

# **AEROPORTO HUMBERTO DELGADO**

**ESTUDO DA LIGAÇÃO  
DO  
PMS (POINT MERGE SYSTEM)  
AOS  
PROCEDIMENTOS DE APROXIMAÇÃO  
DAS PISTAS 02 & 20  
DO  
AEROPORTO HUMBERTO DELGADO  
(LPPT)**

REGISTO DE MODIFICAÇÕES NA DOCUMENTAÇÃO

EDIÇÃO	DATA	CAUSAS DA MODIFICAÇÃO	PONTOS OU PAGINAS AFECTADAS
1.0	06-02-2020	N/A	N/A
2.0	06-05-2023	Actualização PMS	Todas

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## 1. INTRODUÇÃO

Este estudo visa adaptar os atuais procedimentos de aproximação por instrumentos das pistas 02 & 20 do AEROPORTO HUMBERTO DELGADO, à implementação do PMS (Point merge System).

Sendo o PMS um STAR, torna-se necessário estabelecer a sua ligação ao início dos procedimentos de aproximação em vigor.

Desta forma, optou-se por definir o início dos procedimentos de aproximação coincidentes com o Point Merge de cada pista, com o ponto UPKAT para a pista 20 e o ponto PESEX para a pista 02.

São eliminados os “IAF” e “IF” dos atuais procedimentos, sendo o “IF” substituído pelos pontos UPKAT para a pista 20 e o ponto PESEX para a pista 02.

A aproximação falhada é feita a FL070 e os procedimentos de aproximação falhada em situações de RCF (Radio Communications Failure), são feitos a 4000ft, pelo que se tornou necessário fazer uma análise de obstáculos para o RCF nos respetivos segmentos estabelecidos.

Para o efeito propôs-se a realização de uma ASO (Avaliação de Segurança Operacional), de forma a apurar que estas alterações mantêm a segurança das aproximações em vigor, a qual será enviada à ANAC.

## 2. OBJECTIVO

Estudar as áreas de proteção laterais e verticais que ligam o Point Merge ao início dos procedimentos atuais, bem como a aeronavegabilidade da estabilização das voltas, garantindo que são respeitados os critérios do MSD (Minimum Stabilization Distance).

Estudar as áreas de proteção laterais e verticais dos novos segmentos intermédios.

Estudar as áreas de proteção laterais e verticais dos trajetos da aproximação falhada em situação de RCF.

## 3. PRESSUPOSTOS

O procedimento e as cartas propostas deverão considerar os seguintes pontos:

- Velocidade de 180kt nos pontos ARNIT, COCUN, NEVUD, ULTIT, PESEX e UPKAT
- Altitude de 4000ft nos pontos ARNIT, COCUN, NEVUD, ULTIT, PESEX e UPKAT e os dados representados nas cartas devem ser representados com a simbologia “ at 4000”;
- Altitude de 3000ft nos pontos NETVO e TOPVI.
- Altitude final da aproximação falhada que passa de FL060 para FL070 (relativamente ao processo submetido à ANAC em FEV2020.

- Foi utilizado o Datum WGS84 como se demonstra abaixo:

### Geodesic Datum

Name	Portugal - WGS84 - UTM29N
Reference Latitude	00°00'00.00"N
Reference Longitude	009°00'00.00"W
Reference X	500000.0000
Reference Y	0.0000
Semi Major Axis [a]	6378137 m
Eccentricity [e]	0.0818191908426215
Scaling Factor	0.9996
Projection	Transverse Mercator

- Foi utilizado a declinação magnética referente a 23 Julho 2020 para a actualização de rumos. 1.8481W

## 4. MAPAS E ESCALAS

Foram utilizadas as seguintes cartas e escalas:

- Cartas 1:25 000 para estudo das Esperas e dos segmentos Intermédios e Aproximação Falhada em caso de RCF (Radio Communications Failure).
- Cartas 1:250 000 para estudo da Aproximação Falhada em caso de RCF (Radio Communications Failure) e validação do Levantamento Topográfico, feito em 2019.

## 5. METODOLOGIA

Foram efectuados os estudos dos procedimentos de acordo com os critérios estabelecidos no Doc.8168 Vol II.

### LPPT RWY20 PATH TERMINATORS

Serial # / Procedure designator	Navigational performance	Path descriptor	Waypoint identifier	Type	Waypoint coordinates	Fly-Over	True track [°] / Magnetic track [°]	Distance [nm]	Turn direction	Upper limit [ft] / Lower limit [ft]	Speed [kts]	VPA [°]	TCH [ft]	Remarks
1 / RNAV (GNSS) RWY20	RNP APCH	IF	UPKAT	IF	38°57'59.04"N / 009°02'12.05"W				-	@4000	180	-	-	-
2 / RNAV (GNSS) RWY20	RNP APCH	TF	TOPVI	FAF/FAP	38°55'06.75"N / 009°03'44.64"W		202.7745° / 204.6226°	3.1		@3000	-			
3 / RNAV (GNSS) RWY20	RNP APCH	TF	RW21/THR	MAPt	38°47'32.36"N / 009°07'48.17"W	Y	202.7745° / 204.6226°	8.2	-	-	-	3.00	54	-
4 / RNAV (GNSS) RWY20	RNP APCH	TF	PT554		38°42'55.30"N / 009°10'16.09"W		202.7745° / 204.6226°	5.0	-	-	-	-	-	-
5 / RNAV (GNSS) RWY20	RNP APCH	VM					202.7745° / 204.6226°	-	-	@FL070	-	-	-	-
1 / RNAV (GNSS) RWY20	RNP APCH	HM	UPKAT		38°57'59.04"N / 009°02'12.05"W		202.7745° / 204.6226°		L	FL090 / 3000	185			

**LPPT (APV) RWY 20 FAS DATA BLOCK**

<b>Input Data</b>	
Operation Type	[0] Straight-in/Offset approach
Service Provider	[1] EGNOS
Airport Identifier	LPPT
Runway	20
Runway Direction	[0] None
Approach Performance Designator	[0] APV
Route Indicator	
Reference Path Data Selector	0
Reference Path Identifier	E21A
LTP / FTP Latitude	384732.3600N
LTP / FTP Longitude	0090748.1700W
LTP / FTP Ellipsoidal Height	159.1 m
FPAP Latitude	385506.7450N
Delta FPAP Latitude	454.3850 seconds
FPAP Longitude	0090344.6390W
Delta FPAP Longitude	243.5310 seconds
Threshold Crossing Height	54 ft
Glidepath Angle	3 °
Course Width	105 m
Length Offset	0 m
HAL	40 m
VAL	50 m
<b>Output Data</b>	
Data Block	10 14 10 10 0C 15 00 00 01 31 32 05 10 DA A5 10 6C F1 14 FC 37 1A E2 DD 0D 96 6E 07 1C 02 2C 01 64 00 C8 FA 62 77 4D 26
Calculated CRC Value	62774D26
<b>Required Additional Data</b>	
ICAO Code	LP
LTP/FTP Orthometric Height	105.7 m

