



**A350**  
FLIGHT CREW  
OPERATING MANUAL

**AIRCRAFT SYSTEMS**  
**22 - AFS - FLIGHT GUIDANCE**  
AP/FD MODES - DESCENT

**EMER DES**

**GENERAL**

Ident.: DSC-22-FG-70-60-40-00023928.0001001 / 26 FEB 19

Applicable to: ALL

The Emergency Descent function uses combined lateral and vertical modes to perform an assisted Automatic Emergency Descent (AUTO EMER DESCENT) down to the highest altitude between FL 100 and current MORA plus an envelope margin.

The **EMER DES** mode has the same vertical guidance as the **OP DES** mode coupled with usual **HDG** and **THR IDLE** modes, with an automatic setting of the AFS CP altitude, heading and speed targets.

In addition, when **EMER DES** mode engages:

- The FDs engage, if not already engaged
- The A/THR automatically activates, if not already activated
- The AP engages, if not already engaged, if **EMER DES** was automatically armed
- The speed brakes automatically fully extend if **EMER DES** was automatically armed
- The XPDR automatically squawks the emergency 7700 transponder code
- The TCAS display mode is automatically set to BLW.

Two types of AUTO EMER DESCENT function arming exist:

- The manual arming of the AUTO EMER DESCENT function via dedicated controls (i.e. the EMER DESCENT pb and the speed brakes lever).

It aims at assisting the flight crew to perform an emergency descent. *Refer to DSC-22-FG-70-110-130 AUTO EMER DESCENT with manual arming.*

- The automatic arming of the AUTO EMER DESCENT function.

It aims at performing an automatic emergency descent with engagement of the AP/FDs following a severe cabin decompression. The purpose is to cover a possible flight crew incapacitation situation. *Refer to DSC-22-FG-70-110-130 AUTO EMER DESCENT with automatic arming.*

During the AUTO EMER DESCENT, the AP/FD **TCAS** has priority over the **EMER DES** mode. When clear of conflict, the AUTO EMER DESCENT function automatically arms again, if automatic arming conditions are still applicable (i.e.: The cabin altitude is still predicted to increase above 14 000 ft in the next 15 s). *Refer to DSC-22-FG-70-110-130 TCAS during AUTO EMER DESCENT.*

When the AUTO EMER DESCENT is completed, the AP/FD guidance reverts to **ALT** mode to maintain the targeted altitude, and keeps **HDG** mode. Speed brakes retract to the speed brake lever position if automatically extended, and the speed target is automatically set to Green Dot.

**MORA with envelope margin**

To ensure sufficient margin versus the terrain at the end of the emergency descent procedure, the altitude target sent to the AFS CP is the FMS Grid MORA corrected by an envelope margin.

This envelope margin takes into account potential large deviation of temperature below standard and low atmospheric barometric pressure.

The value of the envelope margin (between 3 000 ft and 6 000 ft) depends on the FMS grid MORA. This FMS Grid MORA with envelope margin is referred to as the  $MORA_{dISA/dP}$  in the FCOM.

*Note:* The FMS MORA which is displayed on the ND and the VD has no added margin.

## ARMING CONDITIONS

Ident.: DSC-22-FG-70-60-40-00023929.0001001 / 01 JUN 17

Applicable to: ALL

The AUTO EMER DESCENT function arms:

- Manually, when the flight crew presses the EMER DESCENT pb, and the aircraft flies above the highest altitude between FL 100 and current  $MORA_{dISA/dP}$ .

The **ARM** indication appears steady on the EMER DESCENT pb.

**EMER DESCENT ARMED** message appears on the PFD and on the HUD .

- L2** If neither **CAB PRESS EXCESS CAB ALT** nor **MISC EMER DESCENT** ECAM alert is already displayed, the **AUTO FLT EMER DESCENT** ECAM alert triggers.

- L1** *Note:* The **EMER DESCENT ARMED** message on the PFD indicates that the flight crew has initiated the manual arming of the AUTO EMER DESCENT function. The AUTO EMER DESCENT function activates only if the flight crew extends the speed brakes.

