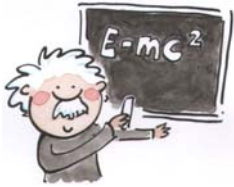


## STRAIGHT-IN VNAV APPROACH



### *Ludo's Brief*

#### Purpose of a VNAV Approach

- Non Precision Approach (NPA) procedures typically are complex and increase pilot workload during critical phases of flight. A VNAV approach replaces the conventional Vertical Speed (V/S) used in a NPA with a more efficient descent profile and low drag approach.
- Controlled Flight Into Terrain (CFIT) occurs when an airworthy aircraft under the control of the flight crew is flown unintentionally into terrain, obstacles or water, usually with no prior awareness by the crew. This type of accident can occur during most phases of flight, but CFIT is more common during the approach and landing phases.

A VNAV approach minimizes the potential exposure to a CFIT incident when conducting NPA through the introduction of simpler flight deck operating procedures.

Remember that:

- 60% of CFIT accidents occur on NPAs
- 47% occurred during step down NPAs
- Almost all occurred in darkness or IMC
- 48% mostly in flat terrain
- Most common cause: descent below MDA

#### Significant Safety Benefits

- A more stabilized path similar to the ILS
- The coded Glide Path angle in the final approach segment clears all obstacles, subject to temperature correction
- Less potential for crew errors
- Less potential for CFIT, approach and landing accidents
- Lower workload

#### Instrument Approaches Using VNAV

- Only approaches programmed in the FMC can be used to fly VNAV approaches
- No waypoints from the centerfix and onwards may be changed, added or deleted (with the exception of speed restrictions and cold temperature correction)
- Overlay approaches are allowed (see Note)
- LNAV and VNAV may be used
- Overlay approaches are allowed as long as the waypoints and GP angle are checked to be the same
- Do NOT overlay an approach that is available in the FMC database

**Note:** What is an "overlay" approach? If the approach to be flown is not in the FMC database, another approach having the same profile and plan view may be selected.

### VNAV Compatible Approaches

- Non-ILS approaches that have one or more of the following:
  - An appropriate path that has a missed approach point at or before the runway threshold
  - There is a glide path (GP) angle indicated on the chart and/or shown on the legs page
  - Approaches with a published VNAV DA (Not available at present in Europe)
- Most approaches will have both a GP and a missed approach waypoint (displayed as RWxx or MXxx in the FMC), however only one of the two is required to fly a VNAV approach.
- On the LEGS Page, a VNAV-Compatible Path will have (either or both):
  - An RWxx or MXxx waypoint at or before the approach end of the runway
    - ❖ The waypoint altitude constraint will result in approximately 50 feet TCH
    - ❖ Examples (runway 12, TDZE at 1000' MSL)
      - MA12 145/1190 means an IAS of 145 kt and a crossing altitude of 1190 ft (190 ft AGL)  
This waypoint must be checked to be before the approach end of the runway.
      - RW12 145/1050 means an IAS of 145 kt and a crossing altitude of 1050 ft (50 ft AGL)
  - A "GP" angle shown on the LEGS page for the final approach segment. The GP angle is constructed "backward" from the 50 ft runway waypoint and normally intersects the FAF altitude constraint.

**Note 1:** Many approaches are coded with a GP angle which the charted procedure does not show. These approaches are valid, and can be used for VNAV approaches.

**Note 2:** There are two types of missed approach waypoints:

- RWxx waypoint located at the threshold crossing height (TCH): RWxx waypoints normally used on localizer approaches
- MXxx waypoint located before or after the runway threshold: MXxx waypoints are common on VOR and NDB approaches

### Roll Modes for VNAV approaches

- For Localizer approaches use VOR/LOC
- For VOR or NDB use LNAV

### RNP/ANP

- RNP – Required Navigation Performance.
  - Specified navigation accuracy for a route or departure/approach procedure in NM units
  - PRNAV requires RNP 1.0 (PRNAV is not applicable to final approaches)
  - There is currently no RNP requirement for final approaches as these are still based on VOR/NDB or LOC/ILS
- ANP – Actual Navigation Performance
  - The FMC-calculated certainty of the airplane's position in NM units.
  - There is a 95% probability that the airplane is within the displayed ANP.