**LIGAÇÃO DO PMS (POINT MERGE SYSTEM) AOS PROCEDIMENTOS DE APROXIMAÇÃO DAS PISTAS 02 / 20**

**Bearing and Distance COCUN\_UPKAT**

<b>Starting Position</b>	
ID	COCUN
Latitude	39°01'35.52"N
Longitude	009°04'06.96"W
Magnetic Variation	1.8481°W
<b>Finishing Position</b>	
ID	UPKAT
Latitude	38°57'59.04"N
Longitude	009°02'12.05"W
Magnetic Variation	1.8481°W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	157.4898°
Forward Magnetic Bearing	159.3379°
Reverse True Bearing	337.5098°
Reverse Magnetic Bearing	339.3579°
Distance Between Positions	3.9016 nm
Distance Between Positions	7.2257 km

**Bearing and Distance ARNIT\_UPKAT**

Starting Position	
ID	ARNIT
Latitude	38°59'26.60"N
Longitude	008°57'33.61"W
Magnetic Variation	1.8481°W
Finishing Position	
ID	UPKAT
Latitude	38°57'59.04"N
Longitude	009°02'12.05"W
Magnetic Variation	1.8481°W
Parameters	
Calculation Type	Ellipsoid
Result	
Forward True Bearing	248.0803°
Forward Magnetic Bearing	249.9284°
Reverse True Bearing	068.0317°
Reverse Magnetic Bearing	069.8798°
Distance Between Positions	3.9015 nm
Distance Between Positions	7.2256 km

**Bearing and Distance UPKAT\_TOPVI**

Starting Position	
ID	UPKAT
Latitude	38°57'59.04"N
Longitude	009°02'12.05"W
Magnetic Variation	1.8481W
Finishing Position	
ID	TOPVI
Latitude	38°55'06.75"N
Longitude	009°03'44.64"W
Magnetic Variation	1.8481W
Parameters	
Calculation Type	Ellipsoid
Result	
Forward True Bearing	202.7745°
Forward Magnetic Bearing	204.6226°
Reverse True Bearing	022.7583°
Reverse Magnetic Bearing	024.6064°
Distance Between Positions	3.1112 nm
Distance Between Positions	5.7620 km

**Bearing and Distance TOPVI\_THR20**

Starting Position	
ID	TOPVI

Latitude	38°55'06.75"N
Longitude	009°03'44.64"W
Magnetic Variation	1.8481W
<b>Finishing Position</b>	
ID	RWY20
Latitude	38°47'32.36"N
Longitude	009°07'48.17"W
Magnetic Variation	1.8481W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	202.7584°
Forward Magnetic Bearing	204.6065°
Reverse True Bearing	022.7160°
Reverse Magnetic Bearing	024.5641°
Distance Between Positions	8.2033 nm
Distance Between Positions	15.1925 km

**Bearing and Distance RWY20/THR\_PT554**

<b>Starting Position</b>	
ID	RWY20
Latitude	38°47'32.36"N
Longitude	009°07'48.17"W
Magnetic Variation	1.8481W
<b>Finishing Position</b>	
ID	PT554
Latitude	38°42'55.30"N
Longitude	009°10'16.09"W
Magnetic Variation	1.8481W

**Determine Bearing and Distance NEVUD – PESEX**

<b>Starting Position</b>	
ID	NEVUD
Latitude	38°34'03.69"N
Longitude	09°18'48.99"W
Magnetic Variation	1.8481°W
<b>Finishing Position</b>	
ID	PESEX
Latitude	38°35'32.42"N
Longitude	09°14'12.69"W
Magnetic Variation	1.8481°W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	067.7257°
Forward Magnetic Bearing	069.5738°
Reverse True Bearing	247.7735°



Reverse Magnetic Bearing	249.6222º
Distance Between Positions	3.9015 nm
Distance Between Positions	7.2256 km

**Determine Bearing and Distance ULTIT – PESEX**

<b>Starting Position</b>	
ID	ULTIT
Latitude	38°31'56.20"N
Longitude	09°12'17.65"W
Magnetic Variation	1.8481°W
<b>Finishing Position</b>	
ID	PESEX
Latitude	38°35'32.42"N
Longitude	09°14'12.69"W
Magnetic Variation	1.8481°W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	337.3377°
Forward Magnetic Bearing	339.1858°
Reverse True Bearing	157.3178°
Reverse Magnetic Bearing	159.1659°
Distance Between Positions	3.9015 nm
Distance Between Positions	7.2257 km

**Determine Bearing and Distance PESEX - NETVO**

<b>Starting Position</b>	
ID	PESEX
Latitude	38°35'32.42"N
Longitude	09°14'12.69"W
Magnetic Variation	1.8481°W
<b>Finishing Position</b>	
ID	NETVO
Latitude	38°38'24.00"N
Longitude	09°12'41.00"W
Magnetic Variation	1.8481°W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	022.7392°
Forward Magnetic Bearing	024.5873°
Reverse True Bearing	202.7551°
Reverse Magnetic Bearing	204.6032°
Distance Between Positions	3.0977 nm
Distance Between Positions	5.7370 km

**Determine Bearing and Distance NETVO – THRO2**

<b>Starting Position</b>	
ID	NETVO
Latitude	38°38'24.00"N
Longitude	009°12'41.00"W
Magnetic Variation	1.8481°W
<b>Finishing Position</b>	

ID	THR 02
Latitude	38°45'59.15"N
Longitude	009°08'38.04"W
Magnetic Variation	1.8481°W
<b>Parameters</b>	
Calculation Type	Ellipsoid
<b>Result</b>	
Forward True Bearing	022.6778°
Forward Magnetic Bearing	024.5259°
Reverse True Bearing	202.7200°
Reverse Magnetic Bearing	204.5681°
Distance Between Positions	8.2146 nm
Distance Between Positions	15.2134 km

