Docket No. SA-538

Exhibit No. 22-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Airbus Non-Precision Approach Procedures
(19 Pages)

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

February 12, 2014

Airbus Non-Precision Approach Procedures

OPERATIONAL FACTORS

DCA13MA133


February 2014
UPS1354 PUBLIC HEARING
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Non Precision Approach
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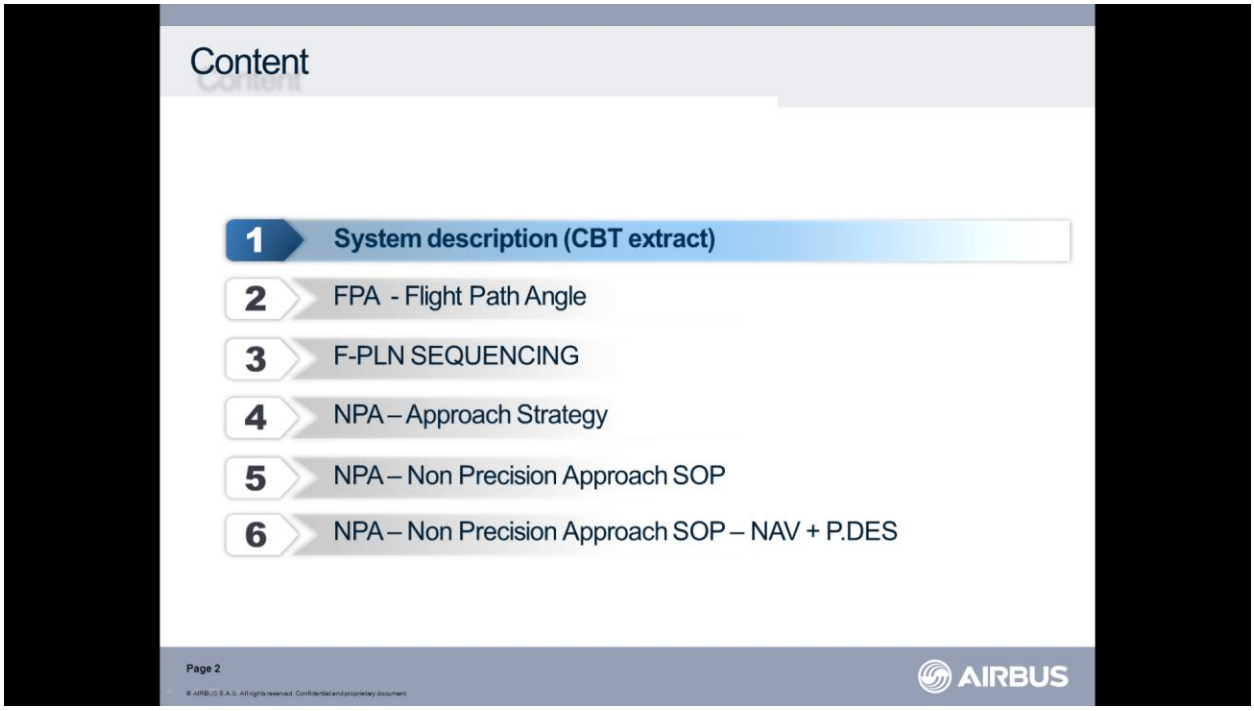
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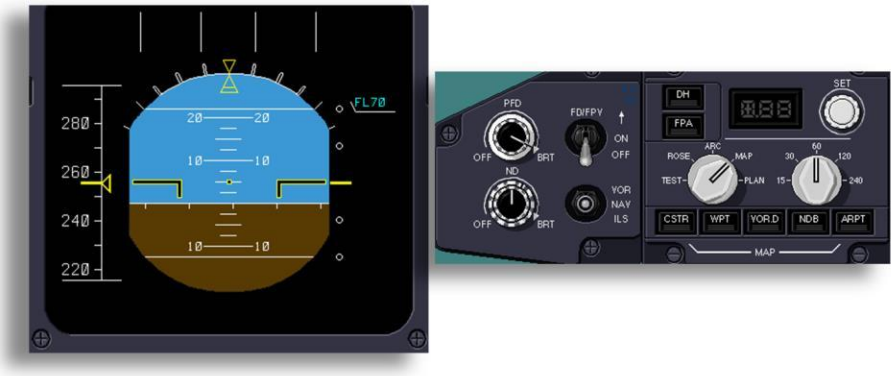
1 System description (CBT extract)



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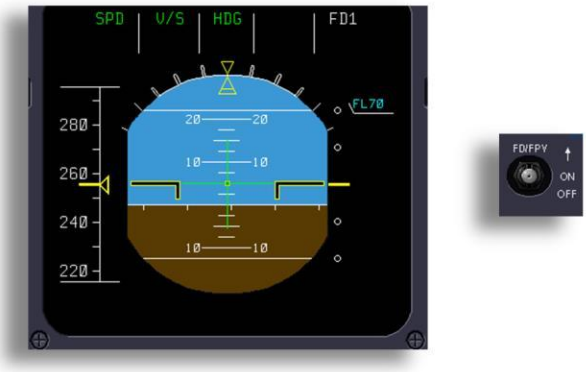
1 System description (CBT extract)



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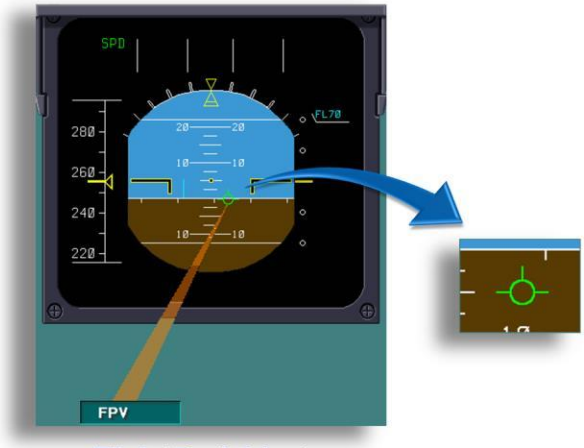