### FMC Default RNP

- The FMC provides a default value according to the current phase of navigation:
  - Approach 0.5 NM
  - Terminal (below 15,000') 1.0 NM
  - En-route (domestic) 2.0 NM
  - The FMC RNP PROGRES page 4/4 displays the expected approach RNP (the default of 0.5) during all phases of flight.

- Crew Alerting Occurs when ANP Exceeds RNP:
  - UNABLE REQD NAV PERF-RNP displayed on Navigation Display during the approach phase, FMC scratchpad message at other times
  - FMC update 10.7 results in Navigation Display alerting for all flight phases

#### VNAV General Features - Speed Intervention

- If engaging speed intervention:
  - During a path descent with flaps up on an idle leg, VNAV switches to VNAV SPD
  - With flaps down, VNAV remains in VNAV PTH
  - When a geometric path leg is active, VNAV remains in VNAV PTH
  - While a vertical angle leg (GP x.xx on RTE LEGS page) is active, VNAV remains in VNAV PTH
  - Benefits of Using Speed Intervention:
    - ❖ Gives MCP speed control like on an ILS
    - ❖ Easier to comply with ATC speed restrictions
    - ❖ Easier to make corrections to final approach speed if wind additive changes

#### Fly Off

- If the distance from the FAF to the runway is greater than that required for an immediate descent, a “fly-off” is created :
  - A T/D is shown on the ND for a fly-off”
  - The FMC will command level flight in VNAV PATH until reaching the descent path.

**Note:** With the geometric path option enabled (Ryanair has this feature enabled) a fly-off and a new T/D on the ND should only appear on the approach when there is a GP angle specified, and the distance from the FAF to the runway greater than required for an immediate descent.

#### On Approach Logic

- When the FMC transitions to on approach logic, the RNP changes to a default of 0.5 NM.
- On Approach logic features:
  - ❖ UNABLE REQD NAV PERF-RNP alerting levels are higher
  - ❖ MAA can be set when > 300 feet below Missed Approach Altitude (MAA). VNAV will continue to command in descent
  - ❖ If more than 200 feet below vertical glide path, VNAV commands zero vertical speed until intercepting path.
  - ❖ If FMC not in on approach logic, the pitch mode will revert to CWS pitch if a higher MCP altitude is set
  - ❖ The FMC will command level flight in VNAV PATH until reaching the descent path.

**Note 1:** If on radar vectors the FMC will transition into on approach logic approximately 2 NM before the Cx (Final Approach Course Fix) or Fx (Final Approach Fix) point.

**Note 2:** FMC transitions out of “on approach” logic when:

- Pushing TOGA
- Landing
- Waypoint cycles to first waypoint of the missed approach
- Executing a direct-to waypoint in the missed approach
- VNAV disconnects (VNAV DISCONNECT Msg light and FMC alert message will illuminate when aircraft passes the RWxx point or MXxx point