### LPPT RWY02 Path Terminators

Serial # / Procedure designator	Navigational performance	Path descriptor	Waypoint identifier	Type	Waypoint coordinates	Fly-Over	True track [°] / Magnetic track [°]	Distance [nm]	Turn direction	Upper limit [ft] / Lower limit [ft]	Speed [kts]	VPA [°]	TCH [ft]
1 / RNP RWY02	RNP APCH	IF	PESEX	IF	38°35'32.42"N 009°14'12.69"W	-	337.3377° 339.1858°	3.9015	-	@4000	180	-	-
2 / RNP RWY02	RNP APCH	TF	NETVO	FAF/FAP	38°38'24.00"N 009°12'41.00"W	-	022.7392° 024.5873°	3.0977	-	@3000	-	-	-
3 / RNP RWY02	RNP APCH	TF	RWY02 THR	MAPt (LNAV ONLY)	38°45'59.15"N / 009°08'38.04"W	Y	022.6778° 024.5259°	8.2146	-	-	-	3.00	54
4 / RNP RWY02	RNP APCH	TF	PT544	-	38°50'36.16"N / 009°06'09.86"W	-	022.6778° 024.5259°	5.0	-	-	-	-	-
5 / RNP RWY02	RNP APCH	VM	-	-	-	-	022.6778° 024.5259°	-	-	@FL070	-	-	-
1 / RNP RWY02	RNP APCH	HM	PESEX	HLDG	38°35'32.42"N 009°14'12.69"W	-	022.6778° 024.5259°	-	R	FL090 / 3000	185	-	-

### LPPT RWY02 FAS DATA BLOCK

Input Data	
Operation Type	[0] Straight-in/Offset approach
Service Provider	[1] EGNOS
Airport Identifier	LPPT
Runway	02
Runway Direction	[0] None
Approach Performance Designator	[0] APV
Route Indicator	
Reference Path Data Selector	0
Reference Path Identifier	E02A
LTP / FTP Latitude	384559.1500N
LTP / FTP Longitude	0090838.0400W
LTP / FTP Ellipsoidal Height	153.7 m
FPAP Latitude	384750.3000N
Delta FPAP Latitude	111.1500 seconds
FPAP Longitude	0090738.5700W
Delta FPAP Longitude	59.4700 seconds
Threshold Crossing Height	54 ft
Glidepath Angle	3 °
Course Width	105 m
Length Offset	0 m
HAL	40 m
VAL	50 m
Output Data	
Data Block	10 14 10 10 0C 03 00 00 01 33 30 05 DC 01 A3 10 DO 6B 13 FC 01 1A 5C 64 03 9C DO 01 1C 02 2C 01 64 00 C8 FA FE F2 DD 07
Calculated CRC Value	FEF2DD07
Required Additional Data	
ICAO Code	LP
LTP/FTP Orthometric Height	100.3

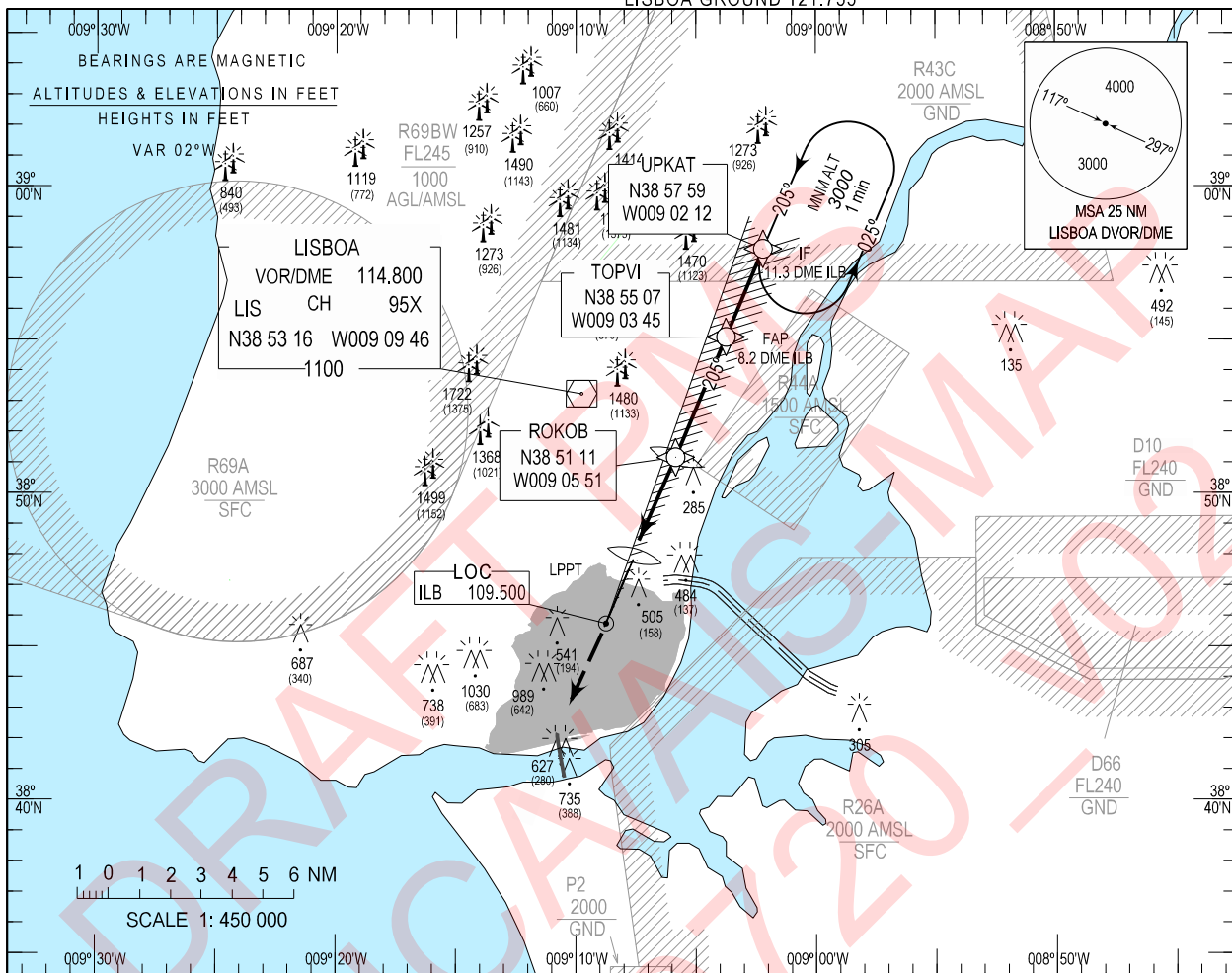
DRAFTS DOS PROCEDIMENTOS PARA A PISTA 20