- Flight Path Vector

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1 System description (CBT extract)

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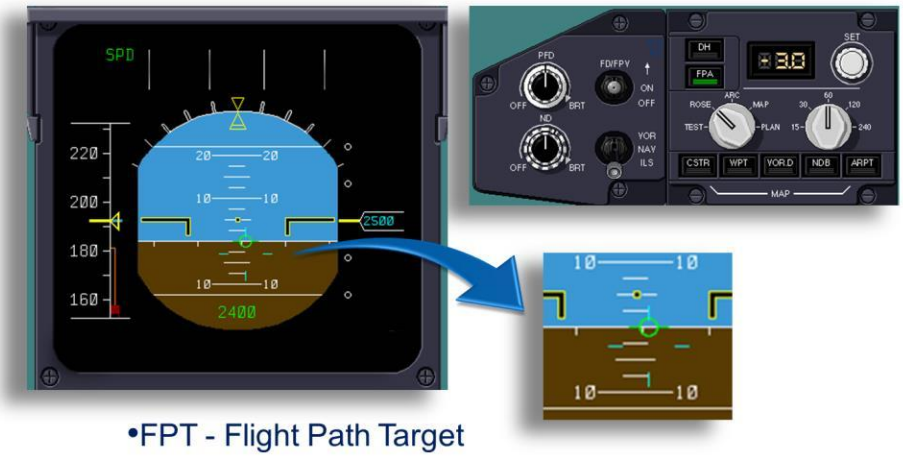
1 System description (CBT extract)



•FPT - Flight Path Target

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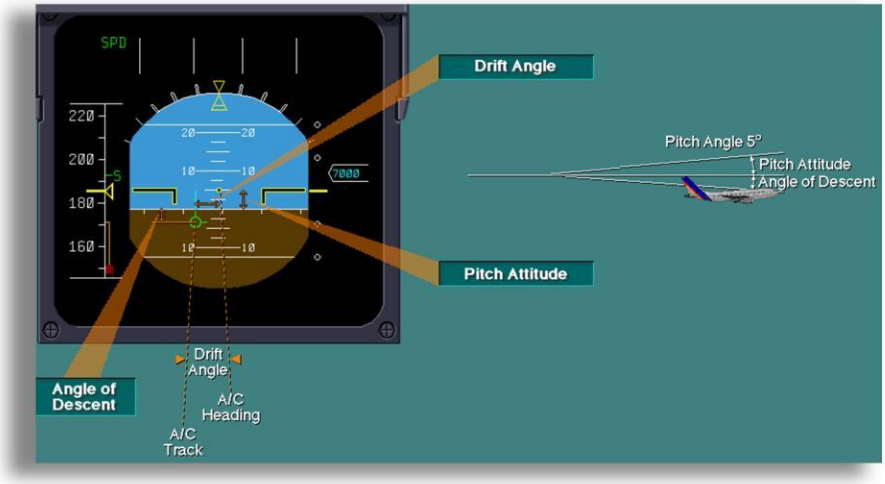
1 System description (CBT extract)



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2 FPA - Flight Path Angle

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2 FPA - Flight Path Angle

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2 FPA - Flight Path Angle

- GO AROUND

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Content

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3 F-PLN SEQUENCING

A300-600 FLIGHT CREW OPERATING MANUAL A/C	FCTM – NORMAL OPERATIONS APPROACH GENERAL	2.32.70 PAGE 2 REV 33 SEQ 001

F-PLN SEQUENCING

In NAV mode, the F-PLN automatically sequences. In HDG/S mode, the F-PLN waypoints will automatically sequence only if the aircraft flies close to the prepared route.

Correct F-PLN sequencing is important to ensure that :

- The programmed missed approach route is available in case of go-around
- The predictions are correct.

A good cue to monitor the proper F-PLN sequencing is the TO waypoint on the upper right side of the ND, which should be the next WPT ahead of the aircraft.

If under radar vectors and if automatic waypoint sequencing does not occur, it is recommended to sequence the F-PLN by either using the DIR TO function, or by deleting the FROM WPT on the F-PLN page until the next WPT to be overflown is displayed as the TO WPT on the ND.

This ensures :

- A coherent ND display
- Assistance for lateral interception
- VDEV computed on reasonable distance assumption.
- In case of go-around, NAV mode can be engaged to follow missed approach routing as programmed in F-PLN.

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3 F-PLN SEQUENCING

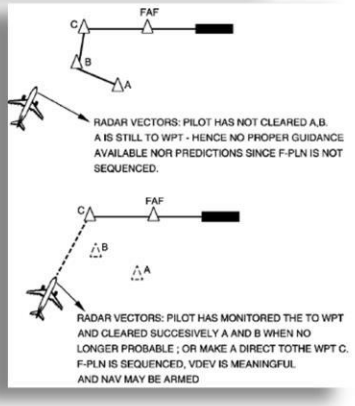
A300-600 FLIGHT CREW OPERATING MANUAL A/C	FCTM – NORMAL OPERATIONS	2.32.72
	NON-PRECISION APPROACH	PAGE 4
		REV 33 SEQ 001

INTERMEDIATE APPROACH

F-PLN SEQUENCING

It is essential for the F-PLN to be correctly sequenced. The crew should therefore check that the TO WPT indicated on the upper righthand corner of the ND (in MAP mode) corresponds to the next WPT ahead. This may not be the case if HDG/S mode is used to intercept the final approach course (e.g. when under radar vectors), so that one or more WPTs are by-passed ; these WPTs should then be cleared from the F-PLN, or a DIRECT TO the next WPT on the final approach course should be performed.

Note : If the F-PLN is not correctly sequenced, it will not be possible to use NAV mode for the approach, and the distance to dest (PROG page) and VDEV will not be realistic; furthermore, in the event of a go-around it will not be possible to use NAV mode to follow the missed approach routing.