## Straight In VNAV Approach According To RYANAIR Procedures

PF	PM	REMARKS
Type Airfield Designator in Fix Page and put a 10 NM ring + a 6 NM ring around the airfield if not already done		- <u>PF</u> : DES Page and <u>PM</u> : LEGS Page. Pilots may use whichever page they desire in order to extract information and then revert to these default pages - 10 NM ring = Flaps 1 identification - 6 NM ring = Gear down + Flaps 15 identification.
<ul style="list-style-type: none"> <li>Call <b>"FLAPS ____"</b> according to the flap extension schedule.</li> <li>Select SPD INTV on MCP if VNAV is engaged</li> </ul>	Set the flaps lever as directed and monitor extension	The crew always slow down at the DECEL (or 10 nm if earlier). Flaps are not selected at the DECEL point, but when the speed approaches Flaps UP maneuvering speed.  SPD INTV should be selected at least at the DECEL point. (You must always select F1 and SPD INTV at the UP speed).
<b>CLEARED FOR THE APPROACH</b>		
When on the final approach course intercept heading: <ul style="list-style-type: none"> <li>Verify that the localizer is tuned and identified (Localizer approach only)</li> <li>Verify that the LOC pointer is shown (Localizer approach only)</li> <li>Verify that the FMC GP Point coincides with published distances</li> </ul>		The recommended roll modes for the final approach are: <ul style="list-style-type: none"> <li>For a VOR or NDB approach use LNAV</li> <li>For a LOCALIZER approach use VOR/LOC.</li> </ul> <b>WARNING! When using LNAV to intercept the localizer, LNAV might parallel the localizer without capturing it. The airplane can then descend on the VNAV path with the localizer not captured.</b>
Select LNAV or arm the VOR/LOC mode and call in this example: <b>"VOR/LOC ARMED"</b>	Monitor FMA and respond <b>"CHECKED"</b>	
Monitor ADI and respond <b>"CHECKED"</b>	Call <b>"LOC ALIVE"</b> (Localizer approach)	Verify that LNAV is engaged or that VOR/LOC is captured.
Monitor ADI and respond <b>"CHECKED, HEADING ____ SET"</b>	Call <b>"LOC CAPTURED"</b> (Localizer approach)	PF set HDG BUG for runway magnetic heading
<b>APPROXIMATELY 2 NM BEFORE THE GLIDE PATH AND AFTER ALT HOLD OR VNAV PTH IS ANNUNCIATED</b>		
<ul style="list-style-type: none"> <li>Set or confirm MDA set on the MCP and respond <b>" ____ FEET SET"</b></li> <li>Select or verify VNAV PATH and call <b>"VNAV PATH"</b></li> <li>Select or verify SPD INTV and call <b>"SPEED INTERVENT"</b></li> <li>Confirm RNP/ANP status and call <b>"ANP CHECKS"</b></li> </ul>	Call: <b>"APPROACHING GLIDE PATH"</b>	<b>" ____ FEET SET"</b> means PF sets MDA (i.e. MAA will not be set at this point even if the platform is lower than the MAA)  <b>"VNAV PATH"</b> – The FMA must be used to verify VNAV PTH, not the light on the switch  <b>"SPEED INTERVENT"</b> – match speed as necessary  <b>"ANP CHECKS"</b> – If RNP hasn't changed to 0.5 the approach should still be continued but the crew must be aware that they must pay particular attention to the RNP before PM challenges PF to set MAA later on during the procedure. If RNP doesn't change before reaching MDA the aircraft will level off at MDA.
<b>FINAL APPROACH FIX</b>		
Call <b>"FINAL APPROACH FIX, ____ FEET, NO FLAGS"</b>	Respond <b>"ALTITUDE CHECKS, NO FLAGS"</b>	The crossing altitude at the FAF must be verified and crosschecked, this may or may not be at the same point as the GP point  Descend to the MDA and monitor the approach

PF	PM	REMARKS
<b>WHEN AT LEAST 300 FEET BELOW MISSED APPROACH ALTITUDE (MAA)  AND  AT LEAST 300 FEET BELOW THE PLATFORM ALTITUDE  AND  RNP 0.5 IS DISPLAYED ON THE LEGS PAGE</b>		
<b>= 3 CONDITIONS</b>		
Set the Missed Approach Altitude on the MCP and respond "___FEET SET"	Call "SET ___FEET" (MAA) Check Missed Approach Altitude on MCP	<p>If RNP 0.5 not displayed then AFDS will revert to CWS Pitch when setting MAA. The "on approach" logic is not active and the crew must carefully monitor the vertical and lateral path using raw data.</p> <p>If RNP does not change to 0.5 at the expected point, it should change at the next approach waypoint, or when descending through 2000 feet AAL.</p> <p>It is acceptable to continue the approach and set the MAA when the RNP is changed to 0.5 on the LEGS Page.</p> <p>The AFDS will level off at the MDA if the MCP is not reset to MAA.</p>
<b>6 NM TO AIRFIELD</b>		
<ul style="list-style-type: none"> <li>Call "GEAR DOWN, FLAPS 15, LANDING CHECK-LIST TO FLAPS"</li> <li>Set the speed brake lever to ARM and verify the SPEED BRAKE ARMED light is illuminated</li> </ul>	<ul style="list-style-type: none"> <li>Set the landing gear lever to DN and verify that the green landing gear indicator lights are illuminated</li> <li>Set the flap lever to 15</li> <li>Set the engine start switches to CONT</li> <li>Press the Recall</li> <li>Do the landing check-list down to flaps</li> </ul>	
Call "FLAPS ____, " as needed for landing	Set the flaps lever as directed and monitor extension	PF asks for Flaps 30 or 40
Call "COMPLETE LANDING CHECK-LIST"	Do the landing check-list Respond "LANDING CHECK-LIST COMPLETED"	
<b>EGPWS CALL "ONE THOUSAND"</b>		
Call "CHECKED" "___FEET SET"	Check Missed Approach Altitude on MCP	PF calls Missed Approach Altitude as set on the MCP
<b>AT MDA</b>		
<b>LANDING</b>		
<ul style="list-style-type: none"> <li>Disengage A/P and A/T at the "Minimums" call</li> <li>Intercept landing profile and maintain the glide path to landing</li> </ul>	Monitor landing profile and glide path and call any deviation	<p>If suitable visual reference is established at MDA or the missed approach point, disengage the autopilot and autothrottle. Do not recycle Flight Directors.</p> <p>Use PAPI or VASI if available.</p>