**INSTRUMENT  
APPROACH  
CHART - ICAO**

AD ELEV 355 ft  
HEIGHTS RELATED  
THR RWY 20 -ELEV 347 ft

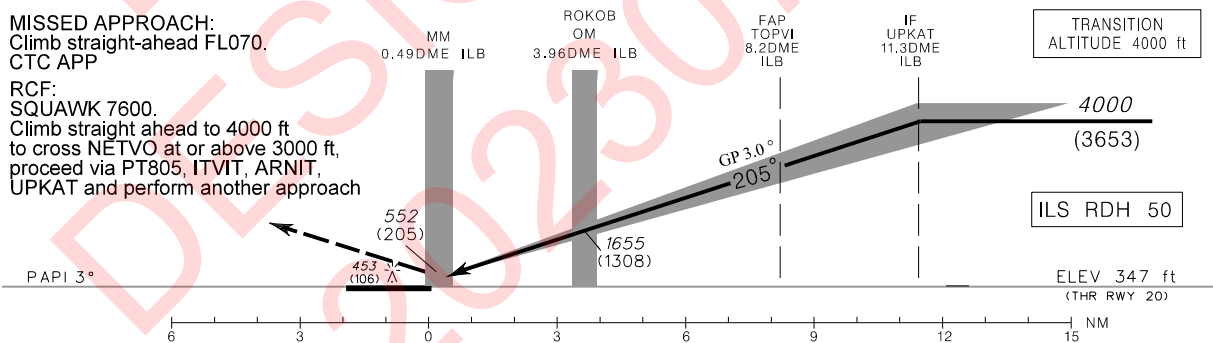
LISBOA ARR INFORMATION 124.155  
LISBOA APPROACH 119.105  
LISBOA ARRIVAL 125.130  
LISBOA TOWER 118.105  
LISBOA GROUND 121.755

**LISBOA**  
**Humberto Delgado (LPPT)**  
ILS RWY 20 CAT II & III



**MISSED APPROACH:**  
Climb straight-ahead FL070.  
CTC APP

**RCF:**  
SQUAWK 7600.  
Climb straight ahead to 4000 ft  
to cross NETVO at or above 3000 ft,  
proceed via PT805, ITVIT, ARNIT,  
UPKAT and perform another approach



		OCA (H)			
CAT of ACFT		CAT A	CAT B	CAT C	CAT D
ILS	CAT I	547 (200)			
	CAT II	447 (100)			
CIRCLING		1500	1580		

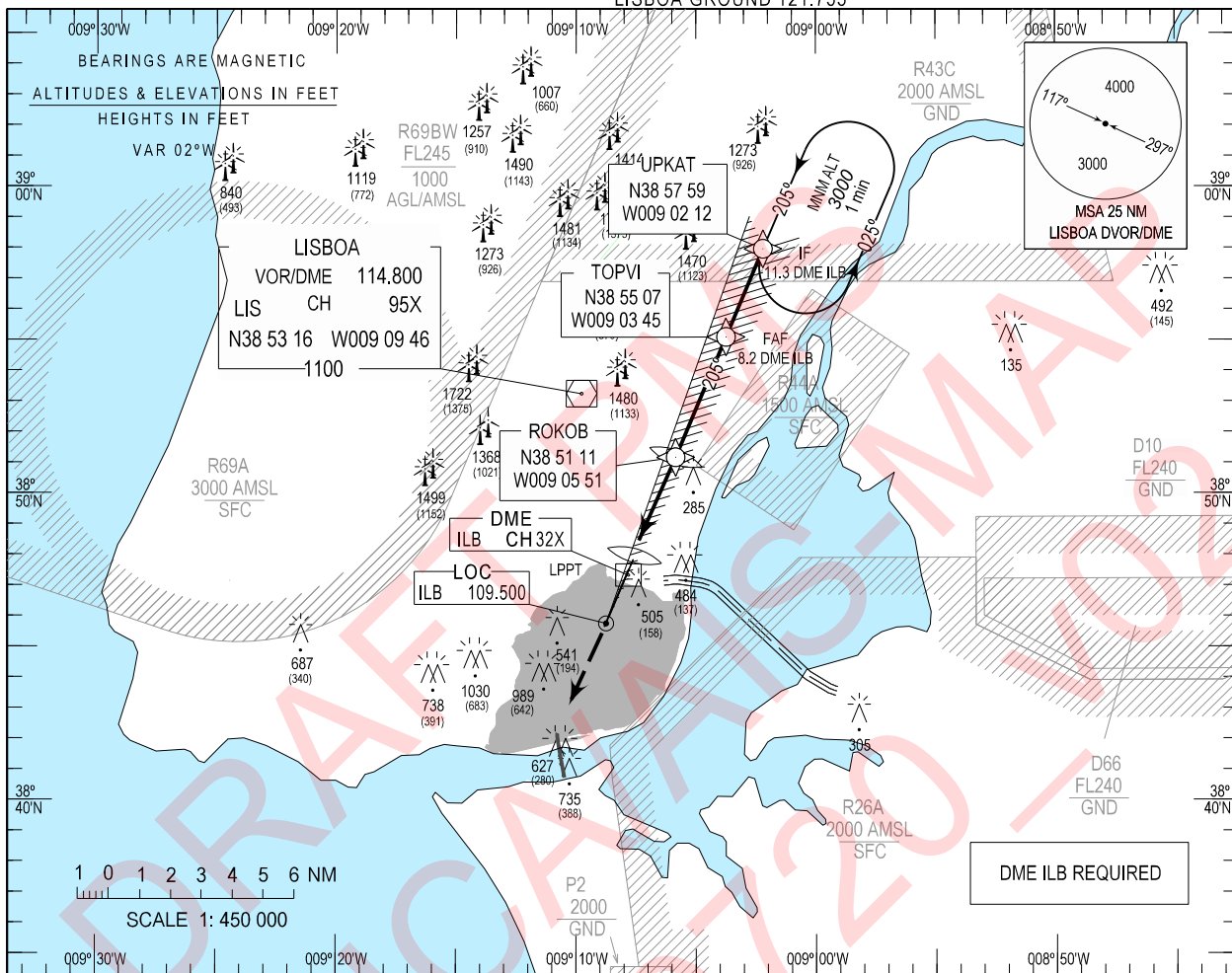
CAT IIIa and CAT IIIb (MNM RVR 75 m) approved  
DME READING REFERS TO THE THR RWY 20

**INSTRUMENT APPROACH CHART - ICAO**

AD ELEV 355 ft  
 HEIGHTS RELATED  
 THR RWY 20 -ELEV 347 ft

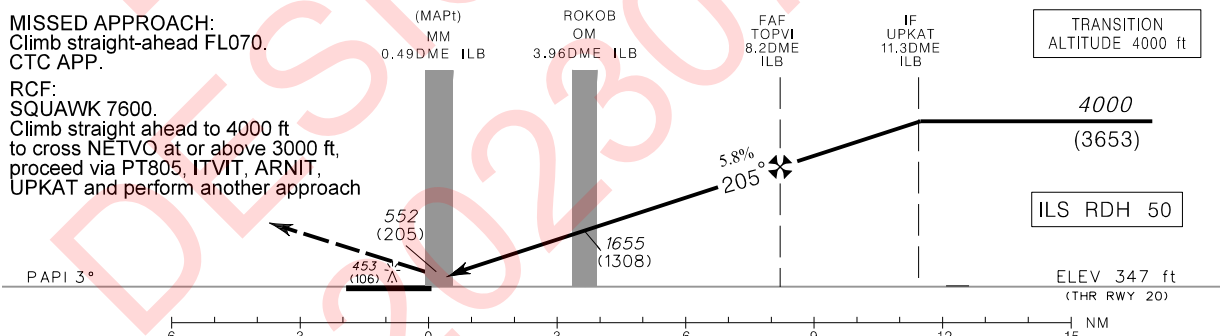
LISBOA ARR INFORMATION 124.155  
 LISBOA APPROACH 119.105  
 LISBOA ARRIVAL 125.130  
 LISBOA TOWER 118.105  
 LISBOA GROUND 121.755

