMGS displays a pseudo waypoint along the flight plan on the MCDU and on the navigation display. This pseudo waypoint shows the predicted location of the aircraft at the entered time.

### HOW TO INSERT A TIME MARKER

- WRITE the time marker in the scratchpad. The entry format is HHMM.
- SELECT any left key of the F-PLN A or B page, to insert the time marker in the active flight plan.  
*The time marker is inserted in the flight plan according to time criteria, irrespective of the key chosen for entry.*



Up to 4 time markers may exist at a time. An attempt to enter a fifth time marker will cause the message "TIME MARKER LIST FULL" to appear on the scratchpad.

The FMGS updates the time marker position with the predictions.

When the current clock time equals or exceeds the time marker entry, the FMGS sequences the time marker (even in preflight).