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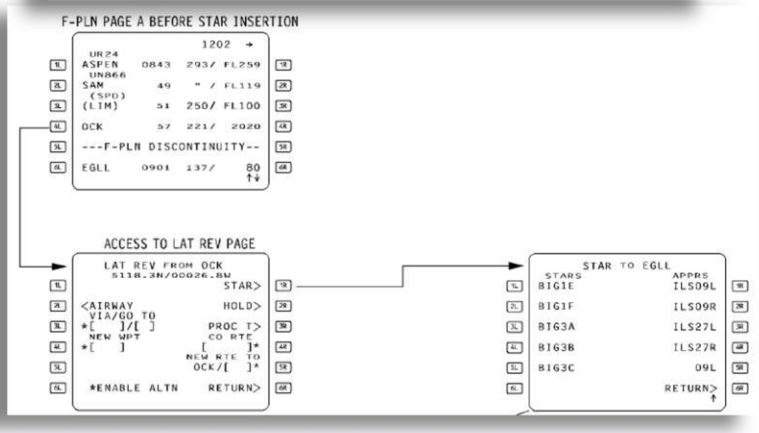
3 F-PLN SEQUENCING

A300-600 FLIGHT CREW OPERATING MANUAL A/C	PROCEDURES AND TECHNIQUES	2.02.25
	USE OF « SPERRY » FMS	PAGE 2
	PREPARATION BEFORE DESCENT & DESCENT	REV 28 SEQ 200



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4 NPA – Approach Strategy

- 2.03.20p1 FCOM extract

APPROACH GUIDANCE

Non Precision Approaches can be performed using two different AP/FD guidances :

- FMS guidance :
  - NAV mode down to the MDA or until LOC interception (lateral)
  - PROFILE mode down to the MDA provided FINAL APP state is active after the FAF (vertical).
- Selected guidance :
  - HDG SEL mode down to the MDA (lateral) or until LOC interception
  - V/S mode down to the MDA (vertical)

NAV and PROFILE modes can be used in final approach provided :

- The approach stored in the NAV database has been validated and is approved by the operator and
- GPS PRIMARY is available (required for RNAV (GPS) approach) or HIGH accuracy is displayed with the appropriate RNP, or the navaids raw data are tuned and monitored.

Otherwise, selected guidance must be used.
For selected guidance, the recommended flight reference display for a Non Precision Approach is the FPV/FPR.
For FMS guidance, the recommended flight reference display is FD.

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4 NPA – Approach Strategy

- 2.03.20p1 FCOM extract

APPROACH SPEED TECHNIQUE

The standard speed technique is a stabilized approach using AP engaged in CMD mode and A/THR engaged in SPD or P.SPD mode. This enables the aircraft to intercept the final descent path in the landing configuration and at V_{APP}, thrust above idle.

FCTM 2.32.72p1

APPROACH STRATEGY

Provided a Final Approach Fix (FAF) is defined in the approach procedure, the recommended technique for performing a NPA is to fly an ILS-like procedure, i.e. stabilized on a constant-angle final approach path from the FAF, with no level-off at intermediate waypoints or on reaching MDA.

The use of AP in CMD mode and A/THR is recommended for all NPAs to reduce crew workload and to facilitate monitoring of the procedure and flight path.

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5 NPA – Non precision Approach SOP

INITIAL APPROACH

FPA/CRS target . . . . . **SET**

In FMS guidance, the FPA is set in anticipation to a possible reversion to selected guidance

FD/FPV switch . . . . . **AS RQRD**

If FMS guidance is used in final approach, select FD.
If selected guidance is used in final approach, select FPV just before the FAF at the latest.

APPROACH CHECKLIST . . . . . **COMPLETE**

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5 NPA – Non precision Approach SOP

FINAL APPROACH

- **At FAF** :
  - **If FMS vertical guidance is used :**

    P. DES . . . . . **CHECK ENGAGEMENT**

    FCU altitude is disregarded.
    According to vertical transients (external perturbations, flaps extension,...) PDES may engage earlier than point of final descent but A/C will be guided in level-off up to the point of descent. No anticipated descent is guaranteed.
  - **If selected vertical guidance is used :**

    V/S . . . . . **SELECT**

    Set pre-calculated V/S required to obtain desired FPA.
- **GA ALTITUDE** . . . . . **SET**

  Set when below the go around altitude.

- **During final approach** :

  POSITION and FLIGHT PATH . . . **CHECK/ADJUST**
  - Monitor reference navaid raw data.
  - Monitor altitude in relation with the published descent profile and the distance to the runway.
  - Adjust HDG SEL and V/S accordingly, in selected guidance.
  - If FMS NAV is not satisfactory, revert to HDG/SEL. Note that if FMS vertical guidance is used, the reversion to HDG/S disengages AP and FMA reverts to basic modes.

  LANDING CHECKLIST . . . . . **COMPLETE**

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5 NPA – Non precision Approach SOP

FLIGHT PARAMETERS . . . . . CHECK
PF announces any FMA modification.
PNF calls out if :
- Speed becomes lower than VAPP – 5 kt or greater than speed target + 10 kt.
- Pitch attitude becomes lower than – 2.5° or greater than 10° nose up.
- Bank angle becomes greater than 7°.
- Descent rate becomes greater than 1000 ft/min.
- VDEV exceeds one dot in FMS vertical guidance.
- Any significant changes in ground speed that might indicate windshear.
- Excessive LOC deviation for a LOC approach.

When the PNF calls flight parameter exceedance, the suitable PF response is :
- Acknowledge the PNF call out, for proper crew coordination purposes
- Take immediate corrective action to control the exceeded parameter back into the defined stabilized conditions
- Assess whether stabilized conditions will be recovered early enough prior to landing, otherwise initiate a go-around.