**LISBOA Humberto Delgado (LPPT)**  
 LOC RWY 20



**MISSED APPROACH:**  
 Climb straight-ahead FL070.  
 CTC APP.

**RCF:**  
 SQUAWK 7600.  
 Climb straight ahead to 4000 ft  
 to cross NETVO at or above 3000 ft,  
 proceed via PT805, ITVIT, ARNIT,  
 UPKAT and perform another approach



	OCA (H)			
	CAT A	CAT B	CAT C	CAT D
LOC	740 (400)			
CIRCLING	1500		1580	

Speed	kt	80	100	120	140	160	180	200
FAF - THR (6NM)	min:s	4:30	3:30	3:00	2:34	2:15	2:00	1:48
Rate of descent (5.8%)	ft/min	470	590	700	820	940	1060	1170

DME ILB	6	5	4	3	2	1
ALTITUDE (HEIGHT)	2520 (2170)	2160 (1810)	1810 (1460)	1460 (1110)	1110 (760)	760 (410)

DME READING REFERS TO THE THR RWY 20

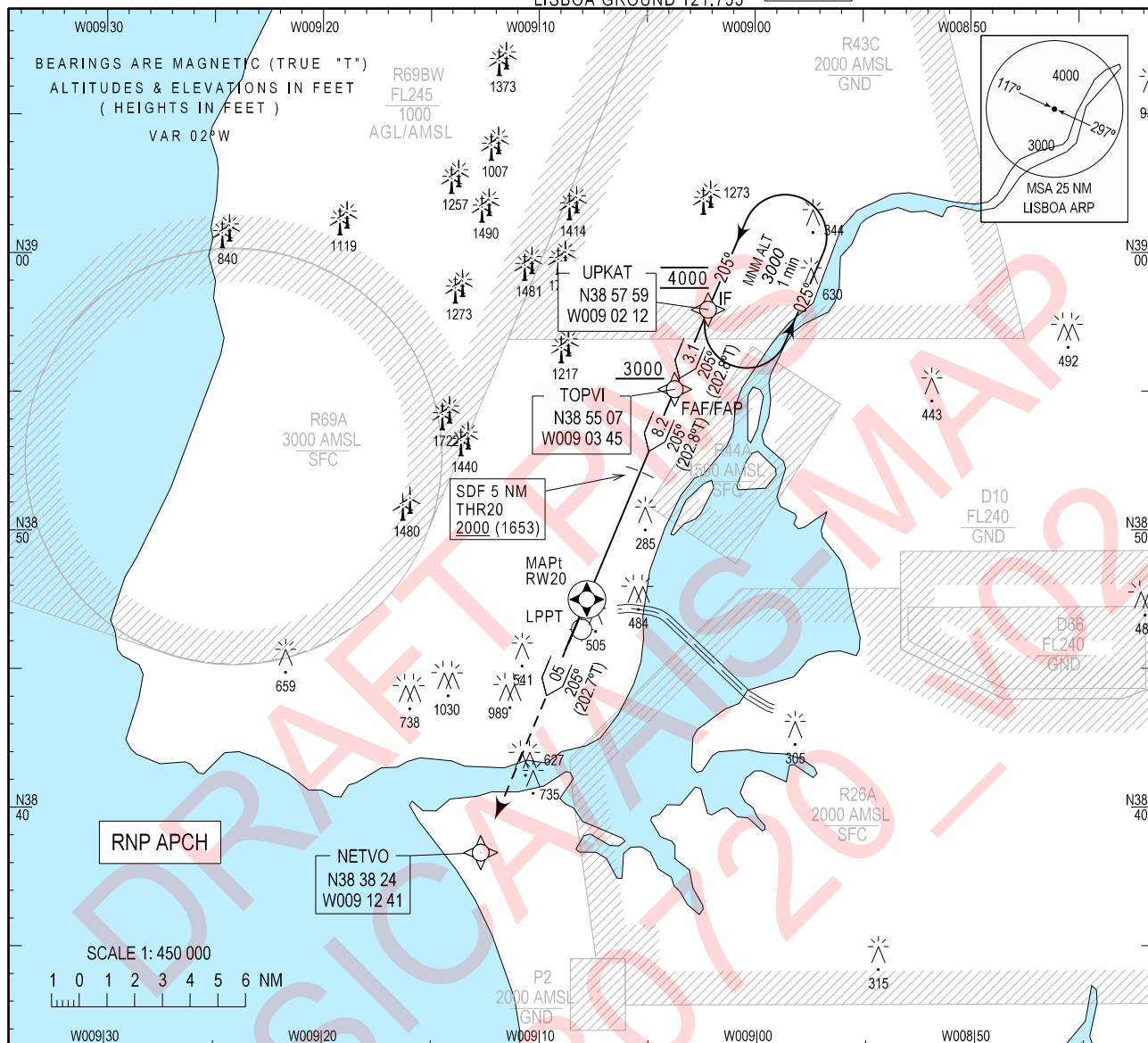
**INSTRUMENT APPROACH CHART - ICAO**

AD ELEV 355 ft  
 HEIGHTS RELATED  
 THR RWY 20 - ELEV 347 ft

LISBOA ARR INFORMATION 124.155  
 LISBOA APPROACH 119.105  
 LISBOA ARRIVAL 125.130  
 LISBOA TOWER 118.105  
 LISBOA GROUND 121.755

EGNOS  
 CH 97981  
 E20A  
 RDH: 50

**LISBOA Humberto Delgado (LPPT)**  
 RNP RWY 20

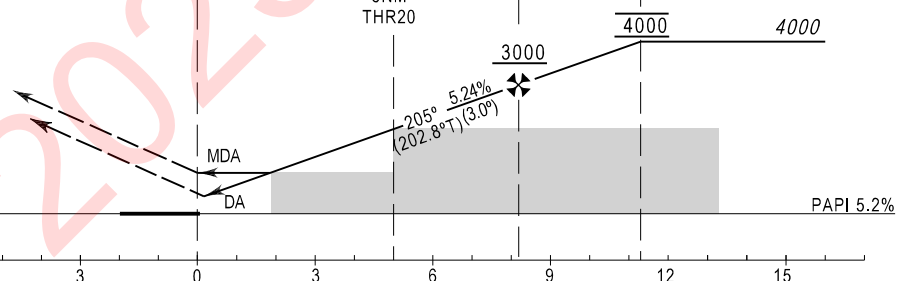


BARO-VNAV  
 minimum temperature: 0°C

MAPt RWY 20      SDF 2000(1653) 5NM THR20      FAF/FAP TOPVI      IF UPKAT      TRANSITION ALTITUDE 4000 ft

**MISSED APPROACH:**  
 Climb straight-ahead FL070.  
 CTC APP.

**RCF:**  
 Climb straight-ahead to 4000 ft to cross NETVO at or above 3000 ft, proceed via PT805, ITVIT, ARNIT, UPKAT and perform another approach.