- Automatically, when the cabin altitude is predicted to increase above 14 000 ft in the next 15 s.

- L3** For airports with an elevation above 12 000 ft, the cabin altitude threshold for automatic arming of the AUTO EMER DESCENT function is equal to the cabin altitude at the airport plus 2 000 ft. However, the threshold will not exceed a cabin altitude of 18 000 ft.

- L1** The **ARM** indication flashes on the EMER DESCENT pb.

**AUTO EMER DES IN XX S** countdown message appears on the PFD and on the HUD , to indicate that **EMER DES** automatically engages at the end of the 15 s countdown.

The FMA displays **EMER DES** mode.

- L2** When **TCAS** disengages upon "CLEAR OF CONFLICT" aural alert, the AUTO EMER DESCENT function arms again automatically, if conditions are still applicable.



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**DISARMING CONDITIONS**

Ident.: DSC-22-FG-70-60-40-00023930.0001001 / 08 JUL 19

Applicable to: ALL

If the AUTO EMER DESCENT function was manually armed (i.e. **EMER DESCENT ARMED** message on the PFD and HUD ) , the function disarms when one of the following conditions occurs:

- **EMER DES** engages
- The flight crew presses one time the EMER DESCENT pb.

If the AUTO EMER DESCENT function was automatically armed (i.e. **EMER DES** on FMA and **AUTO EMER DES IN XX S** message on the PFD and HUD ) , the function disarms when one of the following conditions occurs:

- **EMER DES** engages
- The flight crew presses two times the EMER DESCENT pb

**L2** The first action on the EMER DESCENT pb arms the function. Second action disarms the function.

**L1** - **TCAS** engages.

**L2** The AUTO EMER DESCENT function automatically disarms when the aircraft altitude is below the highest altitude between FL 100 and current MORA<sub>dISA/dP</sub>.

**ENGAGEMENT CONDITIONS**

Ident.: DSC-22-FG-70-60-40-00023931.0001001 / 08 JUL 19

Applicable to: ALL

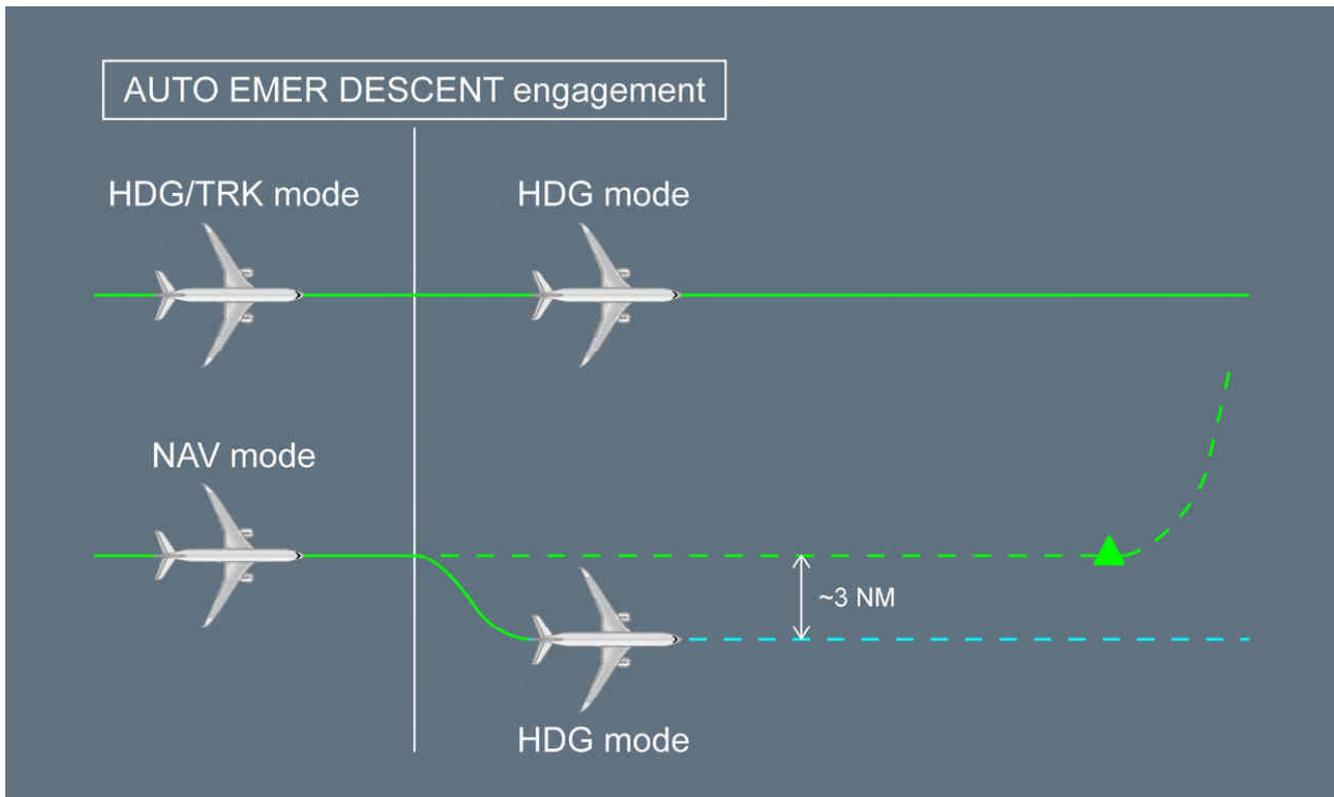
**EMER DES** engages when one of the following conditions is applicable:

