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A318 – STEEP APPROACH OPERATION



AIRBUS

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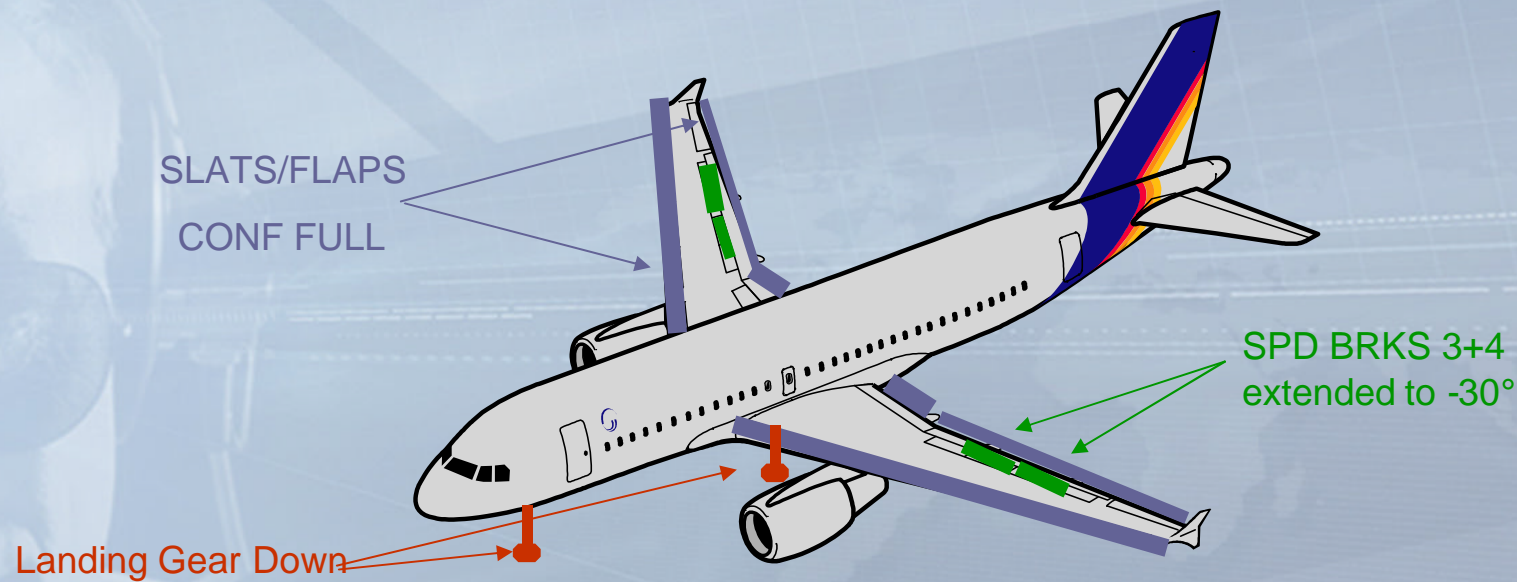
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Design objective

- AIRBUS has developed and tuned a new function on A318 aircraft in order to allow steep approach operation (STEEP APPR), from **-4.5° to -5.5° FPA**, for
 - ▶ CAT1 approaches (LOC + G/S)
 - ▶ LOC without G/S (LOC + FPA or V/S)
 - ▶ Visual approaches (with PAPI or HUD)
- This function is certified since the 3rd of April 2006 and valid for both CFMI and PW A318 versions

Aircraft configuration for STEEP APPR

- In order to increase the descent capability of the A318 and to cope with the -5.5° slope, the following aerodynamic configuration has been chosen:
 - ▶ Gear Down
 - ▶ CONF FULL
 - ▶ SPD BRKS lever FULL → Only SPLR 3+4 are extended to 30°



Systems adaptation and specificities

- In order to select the STEEP APPR function, an 'ON/FAULT' P/B has been added in the cockpit and must be set to ON prior a Steep Approach Landing



Systems adaptation and specificities

- When this P/B is pressed in, all concerned computers (ELAC, SEC, FCDC, FAC, FMGC, FWC, EGPWS/T2CAS) check if the STEEP APPR function is available.

If yes, the P/B 'ON' light illuminates in green, and the green memo 'STEEP APPR' appears on ECAM

If no, the P/B 'FAULT' light illuminates in amber, and 'STEEP APPR' amber appears in INOP SYS on the ECAM STS PAGE

YES



NO



Systems adaptation and specificities

- When STEEP APPR function is active (i.e. CONF FULL/DN + SPD BRKS lever FULL position), the effects on the aircraft are the following:
 - ▶ **F/CTL systems (ELAC/SEC/FCDC):**
 - SPD BRKS 3+4 only are extended to 30°
 - At around 85ft, automatic SPD BRKS retraction to 8° (no full retraction)
 - With SPD BRKS lever set to FULL, GND SPLRS are armed (they will deploy automatically at touchdown)
 - AOA protection, Roll normal law, Nz law and Flare law are adapted (in terms of gains and thresholds)
 - ▶ **Approach Speed (FAC):**
 - VLS is increased by 8Kt ($VREF_{STEEP APPR} = VREF + 8Kt$) and displayed accordingly on PFD