CAT	LPV		LNAV/VNAV		LNAV		CIRCLING	
	DA(H)	OCH	DA(H)	OCH	MDA(H)	OCH	MDA(H)	OCH
A		231					1500(1130)	1126
B	600 (253)	244	800 (453)	451	840 (493)	485		
C		252					1580(1210)	1206
D	610 (263)	262						

DIST THR NM	5	4	3	2	1
Altitude (height)	1988 (1641)	1670 (1323)	1351 (1004)	1033 (686)	714 (367)

rate of descend	kt	160	140	120	100	80
		ft/min	840	735	630	525

DRAFTS DOS PROCEDIMENTOS PARA A PISTA 02

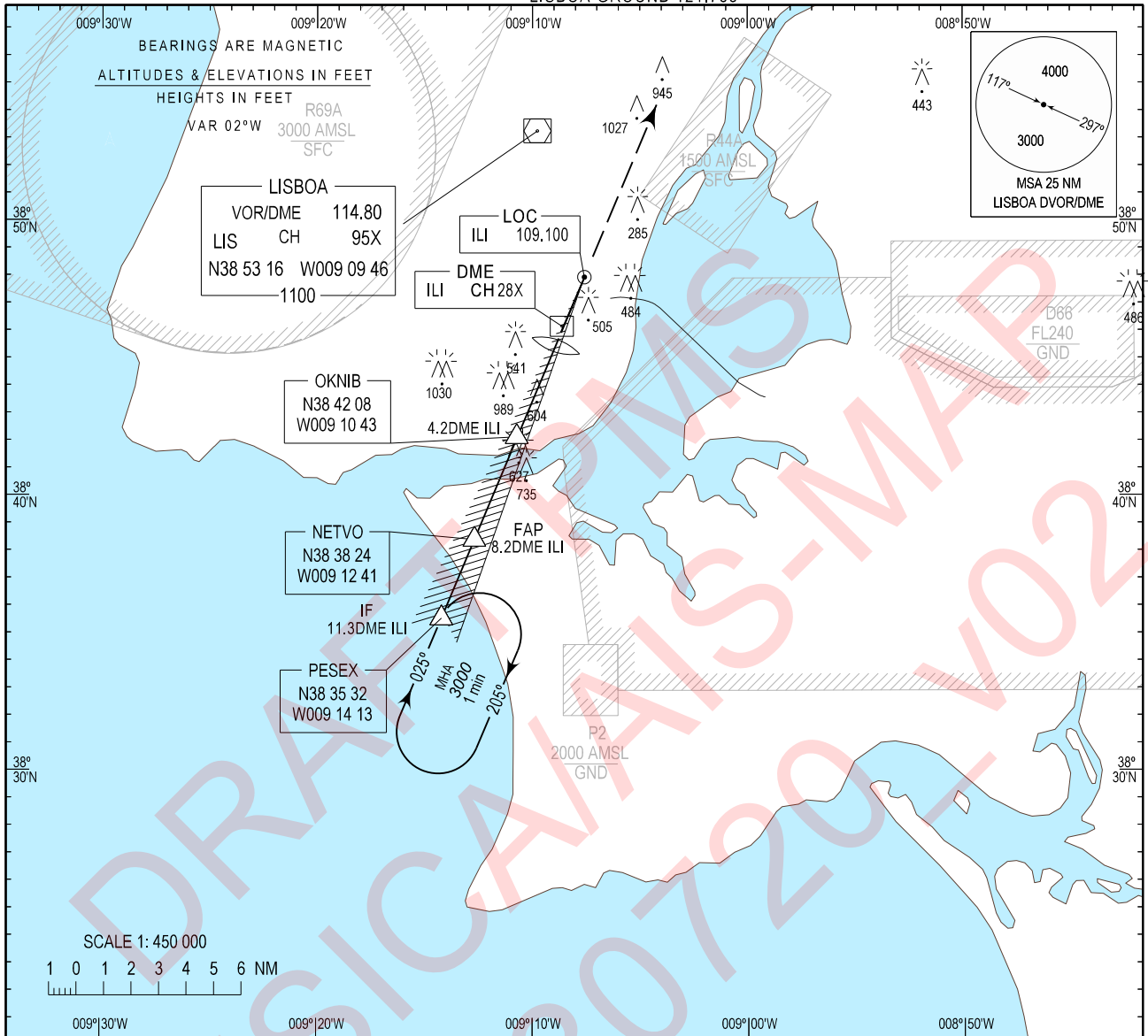
**INSTRUMENT APPROACH CHART - ICAO**

AD ELEV 355 ft  
 HEIGHTS RELATED  
 THR RWY 02 - ELEV 330 ft

LISBOA ARR INFORMATION 124.155  
 LISBOA APPROACH 119.105  
 LISBOA ARRIVAL 125.130  
 LISBOA TOWER 118.105  
 LISBOA GROUND 121.755

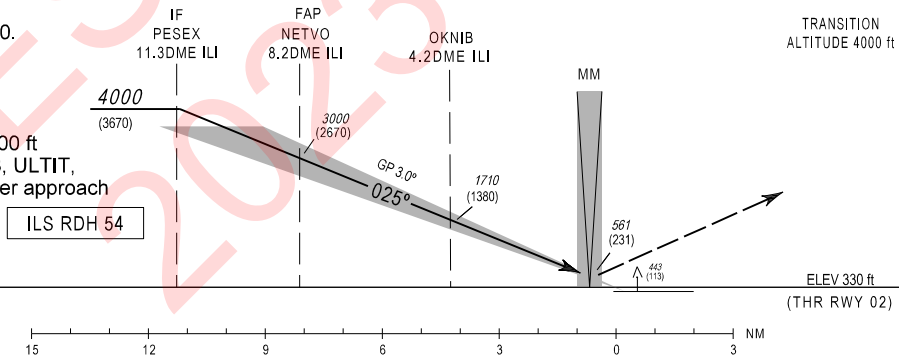
**LISBOA, Humberto Delgado (LPPT)**

ILS RWY 02 CAT II & III



**MISSED APPROACH:**  
 Climb straight-ahead FL070.  
 CTC APP.

**RCF:**  
 SQUAWK 7600.  
 Climb straight ahead to 4000 ft  
 via ROKOB, PT757, PT758, ULTIT,  
 PESEX and perform another approach