PF	PM	REMARKS
GO-AROUND		
If not visual or not stabilized: • Verify ALT ACQ • Verify ALT HLD • Press TOGA Switches • Call "GO-AROUND FLAPS 15, SET GO-AROUND THRUST"	Check FMA	
Follow go-around procedure		



## Example : VNAV VOR APPROACH

VOR Runway 16 Circling 34 - Dublin (EIDW)

CF16 must be identified as the Glide Path Point

Jeppesen altitudes are not "cold-temp" corrected in this example (OAT is at or above 0 deg C).

Check GP angle 3.03°

MD16 must be identified as the Missed Approach Point

RNP and ANP information is displayed in the LEGS page

ACT RTE	LEGS	1/2
162° <b>CF16</b>	298NM	182/ 3000A
162° DUB	4.6NM	156/ 1580A
162° 20VOR	2.0NM GP	3.03° 920A
162° <b>MD16</b>	1.0NM GP	3.03° 619
162° (642)	0.2NM	----/ 642A
RNP/ACTUAL		-----
1.00/0.05NM		RTE DATA>

## What you see on your ND [Plan Mode]



PM : "APPROACHING GLIDE PATH"

PF : "600 FEET SET"

"VNAV PATH"

"SPEED INTERVENT"

"ANP CHECKS"

PM : "SET 3000 FEET" [Missed Approach Altitude]

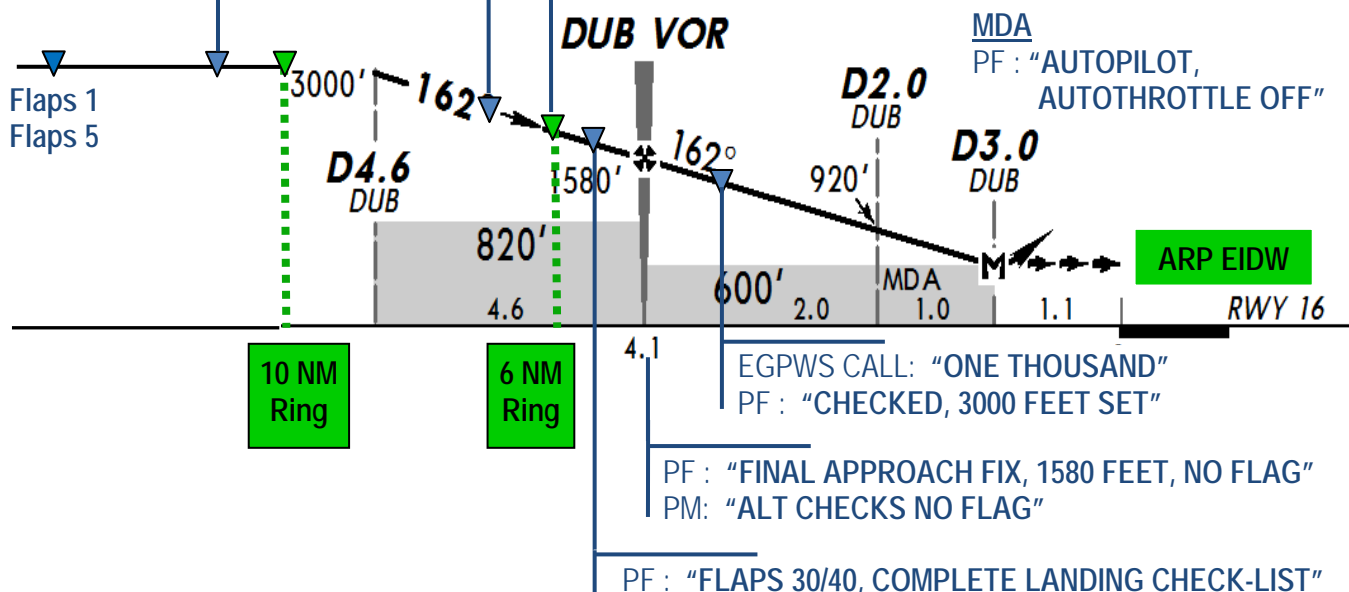
PF : "3000 FEET SET"