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5 NPA – Non precision Approach SOP

A300-600 FLIGHT CREW OPERATING MANUAL A/C	FCTM – NORMAL OPERATIONS APPROACH GENERAL	2.32.70 PAGE 6 REV 33 SEQ 001

TRAJECTORY STABILIZATION

The first prerequisite for safe final approach and landing is to stabilize the aircraft on the final approach flight path laterally and longitudinally, in landing configuration, at Vapp speed, i.e :

- Only small corrections are necessary to rectify minor deviations from stabilized conditions
- The thrust is stabilized, to maintain the target approach speed along the desired final approach path.

Airbus policy requires that stabilized conditions be reached at 1000 ft above airfield elevation in IMC and 500 ft above airfield elevation in VMC

If, for any reason, one flight parameter deviates from stabilized conditions, the PNF will make a callout as stated below :

Exceedance and associated PNF callout

Parameter		Exceedance		Callout
IAS		VAPP +10 kt/-5 KT		"SPEED"
V/S		< -1000 ft/min		"SINK RATE"
Pitch attitude		>+10°, <0°		"PITCH"
Bank angle		> 7°		"BANK
ILS only	Localizer	Excess deviation on PFD	1/4 dot	"LOCALIZER"
	Glide slope		1 dot	"GLIDE SLOPE"
NPA only	Course	Excess deviation : 1/2 dot on ND (or 2.5° VOR or 5° ADF)		"COURSE"
	Altitude at check points	Deviation		"x FT HIGH (LOW)"

(Refer to FCOM 2.03.18 p3).

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5 NPA – Non precision Approach SOP

- **At MDA (MDH) + 100 ft :**
  HUNDRED ABOVE . . . . . ANNOUNCE
- **Reaching MDA (MDH) and VDP :**
  - **When visual references are acquired and confirmed by both PF/PNF :**
    CONTINUE . . . . . ANNOUNCE
    Continue as visual approach with the standard call outs.
    AP . . . . . OFF
    Note : Close to the ground, avoid important down corrections. Give priority to attitude and sink rate.

- **If no visual references are acquired :**
  GO AROUND/FLAPS . . . . . ANNOUNCE
  Initiate go around.
  Note : In selected guidance, if ground references are not visible when the aircraft reaches MDA, an immediate go around must be initiated.
  However, if the distance to the runway is not properly assessed, a step descent approach may be considered and a level off at MDA may be performed, using ALT HOLD to level off not lower than MDA, while searching for visual references. If the pilot has no visual reference at MAPt at the latest, he must begin a go around.