CAT of ACFT		OCA (H)			
		CAT A	CAT B	CAT C	CAT D
ILS	CAT I	529(200)			
	CAT II	429(100)			
CIRCLING		1500		1580	

CAT III A and CAT III B (MNM RVR 75m) approved  
 DME READING REFERS TO THE THR RWY 02



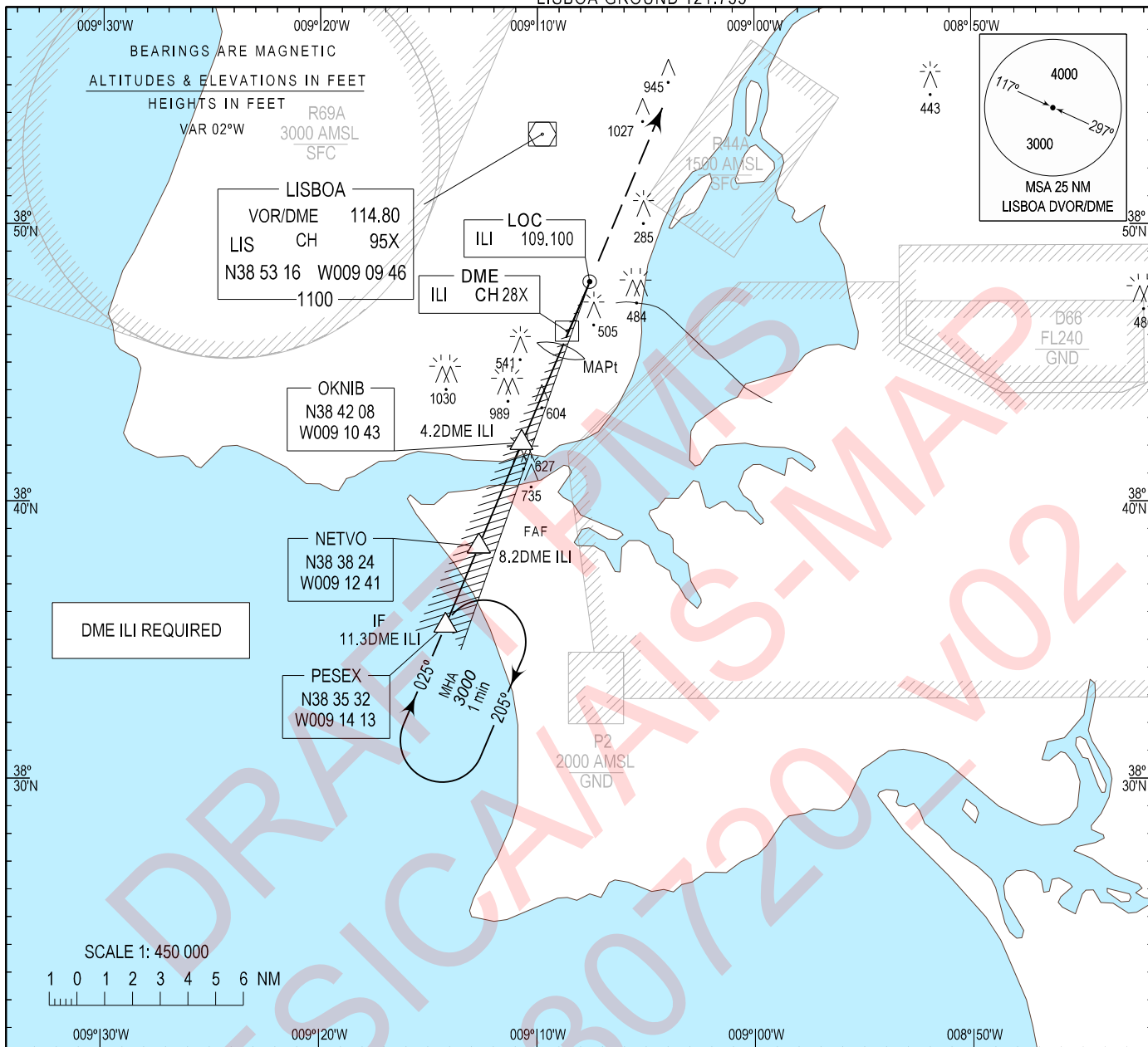
**INSTRUMENT APPROACH CHART - ICAO**

AD ELEV 355 ft  
 HEIGHTS RELATED  
 THR RWY 02 - ELEV 330 ft

LISBOA ARR INFORMATION 124.155  
 LISBOA APPROACH 119.105  
 LISBOA ARRIVAL 125.130  
 LISBOA TOWER 118.105  
 LISBOA GROUND 121.755

**LISBOA, Humberto Delgado (LPPT)**

LOC RWY 02



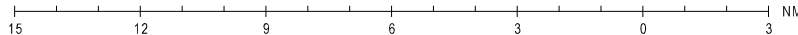
**MISSED APPROACH:**  
 Climb straight-ahead FL070.  
 CTC APP.

**RCF:**  
 Squawk 7600.  
 Climb straight-ahead to 4000ft  
 via ROKOB, PT757, PT758, ULTIT,  
 PESEX and perform another approach.

TRANSITION  
 ALTITUDE 4000 ft

PAPI 3°

ELEV 330 ft  
 (THR RWY 02)



	OCA (H)			
	CAT A	CAT B	CAT C	CAT D
LOC	829(500)			
CIRCLING	1500		1580	

Speed	kt	80	100	120	140	160	180	200
OKNIB to MM (3.6 NM)	min:s	2:42	2:10	1:48	1:33	1:21	1:12	1:05
Rate of descent (5.2%)	ft/min	420	525	630	735	840	945	1050

DME ILI	6	5	4	3	2
ALTITUDE / HEIGHT	2325(1995)	1997(1667)	1670(1340)	1346(1016)	1023(693)