PF : "GEAR DOWN, FLAPS 15"

"LANDING CHECK-LIST TO FLAPS"

MDA

PF : "AUTOPILOT,  
AUTOTHROTTLE OFF"



DUB DME	1.0 after DUB		2.0 after DUB		3.0 after DUB	
ALTITUDE	1240'		920'		600'	

**DUB VOR**

3000' 162° 1580' 820' 4.6 600' 2.0 MDA 1.0 1.1 RWY 16 217'

Gnd speed-Kts	70	90	100	120	140	160	<div>HIALS</div> <div>PAPI PAPI</div> <div>3000'</div> <div>KLY 378</div>
Descent Gradient 5.2%	369	474	527	632	737	843	
MAP at D3.0 after DUB							

JAR-OPS STRAIGHT-IN LANDING RWY 16			CIRCLE-TO-LAND		
MDA(H) 600'(383')			North of rwy 10/28		South of rwy 10/28
ALS out			Max Kts	MDA(H) VIS	MDA(H) VIS
A	RVR 900m	RVR 1500m	100	770'(528')1500m	770'(528')1500m
B	RVR 1000m	RVR 1800m	135	770'(528')1600m	770'(528')1600m
C			870'(628')2400m	870'(628')2400m	
D	RVR 1400m	RVR 2000m	205	950'(708')3600m	1100'(858')3600m

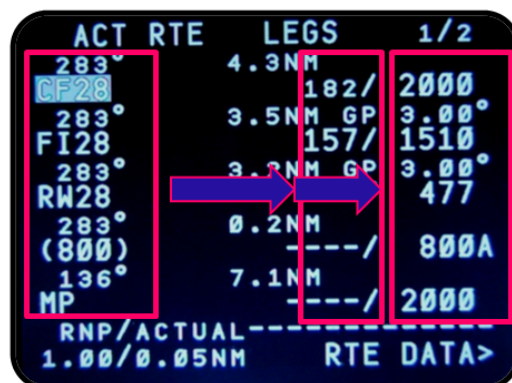


## **DOs !**

- Take into account that VNAV SOPs are not compatible with standard radar vectors/CDA/ILS ATC environment. Inform ATC a 10 nm final will be required.
- Remember that VNAV uses barometric input (altimeter) for the path while the ILS uses a fixed geometric path (glide slope).
- This is an instrument approach using VNAV as the pitch mode as opposed to V/S. It is still a conventional approach that requires the crew to monitor raw data information.  
Height versus Distance checks must still be used and called out as per Jeppesen chart.

### FMC Setup

- Setup and Briefing are essential to the successful outcome of the VNAV Approach.
- The following procedures must be strictly applied:
  - Descent Page: insert speed restriction (250 knots below 10,000 feet)
  - Descent Forecast Page: insert data
    - 1) Verify or enter transition level
    - 2) Enter TAI on/off as required
    - 3) Enter ISA deviation and QNH
    - 4) Use the forecasted winds for intermediate levels. There is no need to use/estimate platform altitude winds.
  - Fix Page: insert Destination Airport (10 NM ring and 6 NM ring).
  - Arrivals Page: Select the expected track or expected/cleared STAR, Transition and Approach.  
In order to fly a VNAV approach the procedure **MUST be** programmed in the FMC.
  - Legs Page: brief from left to right across the CDU
    - 1) Check waypoints in plan mode against Jeppesen chart to confirm accuracy of the approach.
    - 2) Check tracks between waypoints
    - 3) Check speed restrictions: speeds may be changed if necessary.
    - 4) Altitudes should be changed to “at or above” before the GP point unless they are “at” altitudes on the Jeppesen chart. Altitudes from the GP point and onwards **may not be changed other than for cold temperature correction**
    - 5) Always brief from Jeppesen to the FMC.
    - 6) Do not add, delete or change any waypoint from the Centerfix and onwards: ON APPROACH Logic will not be available! (The centerfix is the FI/FD/CI/CD etc. waypoint)
    - 7) Speeds may be changed to comply with Jeppesen charted restrictions. The speed change will not affect ON APPROACH logic. It is however recommended not to change the speeds unless needed to comply with speed restrictions
    - 8) Use plan mode to step through each point on the arrival and approach.