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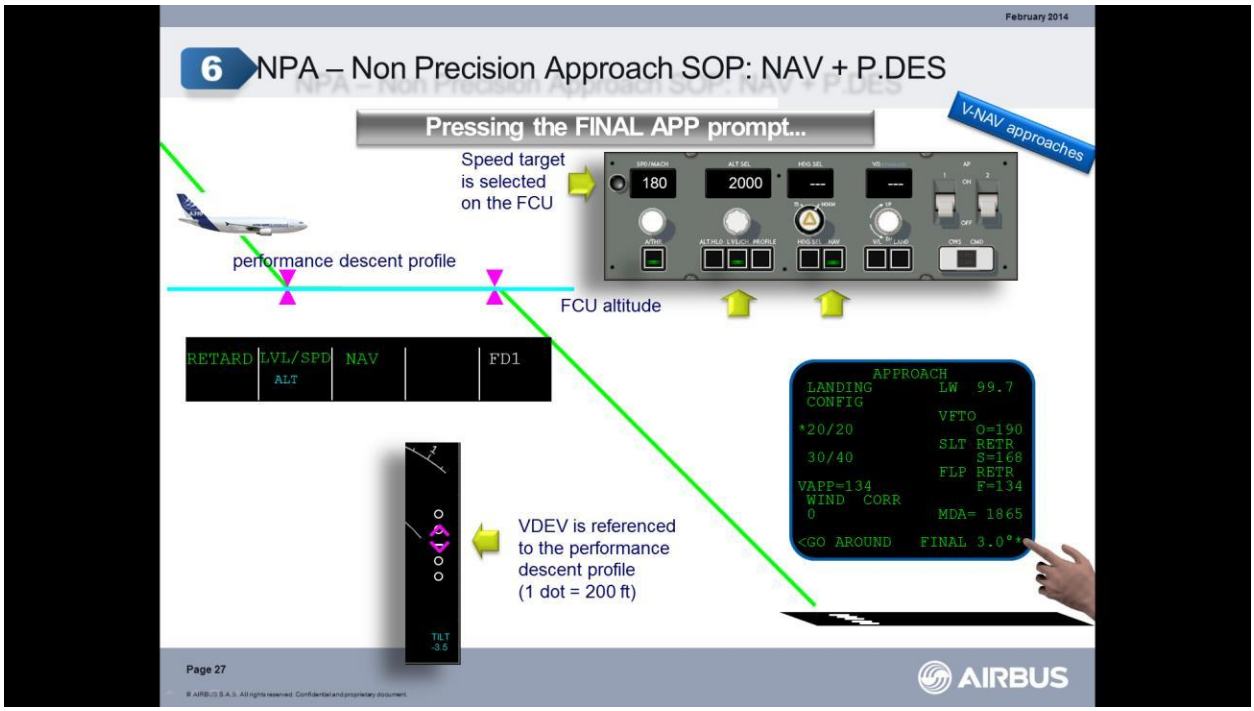
February 2014
6 NPA – Non Precision Approach SOP: NAV + P.DES
Pressing the FINAL APP prompt...
V-NAV approaches
Speed target is selected on the FCU
180
2000
performance descent profile
FCU altitude
RETARD
LVL/SPD
ALT
NAV
FD1
APPROACH
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
FINAL 3.0°
VDEV is referenced to the performance descent profile (1 dot = 200 ft)
TILT
-3.5
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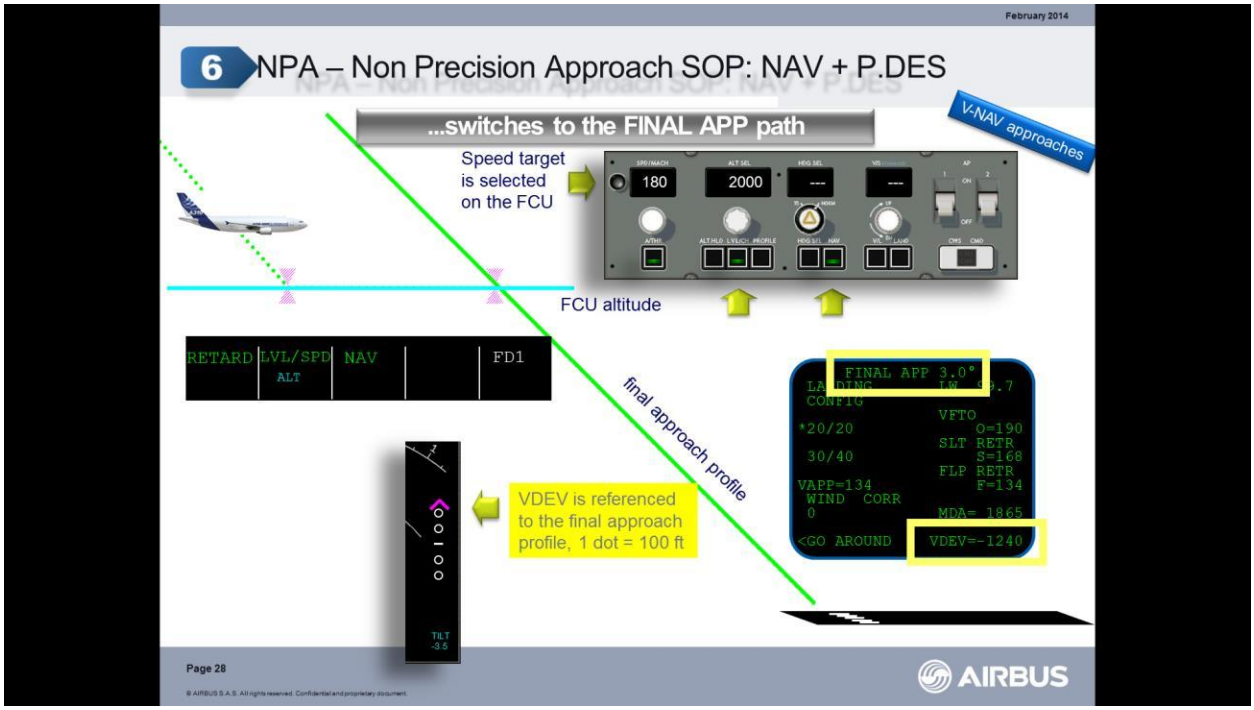
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6 NPA – Non Precision Approach SOP: NAV + P.DES
...switches to the FINAL APP path
V-NAV approaches
Speed target is selected on the FCU
180
2000
FCU altitude
RETARD
LVL/SPD
ALT
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
VDEV=-1240
VDEV is referenced to the final approach profile, 1 dot = 100 ft
TILT
-3.5
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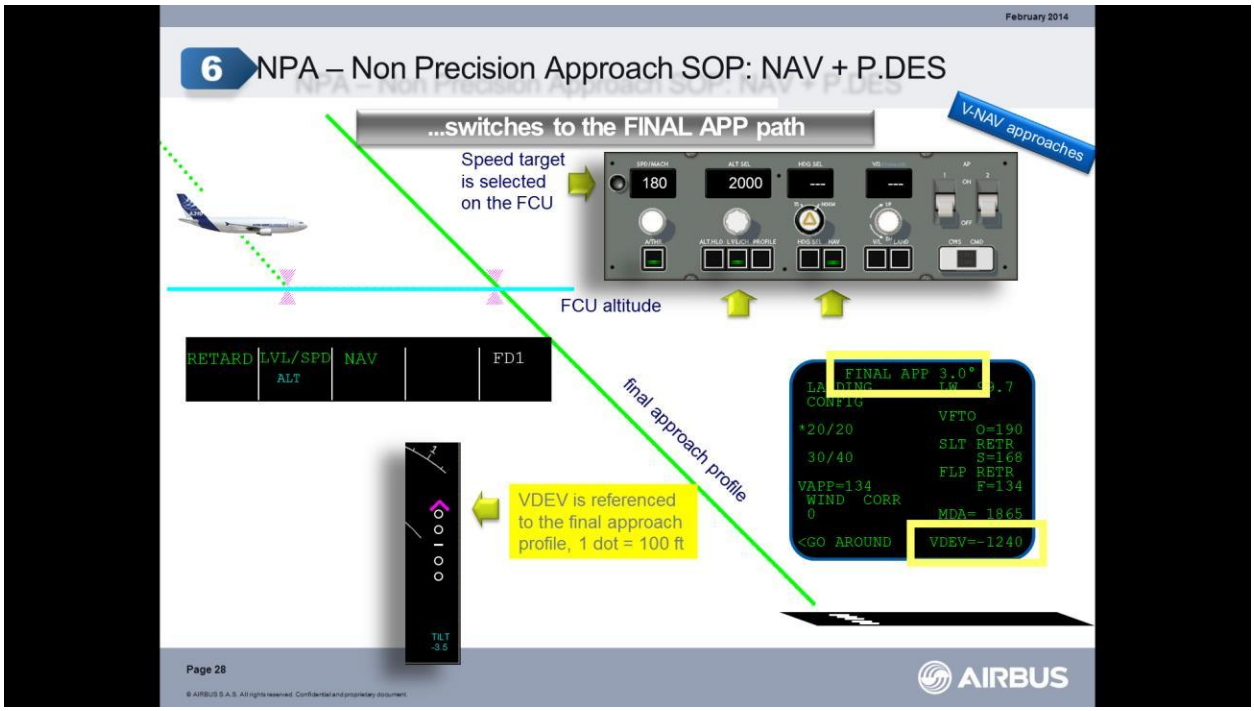