- If the AUTO EMER DESCENT function was manually armed (i.e. **EMER DESCENT ARMED** message on the PFD and HUD ) , the flight crew sets the speed brake lever to at least 1/3 position.
- If the AUTO EMER DESCENT function was automatically armed (i.e. **EMER DES** on FMA and **AUTO EMER DES IN XX S** message on the PFD and HUD ) :
  - During the 15 s countdown, the flight crew presses the EMER DESCENT pb, and sets the speed brake lever to at least 1/3 position, or
  - At the end of the 15 s countdown.

When **EMER DES** engages, all of the following automatically occurs:

- FDs engage, if not already engaged
- A/THR activates, if not already active, and maintains idle thrust
- The AFS CP managed speed target is set to VMAX – 5 kts

- Lateral guidance reverts to **HDG**, if not already engaged:
  - The triple click audio indicator sounds
  - If previously in **NAV**, a right offset of approximately 3 NM is automatically performed along current FMS F-PLN leg.
- L2** The HDG/TRK window indicates the HDG target, which changes according to the lateral guidance to reach the offset of approximately 3 NM.
- L1** • If previously in **TRK**.



- AFS CP selected altitude is set to the highest altitude between FL 100 and current  $MORA_{dISA/dP}$
- All altitude constraints are disregarded
- The **ARM** indication on the EMER DESCENT pb disappears
- XPDR squawks the emergency 7700 transponder code
- TCAS display mode is set to BLW.

In addition, when **EMER DES** engages after an automatic arming, the following automatically occurs:

- AP engages, if not already engaged
- Speed brakes fully extend
- **AUTO EMER DES ENGAGED** message appears on PFD, and on HUD .

- L2** The **AUTO EMER DES ENGAGED** message informs the flight crew under recovery of a previous incapacitation that an AUTO EMER DESCENT is in progress.



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**DISENGAGEMENT CONDITIONS**

Ident.: DSC-22-FG-70-60-40-00023932.0001001 / 08 JUL 19

Applicable to: ALL

**EMER DES** disengages when one of the following conditions is applicable:

- **TCAS** engages
- The flight crew engages another vertical mode.

When **EMER DES** disengages after an automatic arming, the following occurs:

- The speed brakes automatically return to the current SPEED BRAKE lever position
  - **AUTO EMER DES ENGAGED** message on the PFD and on the HUD  disappears.
- At the end of the AUTO EMER DESCENT.

