

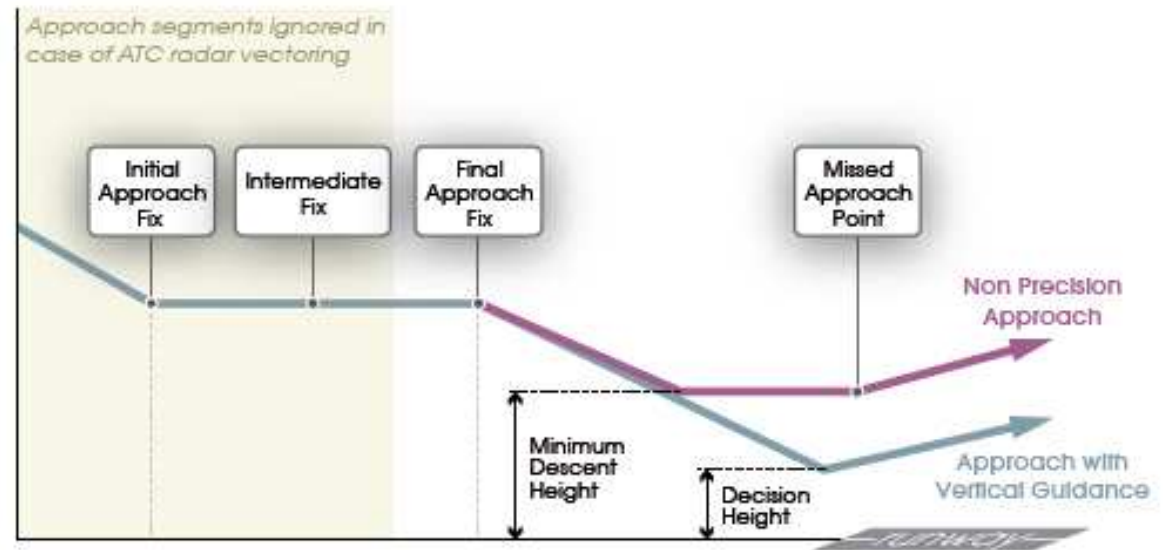


RNAV GNSS APPROACH

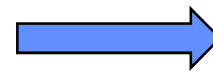


ESESA Aviation Workshop 26th – 27th October 2010

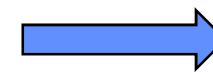
- Before Performance Based Navigation...
- PBN convergence with RNAV GNSS Approach
- RNAV GNSS Approach cross check with RNP APCH
- Airworthiness material



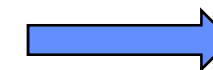
- Non Precision Approaches (NPA):
 - ✓ Use conventional navigation aids such as NDB, VOR and DME to bring the aircraft to a point where the runway is in view and landing can be performed.
- Precision Approaches (PA):
 - ✓ Use an instrument landing system (e.g. ILS, GBAS, MLS) which provides both lateral and vertical guidance on a stabilised continuous descent path.
- Approach with Vertical Guidance (APV)
 - ✓ VNAV flown with baro altitude (APV Baro VNAV)
 - ✓ VNAV flown with SBAS (APV SBAS)



CFIT Risk



Costly ground installation



Takes benefit from aircraft installed systems



NPA ?
APV ?
PA ?
Other ??



RED WING, MINNESOTA

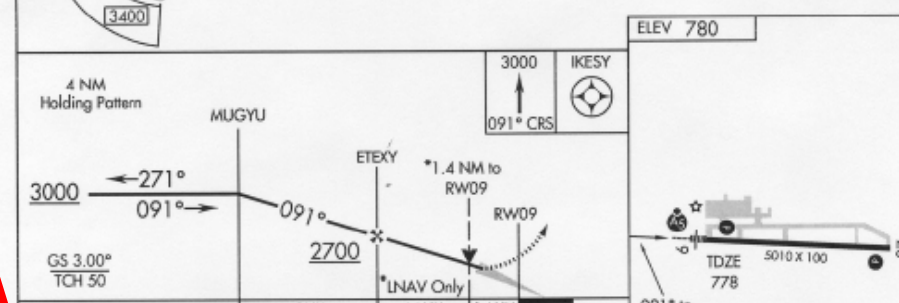
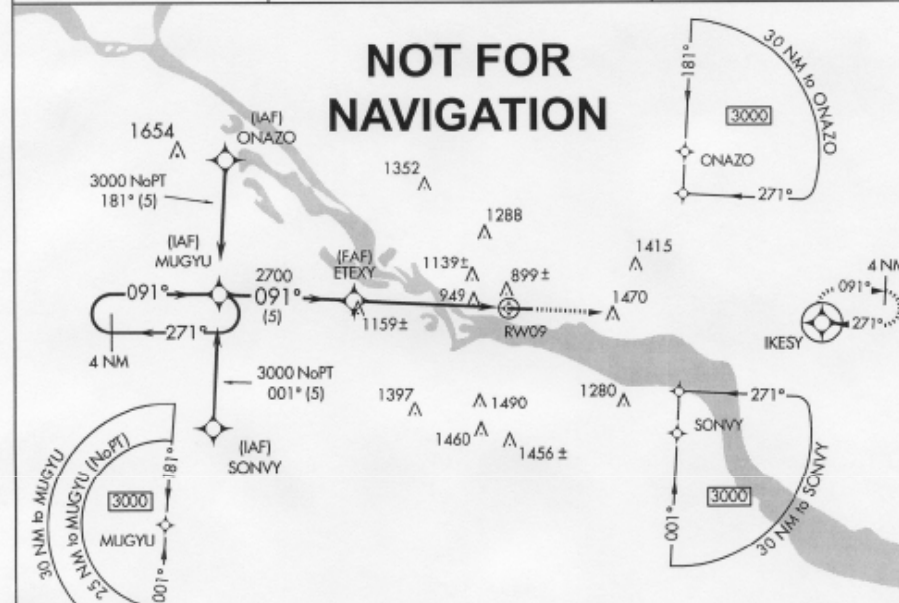
AL-6662 (FAA)