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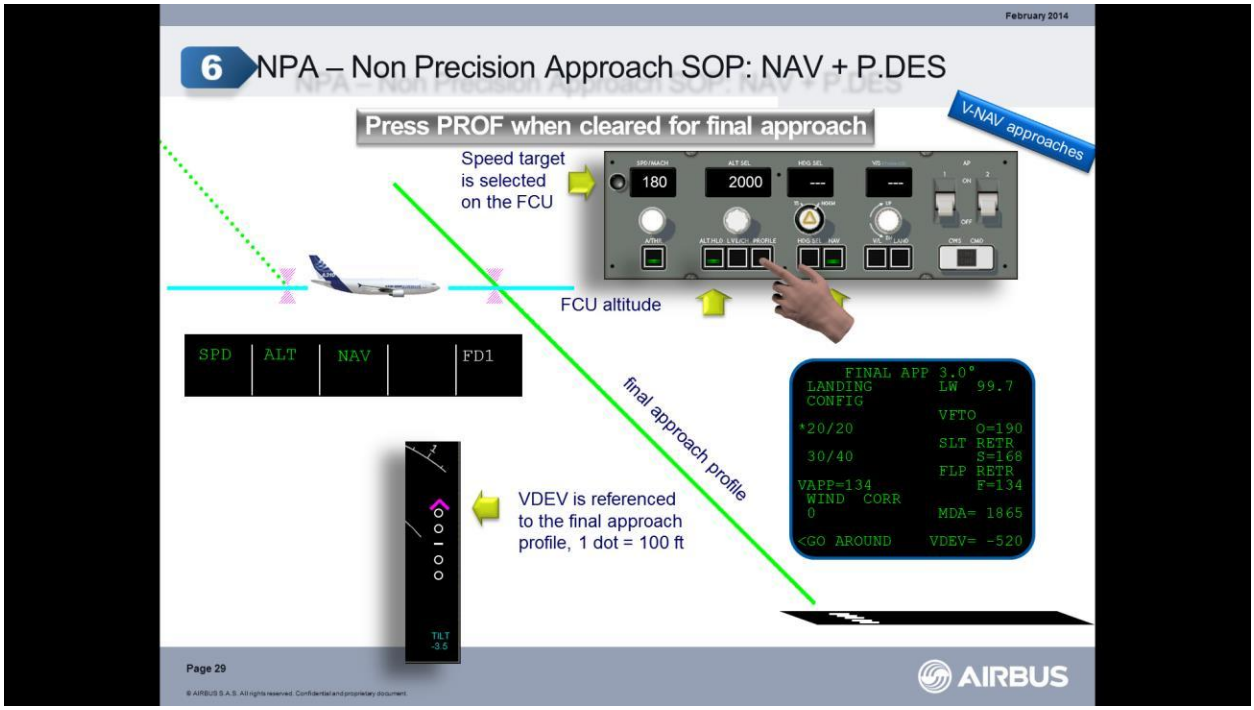
6 NPA – Non Precision Approach SOP: NAV + P.DES
...switches to the FINAL APP path
V-NAV approaches
Speed target is selected on the FCU
180
2000
FCU altitude
RETARD
LVL/SPD
ALT
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
VDEV=-1240
VDEV is referenced to the final approach profile, 1 dot = 100 ft
TILT
-3.5
Page 28
AIRBUS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6 NPA – Non Precision Approach SOP: NAV + P.DES
Press PROF when cleared for final approach
V-NAV approaches
Speed target is selected on the FCU
180
2000
FCU altitude
SPD
ALT
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
LW 99.7
*20/20
30/40
VAPP=134
WIND CORR
0
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
VDEV= -520
VDEV is referenced to the final approach profile, 1 dot = 100 ft
TILT
-3.5
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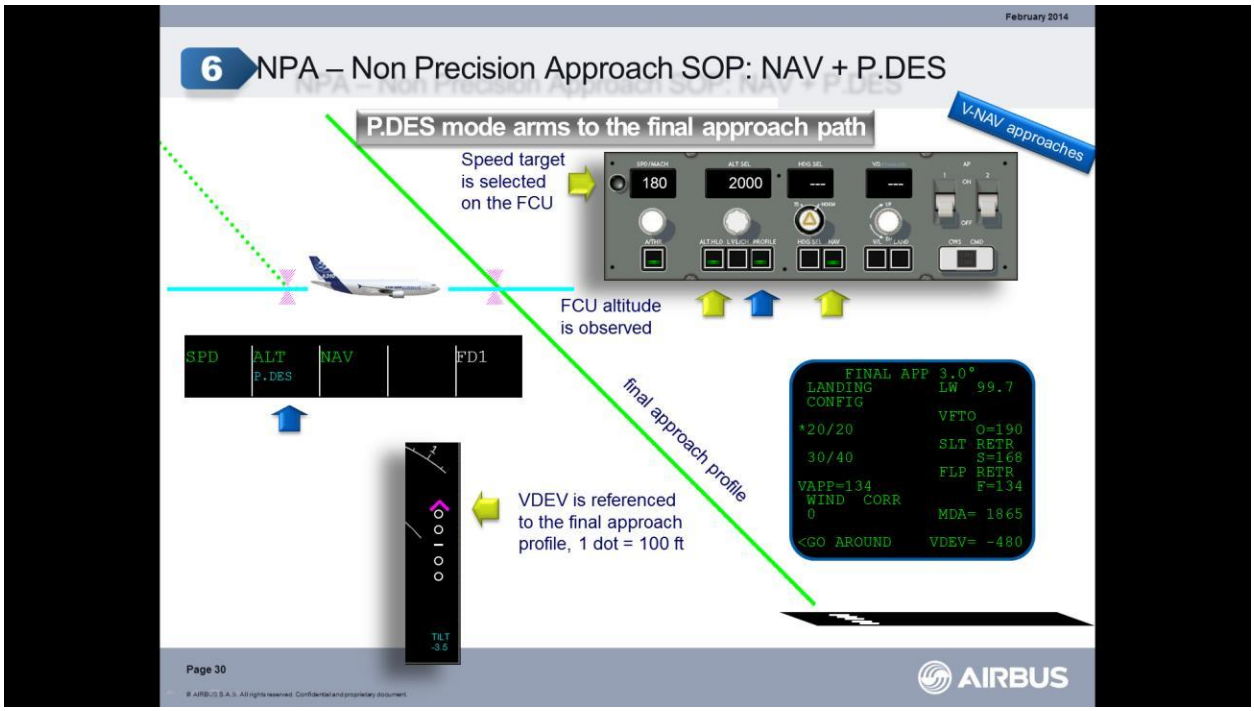
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6 NPA – Non Precision Approach SOP: NAV + P.DES
P.DES mode arms to the final approach path