When **EMER DES** disengages, the following occurs:

- **ALT\*** engages
  - The speed brakes automatically return to the current SPEED BRAKE lever position
  - Aircraft decelerates to Green Dot speed computed with speed brakes extended.
- L2** Green Dot speed with speed brakes extended is 13 kt above Green Dot speed for clean configuration.
- L1** • The **AUTO EMER DES COMPLETED** message replaces the **AUTO EMER DES ENGAGED** message if displayed on the PFD and on the HUD  .
- L2** The **AUTO EMER DES COMPLETED** message remains displayed until the flight crew either:
- Changes any AFS CP target, or
  - Selects another AFS mode, or
  - Voluntarily disconnects the AP.



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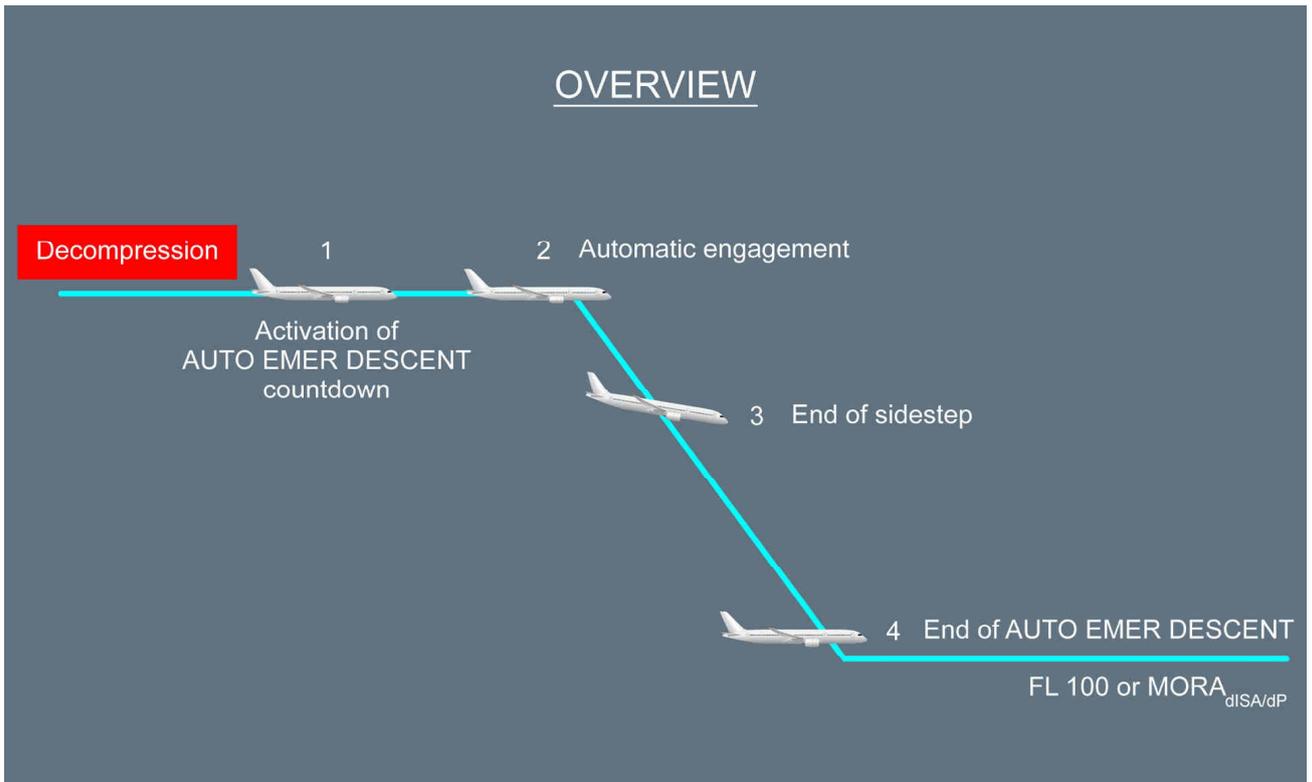
**AUTO EMER DESCENT**