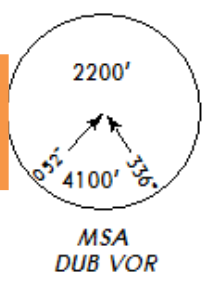
ACT RTE	LEGS	1/2
283°	4.3 NM	182 / 2000
CF28	3.5 NM GP	3.00°
283°	157 /	1510
F128	3.2 NM GP	3.00°
283°		477
RW28	0.2 NM	800A
283°	7.1 NM	2000
(800)		
136°		
MP		
RNP/ACTUAL 1.00/0.05 NM		
RTE DATA>		

- Select Approach Aids and Courses ensuring that the present navigation situation can be backed up by ground based Nav Aids.
- Prog page: calculate fuel difference
- Init Ref Page: Calculate and insert landing weight. Select approach flap setting.

## Approach Briefing

**“This will be a VNAV VOR (or Localizer, or NDB) Approach to runway XX in XXXX.....”**

- Continue with the Jeppesen Briefing Strip moving from left to right across the top rows ensuring that frequencies, courses, ident, MDA etc are confirmed and set.

EIDW/DUB DUBLIN INTL		JEPPESSEN 31 MAR 06 <b>13-2A</b> Eff 13 Apr		DUBLIN, IRELAND VOR DME Rwy 16	
*ATIS 124.52	DUBLIN Approach 121.1 119.55 119.92		DUBLIN Tower 118.6	*Ground 121.8	 <p>MSA DUB VOR</p>
<b>BRIEFING STRIP</b> VOR DUB <b>114.9</b>	Final Appch Crs <b>162°</b>	Procedure Alt <b>DUB VOR</b> <b>1580' (1363')</b>	MDA(H) <b>600' (383')</b>	Apt Elev <b>242'</b> RWY <b>217'</b>	
<p><b>MISSED APCH:</b> CLIMB STRAIGHT AHEAD towards KLY NDB to 5000' and contact ATC.</p> <p><b>MISSED APPROACH WITH RADIO FAILURE:</b> Climb STRAIGHT AHEAD towards KLY NDB to intercept R-100 BAL to TULSO holding climbing to 5000'.</p>					
Alt Set: hPa		Rwy Elev: 8 hPa	Trans level: By ATC		Trans alt: 5000'

- Examine the Plan View and compare the chart to the Legs Page identifying waypoints, tracks, speeds and where applicable altitude restrictions. Briefing must be from Plate to CDU.
- PF must identify the GP point on the plate and on the CDU. This could be noted on a notepad for easy recollection.
- The ND Distance readout (ND Top Right corner) is used as the primary distance reference during the approach.
- PF must identify the Decel point on the ND relating to deceleration below the Up Speed as the point where he will select SPD INTV and Flaps as required if in VNAV. You must always slow down at the DECEL point (or 10 nm if earlier)
- **Minimums:**
  - Baro minimum are set to MDA + 50 feet for straight in approaches.

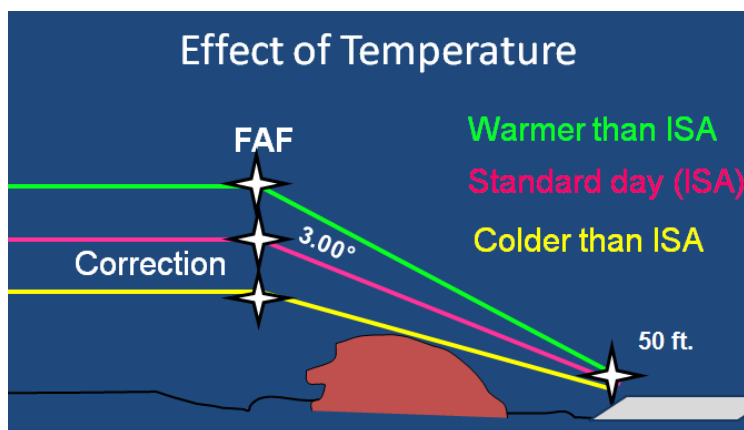
In the example below MDA + 50 ft = 690 + 50. Baro = 740