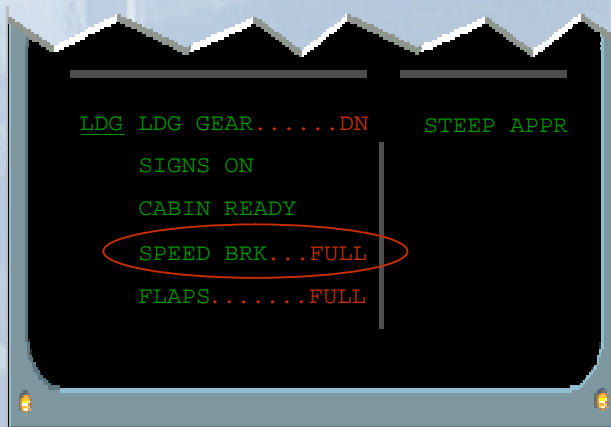
Note: The VLS provided on PERF APPR page by the FM is not updated
 - ▶ **A/THR and Autopilot (FMGC):**
 - AP/FD glide control law is adapted to cope with the increased slope and avoid jerks at AP disconnection
 - A/THR gains are increased to be more reactive

Systems adaptation and specificities

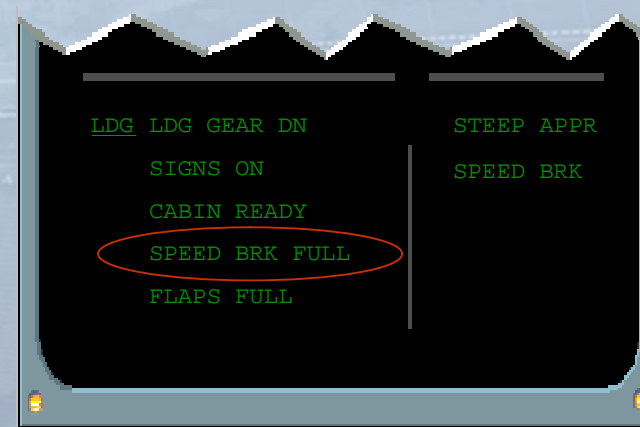
■ Flight Warning System (FWC):

- ▶ **Auto call-outs** 'STANDBY' at 117ft, 'STANDBY' at 90ft, and 'FLARE' at 63ft are triggered, based on Radio Height
- ▶ In case of any **failure** affecting the STEEP APPR capability, the following new ECAM cautions and warnings are triggered:
 - Above 800ft AGL, amber ECAM caution '**F/CTL STEEP APPR LOST**'
 - Below 800ft AGL, red ECAM warning '**F/CTL STEEP APPR FAULT**'
- ▶ **New ECAM LDG memo** to confirm that STEEP APPR is effectively active

Before actions



After actions



Systems adaptation and specificities

- Electronic Information System (EIS):
 - ▶ V/S threshold from green to amber is adapted to cope with the increased slope

- Ground Proximity System (EGPWS/T2CAS):
 - ▶ Adaptation of the alert thresholds to cope with the increased slope
 - ▶ Inhibition of alerts below 130ft to protect the “STANDBY... STANDBY... FLARE’ call-outs

Operational limitations

- Maximum authorised Flight Path Angle: -5.5°
- MLW unchanged (57.5t)
- FWD and CG limits unchanged
- Maximum altitude for landing: 2000ft
- Tailwind limit for landing: 5Kt
- Crosswind limit for landing: 26Kt gust included
- AUTOLAND is not allowed
- CATII and CATIII are not allowed
- All engines operative only

Standard Operating Procedure (SOP)

■ Before descent:

- ▶ Add 8Kt to VAPP in PERF APPR page
- ▶ STEEP APPR P/B pressed in (check ECAM Memo green)
- ▶ Briefing “Steep approach” with following key points:
 - Landing configuration (STEEP APPR P/B pushed + Gear Down + CONF FULL + SPD BRKS lever position FULL)
 - $VLS_{PFD} = VREF + 8Kt$ in steep approach configuration
 - Automatic call-outs “Standby / Standby / Flare”
 - PNF call-out “Flare” at 60ft RA for redundancy with automatic “Flare” call-out at 63ft
 - Retard thrust levers to IDLE at flare initiation
 - Below 2000ft, Final Approach interrupted for Amber or Red warning except if immediate landing is safer (fire or smoke)
 - In case of Go Around, SPD BRKS lever must be retracted by PF (redundant action with automatic retraction)

Standard Operating Procedure (SOP)

■ Intermediate Approach:

- ▶ Steep Approach configuration established before final approach (STEEP APPR P/B pushed + Gear Down + CONF FULL + SPD BRKS lever FULL)
- ▶ Check VAPP with updated wind
- ▶ Landing Check List before final approach

■ Landing:

- ▶ Flare initiated at 55ft (automatic call-out at 63ft)
- ▶ Retard thrust levers to IDLE at flare initiation

■ Go around:

- ▶ PF retracts SPD BRKS lever

■ Failures:

- ▶ In case of any red or amber alarm below 2000ft AGL during final approach, perform a Go Around (except if immediate landing is safer...)

Conclusion

- When defining the STEEP APPR function on A318, AIRBUS objective was to provide pilots with an aircraft handling and associated operational procedures as close as possible to the standard ones
- However, AIRBUS recommends a dedicated training to be provided to the crews who are meant to operate steep approaches on A318, which would consist essentially in base training



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