**AUTO EMER DESCENT WITH AUTOMATIC ARMING**

Ident.: DSC-22-FG-70-110-130-00024050.0001001 / 01 JUN 17

Applicable to: ALL

**AUTO EMER DESCENT with automatic arming**



**AUTO EMER DESCENT WITH MANUAL ARMING**

Ident.: DSC-22-FG-70-110-130-00024051.0001001 / 01 JUN 17

Applicable to: ALL

AUTO EMER DESCENT with manual arming

OVERVIEW

Manual arming of  
the AUTO EMER DESCENT 1  
function

2 Manual engagement

3 End of sidestep

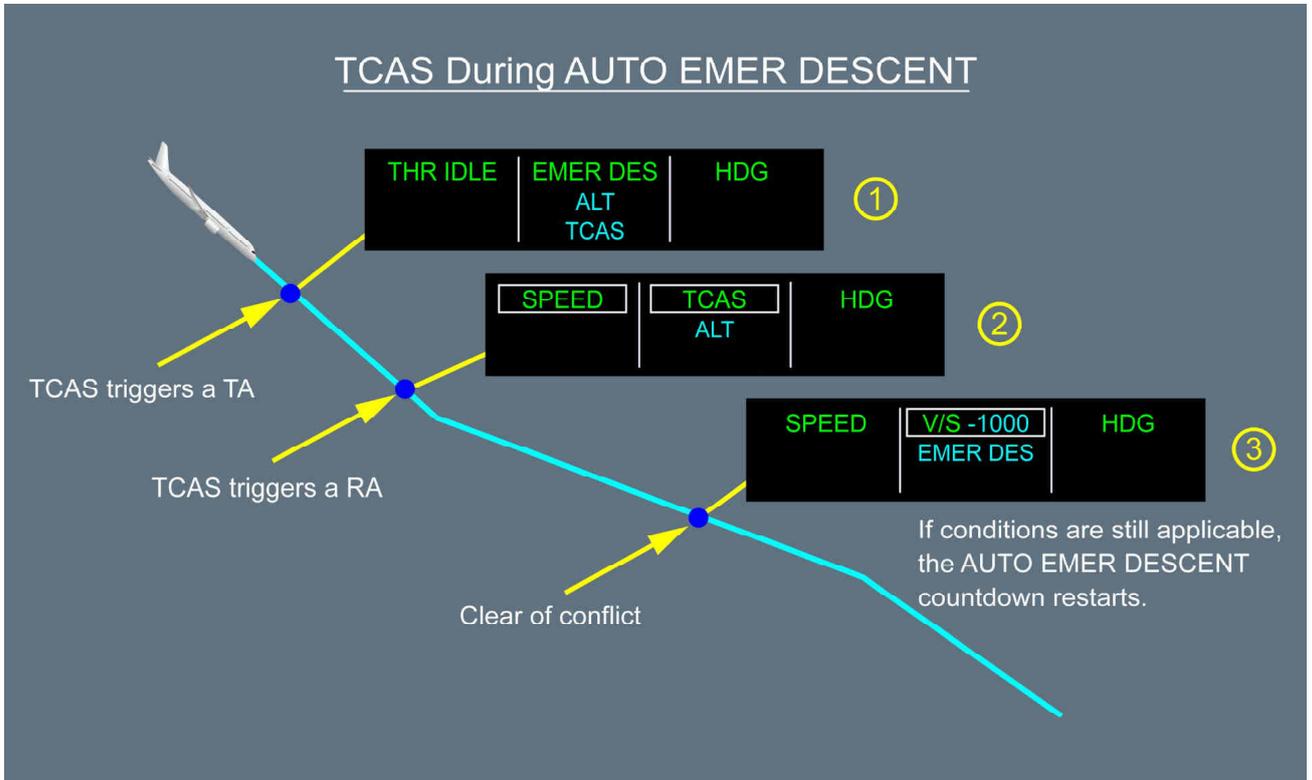
4 End of AUTO EMER DESCENT

FL 100 or MORA<sub>dISA/dP</sub>

**TCAS DURING AUTO EMER DESCENT**

Ident.: DSC-22-FG-70-110-130-00024052.0001001 / 01 JUN 17

Applicable to: ALL





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AP/FD MODES - SCENARIO EXAMPLES

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