JAR-OPS		STRAIGHT-IN LANDING Rwy 27		CIRCLE-TO-LAND	
ILS		LOC (GS out)			
DA(H) 482' (200')		MDA(H) 690' (408')			
FULL		ALS out		Max Kts	MDA(H) VIS
A		RVR 900m	RVR 1500m	100	800' (494') 1500m
B				135	810' (504') 1600m
C	RVR 550m	RVR 1000m	RVR 1800m	180	1200' (894') 2400m
D		RVR 1400m	RVR 2000m	205	1200' (894') 3600m

- This enables the use of the “corrected” MDA like a DA.
- Prevents the aircraft descending below the MDA in the event of a Go-around.
- Add cold temperature corrections (see Chapter Cold Temperature Corrections in this document) to all applicable altitudes including the MDA.

## Cold Temperature Corrections

- The VNAV path coincides with the published angle only when the temperature is ISA.
  - The path will be steeper in warmer temperatures
  - The path will be shallower in colder temperatures
- When the temperature is at or below 0°, add cold temperature corrections to all arrival and approach altitudes.
- The altimeter error is greater near the FAF and smaller near the runway



- The table below is an extract of a well-designed document published by Ryanair. It is used to correct ALL published altitudes associated with the descent and approach to be flown to ensure adequate terrain clearance is maintained.

Altimeter – Cold Temperature Corrections - feet												
Aerodrome Temperature (degrees C )	Ht. above Altimeter Source Elev. (normally Destination Field Elev.)											
	200	300	400	500	600	700	800	900	1000	1500	2000	3000
0	20	20	30	30	40	40	50	50	60	90	120	170
- 10	20	30	40	50	60	70	80	90	100	150	200	290
- 20	30	50	60	70	90	100	120	130	140	210	280	420
- 30	40	60	80	100	120	140	150	170	190	280	380	570
- 40	50	80	100	120	150	170	190	220	240	360	480	720

### Example

Airport Elevation 1,000feet.

Reported Airport Temperature – 40 deg. Cent.

Fix	Published Altitude	Height above Altimeter Source	Correction	Indicated Altitude
Procedure Turn	4000	3000	720	4720
FAF	3000	2000	480	3480
MDA	1500	500	120	1620

- ATC should be informed accordingly if a clearance is unacceptable by the crew due to temperature error.
- FMC altitudes must be corrected for temperature in the LEGS page when the temperature is **0°C or below**.
- No altitude change is possible to RW points, this is acceptable because of the very small temperature error at this altitude (50 feet AGL)  
Other missed approach waypoints can and must be temperature corrected. (MX points)
- **Example:**

## Data

VOR Approach RWY 16 – Dublin (EIDW)

Airport elevation: 242 ft

OAT: -10°C

## Correction

Height AAL at MD16: 619 ft - 242 ft = 377 feet

To round up at 400 ft.

Check COLD TEMPERATURE CORRECTIONS document (handy-dandy) and find correction

40 feet

Altimeter – Cold Temperature Corrections				
Aerodrome Temperature (degrees C)	Ht. above Altimeter Setting			
	200	300	400	500
0	20	20	30	30
- 10	20	30	<b>40</b>	50
- 20	30	50	60	70
- 30	40	60	80	100
- 40	50	80	100	120

Apply exact correction to the MD16:  
619 ft + 40 ft = 659 feet

**Caution!** 659 feet must be entered as 0679 in the scratch pad.

Modify CF16, DUB and the missed approach altitude accordingly

## VOR 16 - BEFORE CORRECTION

```

ACT RTE LEGS 1/2
163° 9.8NM
CF16 185/ 3000A
162° 4.6NM
DUB 160/ 1580A
162° 2.0NM GP 3.03°
20VOR 160/ 920A
162° 1.0NM GP 3.03°
MD16 160/ 619
162° 0.2NM
(642) --- / 642A
RNP/ACTUAL-----
1.00/0.05NM RTE DATA>
  