V-NAV approaches
Speed target is selected on the FCU
180
2000
FCU altitude is observed
SPD
ALT
P.DES
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
LW 99.7
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
VDEV= -480
VDEV is referenced to the final approach profile, 1 dot = 100 ft
TILT
-3.5
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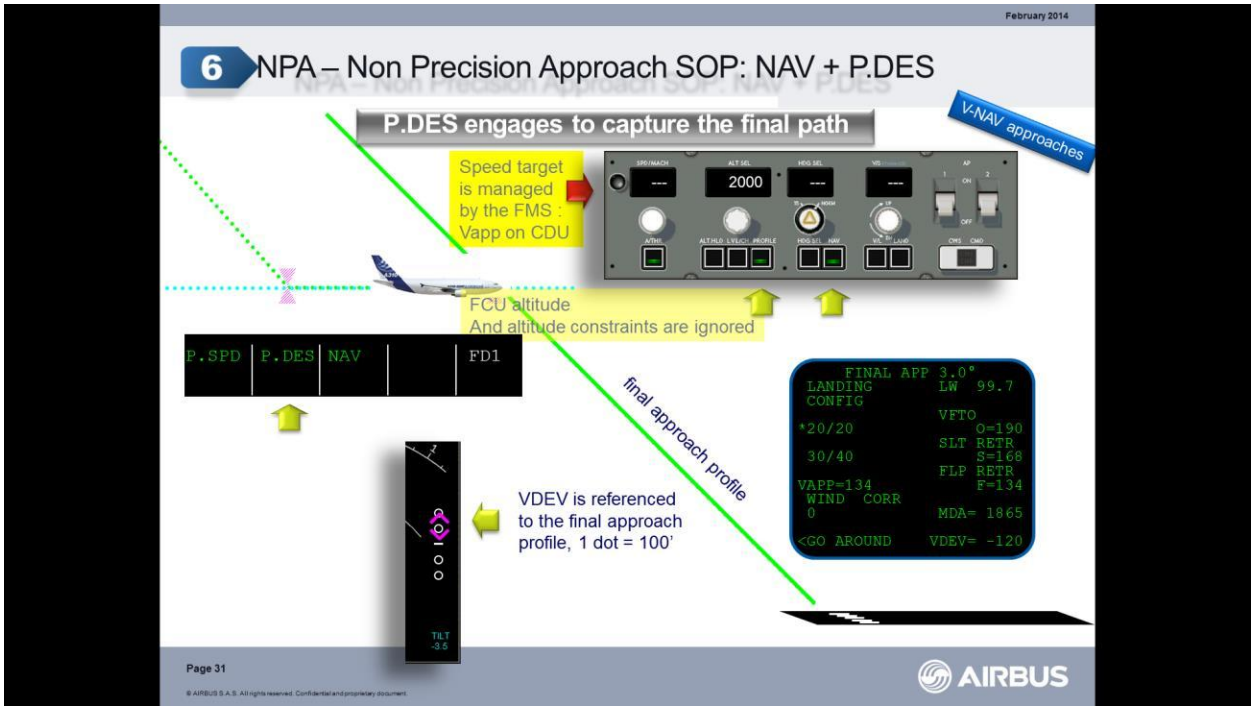
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6 NPA – Non Precision Approach SOP: NAV + P.DES
P.DES engages to capture the final path
V-NAV approaches
Speed target is managed by the FMS : Vapp on CDU
2000
FCU altitude
And altitude constraints are ignored
P.SPD
P.DES
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
LW 99.7
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
<GO AROUND
VDEV= -120
VDEV is referenced to the final approach profile, 1 dot = 100'
TILT
-3.5
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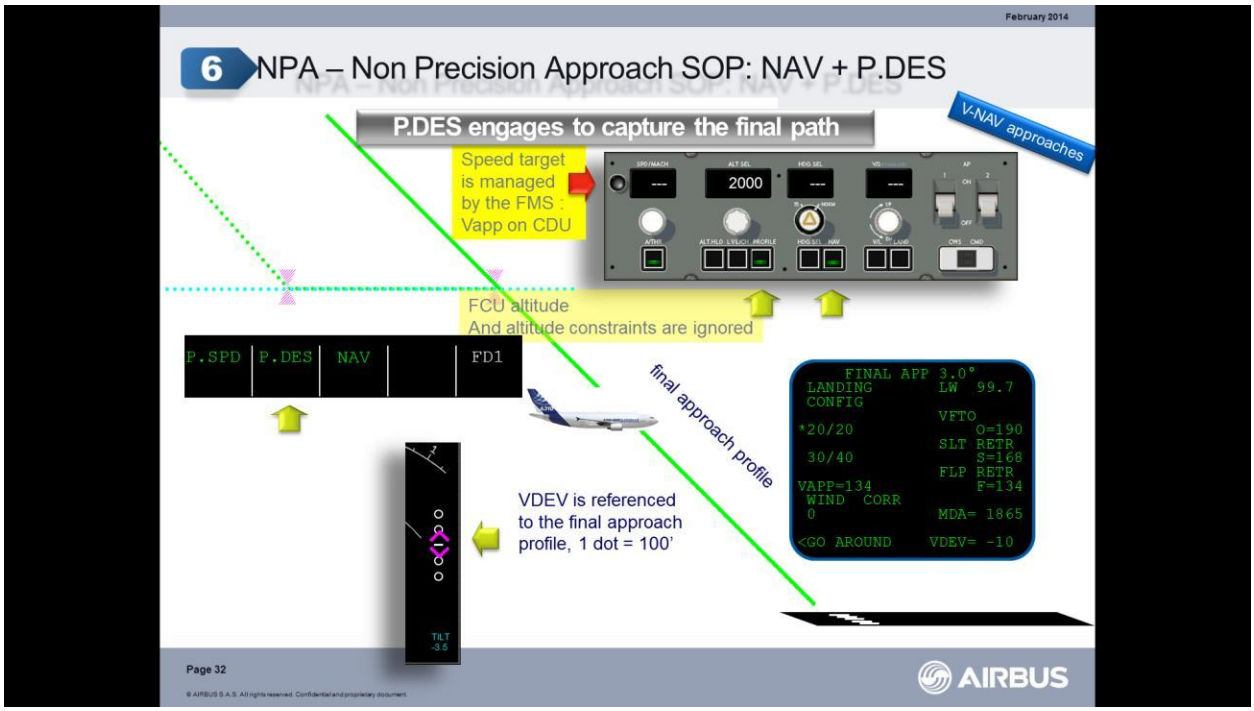
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6 NPA – Non Precision Approach SOP: NAV + P.DES