WAAS CH 46500 W-09
APP CRS 091°
Rwy Idg 5010 TDZE 778 Apt Elev 780

RNAV (GPS) RWY 9
RED WING REGIONAL (RGK)

Baro VNAV NA below -1.6°C (4°F).
GPS or RNP 0.3 required. DME/DME RNP 0.3 NA.
MALS R MISSED APPROACH: Climb to 3000 via course 091° to IKESY WP and hold.

AWOS-3 119.25
MINNEAPOLIS APP CON 121.2 357.4
UNICOM 123.05 (CTAF)



CATEGORY	A	B	C	D
LPV DA	1030-½	250 (250-½)		NA
LNAV/VNAV DA	1160-¾	382 (400-¾)		NA
LNAV MDA	1260-½	482 (500-½)	1260-¾ 482 (500-¾)	NA
CIRCLING	1480-1¼ 700 (700-1¼)	1520-1¼ 740 (800-1¼)	1540-2¼ 760 (800-2¼)	NA

RED WING, MINNESOTA
Orig-A 02136

44°35'N-92°29'W

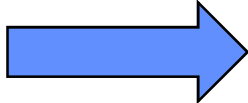
RED WING REGIONAL (RGK)
RNAV (GPS) RWY 9

- PBN Manual (Doc 9613 – 3rd Ed. 2008)
 - ✓ Only RNP APCH and RNP AR APCH specifications
 - ✓ RNP APCH specification mainly covers lateral navigation
 - ✓ No specification for APV (Baro VNAV or SBAS)

RNAV

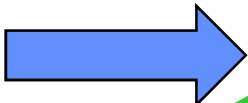
NPA

RNP APCH



Difficulties to consistently implement APV procedures (as required by ICAO Assembly Resolution 36-9) in PBN applications

LNAV



Differences in terminologies used in ICAO documents, PBN Manual and approach charts lead to confusion

LPV

CLARIFICATION URGENTLY NEEDED!

LNAV/VNAV

APV

LP



PBN and RNAV GNSS approach convergence

- The ICAO State Letter SP 65/4-10/53 (23rd July 2010)
 - ✓ Pre-Lease of PBN update scheduled March 2011
 - ✓ Focus on RNP APCH implementation (not to be confused with RNP AR APCH!)
 - ✓ Clarifications on APV (Baro VNAV and SBAS) and RNP APCH criteria
 - ✓ Help to liaise with airworthiness materials developed by FAA and EASA

- Reconciling PBN, Approach charts terminology and aircraft systems
 - ✓ PART A – RNP APCH OPERATIONS DOWN TO LNAV AND LNAV/VNAV MINIMA
 - Addresses APV Baro VNAV (barometric-based vertical navigation requirements given in attachment 1 of the volume)
 - Opens the capability to fly APV Baro VNAV procedures with an SBAS capable GNSS equipment
 - ✓ PART B – RNP APCH OPERATIONS DOWN TO LP AND LPV MINIMA
 - Addresses APV SBAS criteria
 - provisions given are consistent with different sets of LPV minima (down to 200 ft)

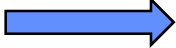
CAUTION: requirements on SiS performance in this ICAO State Letter are not consistent with the Annex 10, Table 3.7.2.4-1. This will be soon amended !



RNAV GNSS App cross check with RNP APCH

RNAV World	PBN Terminology	RNAV GNSS chart minima	Sensor
GPS NPA	RNP APCH down to	LNAV (MDA)	GNSS
APV Baro	RNP APCH down to	LNAV/VNAV (DA)	GNSS + Baro VNAV
-----	RNP APCH down to	LP (MDA)	GPS + SBAS
APV SBAS	RNP APCH down to	LPV (DA)	

RNAV World	PBN Terminology	RNAV GNSS chart minima	Sensor
GPS NPA	RNP APCH down to	LNAV (MDA)	GNSS
APV Baro	RNP APCH down to	LNAV/VNAV (DA)	GNSS + Baro VNAV
-----	RNP APCH down to	LP (MDA)	GPS + SBAS
APV SBAS	RNP APCH down to	LPV (DA)	

- RNP APCH procedures down to LNAV or LNAV/VNAV minima
 - ✓ FAA AC 20-138A
 - ✓ EASA AMC 20-27
- 
- Not equivalent – AMC 20-27 under discussion following IATA and AEA letter July 2010
- RNP APCH procedures down to LP or LPV minima
 - ✓ FAA AC 20-138A
 - ✓ EASA AMC 20-28 to be issued 2011 (certification already possible by CRI)
 - RNP APCH down to LNAV/VNAV conducted with approved SBAS equipment
 - ✓ Accepted by FAA
 - ✓ Under scope of EASA