DME READING REFERS TO THE THR RWY 02

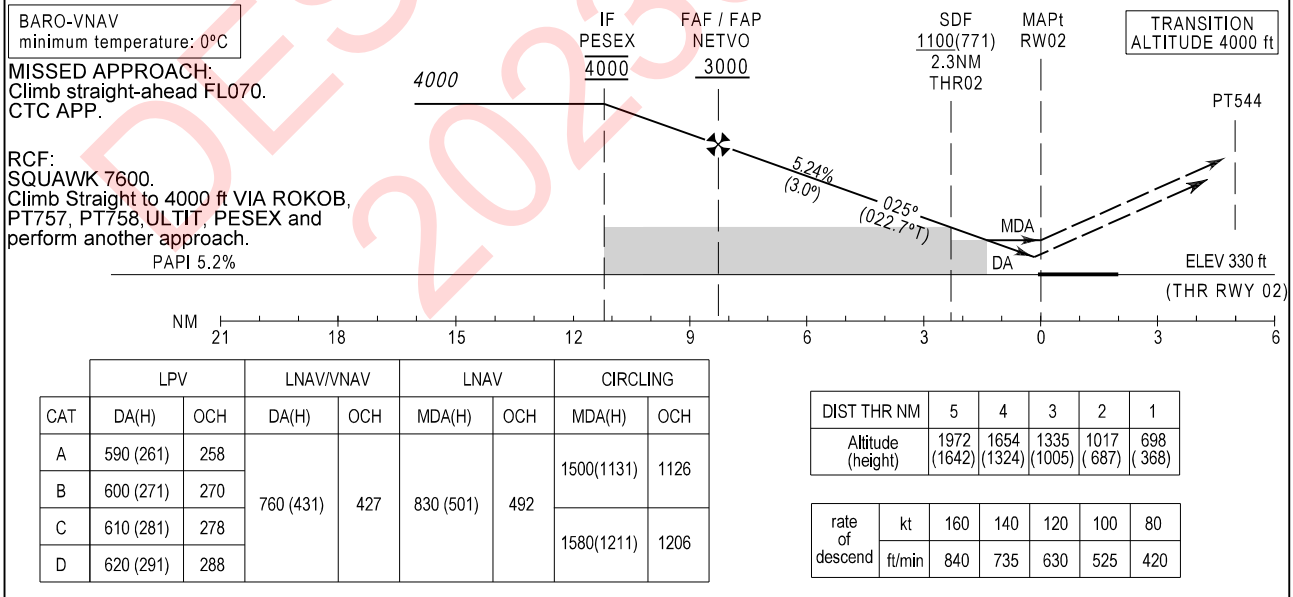
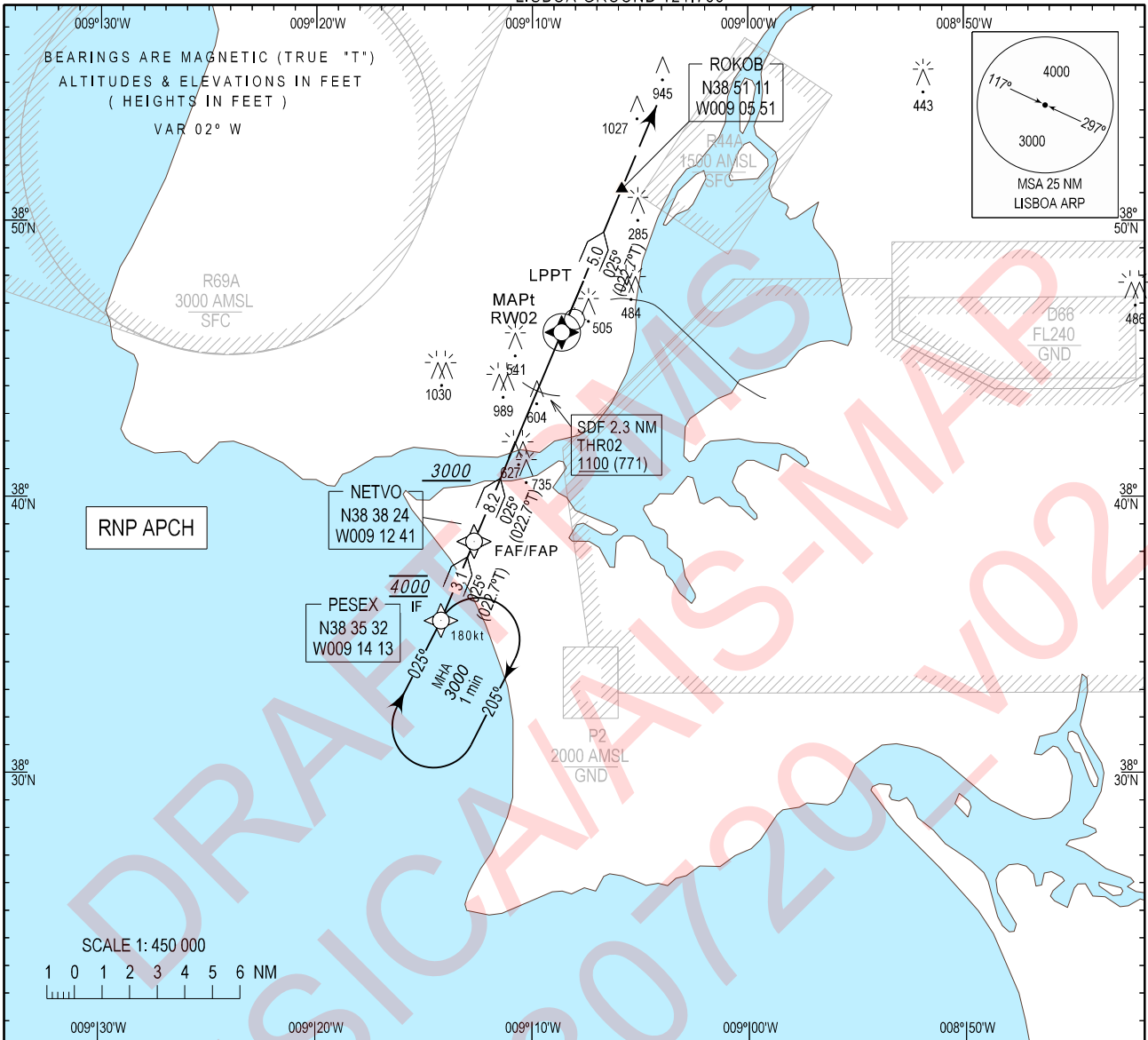
**INSTRUMENT APPROACH CHART - ICAO**

AD ELEV 355 ft  
 HEIGHTS RELATED  
 THR RWY 02 - ELEV 330 ft

LISBOA ARR INFORMATION 124.155  
 LISBOA APPROACH 119.105  
 LISBOA ARRIVAL 125.130  
 LISBOA TOWER 118.105  
 LISBOA GROUND 121.755

EGNOS  
 CH 48477  
 E02A  
 RDH: 50

**LISBOA Humberto Delgado (LPPT)**  
 RNP RWY 02



## 6. CONCLUSÃO

Estas alterações visaram acomodar os procedimentos de aproximação ao Aeroporto Humberto Delgado com a implementação do PMS (Point Merge System), com data definida de publicação pelo ciclo AIRAC de 22 de Fevereiro de 2024. A NAV Portugal considera que este estudo demonstra a viabilidade destas alterações nos procedimentos, nomeadamente no que concerne às áreas de proteção laterais e verticais e à aeronavegabilidade da estabilização das voltas, alterações que visam acomodar a ligação do Point Merge System aos procedimentos de aproximação para as pista 02 e 20 do Aeroporto Humberto Delgado