P.DES engages to capture the final path
V-NAV approaches
Speed target is managed by the FMS : Vapp on CDU
2000
FCU altitude
And altitude constraints are ignored
P.SPD
P.DES
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
<GO AROUND
LW 99.7
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
VDEV= -10
VDEV is referenced to the final approach profile, 1 dot = 100'
TILT
-3.5
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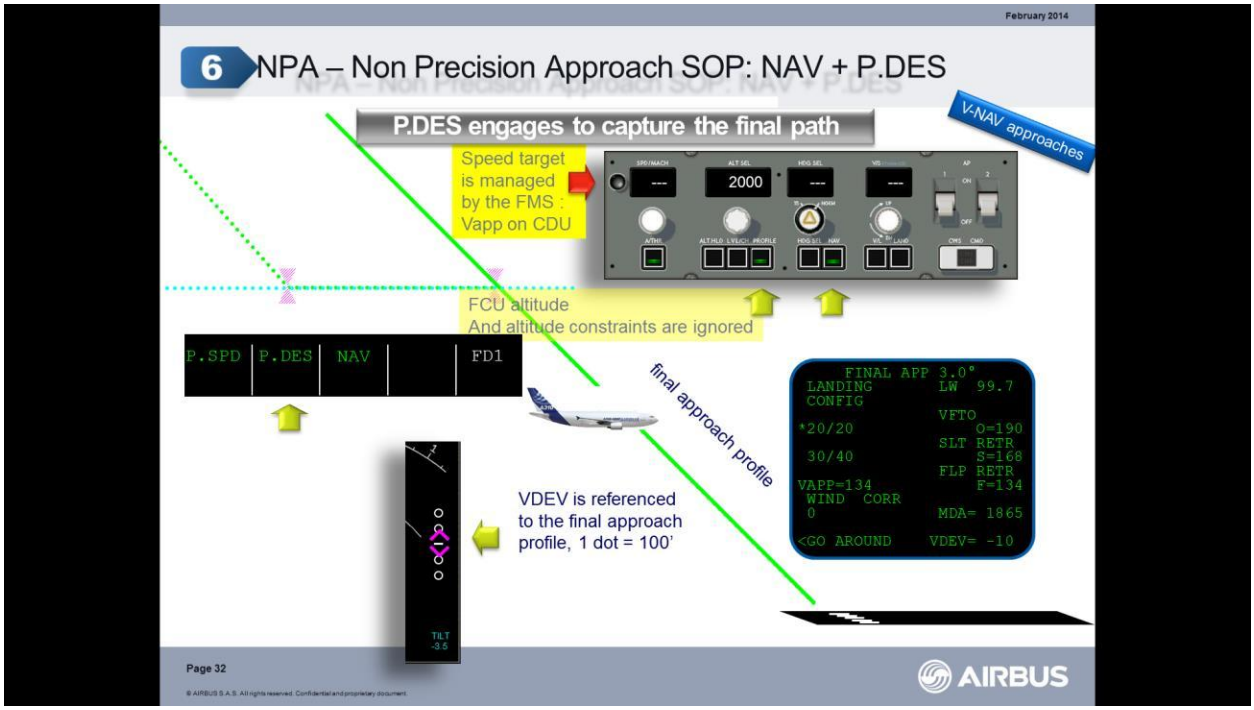
AIRBUS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6 NPA – Non Precision Approach SOP: NAV + P.DES
P.DES engages to capture the final path
V-NAV approaches
Speed target is managed by the FMS : Vapp on CDU
2000
FCU altitude
And altitude constraints are ignored
P.SPD
P.DES
NAV
FD1
final approach profile
FINAL APP 3.0°
LANDING CONFIG
*20/20
30/40
VAPP=134
WIND CORR
0
<GO AROUND
LW 99.7
VFTO
O=190
SLT RETR
S=168
FLP RETR
F=134
MDA= 1865
VDEV= -10
VDEV is referenced to the final approach profile, 1 dot = 100'
TILT
-3.5
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