```

## VOR 16 - AFTER CORRECTION

```

ACT RTE LEGS 1/2
163° 9.8NM
CF16 185/ 3000A
162° 4.6NM
DUB 160/ 1580A
162° 2.0NM GP 3.03°
20VOR 160/ 920A
162° 1.0NM GP 3.03°
MD16 160/ 659
162° 0.2NM
(642) --- / 642A
RNP/ACTUAL-----
1.00/0.05NM RTE DATA>
  
```

## Double Briefing

- The Double Brief is another Ryanair specificity to enhance flight safety. Because the VNAV approach is a Non Precision Approach the Double Briefing has to be made.

### **The Double Briefing – Non Precision & Visual Approaches**

**A Non Precision Approach or visual must never be commenced until the Jeppesen brief plus the Double Brief is complete. The latter requires one to stipulate**

- 1. Where Flaps 1, 5, Landing Gear, Flaps 15, and 30/40 are to be selected**
- 2. The autopilot modes and selections to be used during the approach**
- 3. Both crew's intentions on becoming visual**
- 4. Both crew's intentions on reaching MDA if not visual (i.e. the go around procedure for the aircraft to flaps up)**
- 5. The Landing Gate (1,000ft. agl. IMC, 500 ft. agl. VMC: Circling is 300ft. agl.)**

- Flap configuration will be determined by the Decel point or the 10nm ring whichever occurs first; Landing gear and F15 by the 6nm ring.
  - Modes: VNAV and LNAV or VOR/LOC
  - Actions at MDA are greatly simplified. (e.g. no requirement to recycle F/Ds or set MAA).
  - Landing Gate (1000 feet IMC and 500 feet VMC)

## Key points

- You must always select Flaps 1 and speed intervention at the UP speed.
- Remember that the use of autopilot :
  - Minimizes crew workload
  - Allows better crew monitoring of the procedure and flight path
  - Allows better course and vertical path tracking accuracy
  - Reduces inadvertent deviations below path
  - VNAV PTH does not contain path deviation alerting, therefore the A/P must remain engaged until suitable visual reference is established
- Disengage the A/P at the minimums call.
- When the aircraft passes the missed approach waypoint (RWxx or MXxx) VNAV will disconnect and OVERSPEED DISCONNECT message will appear in the CDU scratchpad.
- A/P limitations on non-precision approaches: A/P disengage before descending >50 ft below MDA.
- PF remains responsible for managing the speed of the aircraft either by adding drag or thrust as required.
- The path may not be consistent and the vertical mode may alternate between Path and Speed. The PF must be alert to this at all times and be prepared to manage the aircraft with Speed/Drag/Flaps as required.



- Verify crossing altitude and crosscheck altimeters at the FAF (i.e. at FD02 PF Calls “Final Approach Fix, 2500 feet, no flags”) (PM Responds “Altitude checks, No Flags”).
- Many operators have special SOPs concerning approach speeds. For instance, all Ryanair aircraft shall fly the ICAO recommended speeds of 220 KIAS at the IAF, 180KIAS on base (particularly important), 180 KIAS on final approach and 160 KIAS by 4 NM.
- Situational awareness in relation to the vertical profile and required path is essential.
- Caution! In VNAV PTH and A/T in ARM the FMC will give a “THRUST REQUIRED” message if the speed goes more than 5 kts below up speed. However the A/T does not add thrust until 15 kts below up speed.



## **DON'Ts !**

- Do not pollute the VNAV profile! No waypoint from the FAF and onwards may be changed, added or deleted. If a waypoint is added or deleted from a database procedure, the FMC “On Approach” logic is partially or completely disabled.
- Do not use V/S or LVL CHG with the intention of “doing a better job” than the FMC.
- Do not recycle the F/Ds as you would do it for a V/S Non Precision Approach.
- Do not fly the VNAV approach “head down”.
- Do not “overlay” an approach if the approach is available in the FMC.
- Do not follow the F/Ds after the missed approach point (MX or RW). Look out the window for visual landing cues.
- Do not forget the Double Brief.
- Do not use VNAV during visual approaches.