The PBN Implementation In China

Yang, Honghai
Deputy Director General
Flight Standard Department, CAAC

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CAAC

The Progress of PBN Implementation in China

- China Civil Aviation PBN Implementation Roadmap
- PBN Training in China
- The Airports with PBN flight procedures
- Operational approval of airlines
- CAAC's Financial support for propelling PBN
- Difficulties, Challenges and following plans

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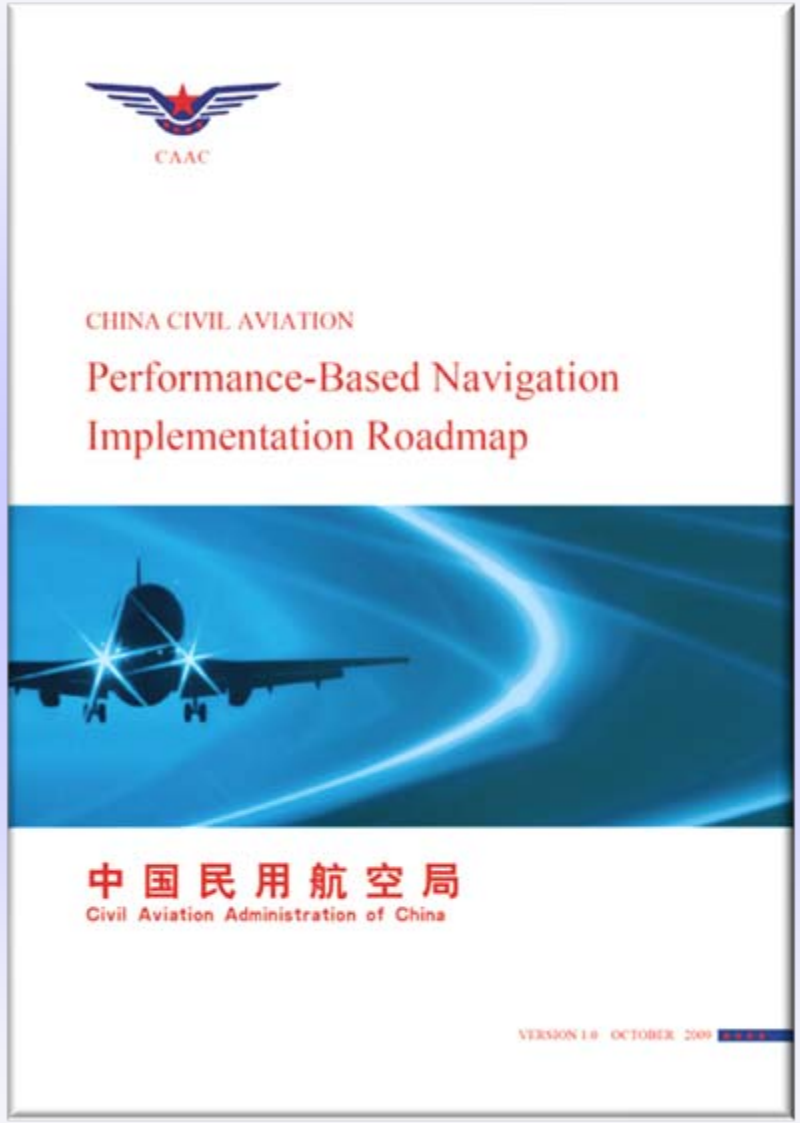
CAAC PBN Implementation Roadmap



CAAC PBN Implementation Roadmap

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5. Implementation time frames

5.1 Near term（2009－2012）

En route

- Based on air transportation requirements, surveillance and communication capability, controller workload, and fleet equipage, the CAAC plans to selectively apply RNP-10 and RNP-4 navigation specifications to certain oceanic operations and continental operations in western China.

- For certain busy routes, RNAV-2 or RNAV-5 navigation specifications are selectively applied, based on coverage of communication and surveillance signals, for reduced route spacing and higher utilization of airspace.

- Existing RNAV/RNP routes will be readjusted in accordance with PBN navigation specifications.

5. Implementation time frames

5.1 Near term（2009－2012）

Terminal area

➢The CAAC plans to apply RNAV-1 navigation specifications to terminal-area operations in China where radar, GNSS, and ground-based navigation infrastructure are available. RNAV-1 implementation shall start at international airports and busy airports where coexistence of PBN operations and conventional operations is allowed. RNAV operations shall be implemented at 30% of airport terminal areas nationwide and all the nation's international airports by 2012.

➢In the airport terminal areas where there is partial radar coverage or insufficient ground-based navigation aids, the CAAC will selectively use GNSS navigation to implement basic RNP-1 SID and STAR procedures.

5. Implementation time frames

5.1 Near term（2009－2012）

Approach

- The CAAC plans to implement GNSS-based RNP APCH procedures, supported with APV based on Baro-VNAV, at all newly built airports and some existing airports. These APV approach procedures will serve as the primary approach or as a backup for ILS precision approaches.
- RNP AR approach procedures will be used at certain airports where there is complex terrain and limited airspace depending on operational requirements.
- RNP approach capability will be available to 30% of instrument runway ends nationwide by 2012.
- RNP APCH or RNP AR approach procedures will be mandated in certain airports.
- In this time frame, conventional navigation aids and flight procedures will be retained for aircraft without PBN capabilities.

5. Implementation time frames

5.1 Medium term（2013－2016）

Medium Term (2013-2016)*		
Airspace	Recommended Navigation Specifications	Acceptable Navigation Specifications
Route - oceanic	RNP-2*, RNP-4	RNAV-10
Route - remote continental	RNP-2*	RNAV-2, RNP-4, RNAV-10
Route - continental	RNP-2*	RNAV-2, RNAV-5
Terminal area - arrivals and departures	RNAV-1 or RNP-1	
Approach	RNP APCH (with Baro-VNAV) RNP AR APCH at airports with operational benefits Introduced landing operations using GNSS and its augmentation systems	
*The CNS requirements and operational procedures related to RNP-2 application are to be defined		

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PBN Training in China

- PBN training base has been established in CAFUC.
- Operation approval , flight procedure design , ICAO standards
- Over 500 people including CAAC inspectors , airlines operational engineers , procedure designers , controllers and airport personnel have been trained

PBN Training in China

- Procedure designers and inspectors from Regional authorities and ATMBs have been trained.
- PBN design office has been set up in the academy of aviation science.
- ICAO Asia-Pacific PBN office has been settled in Beijing。

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ZUJZ(JiuZhai airport) FIRST Public RNPAR project

JIUZHAI PUBLIC RNP AR

CAAC

A319
B737

ZUJZ / JZH
JIUZHAI HUANGLONG

GE Aviation

A-03
17 MAY 12

JIUZHAIGOU, CHINA
RNAV (RNP) RWY 20

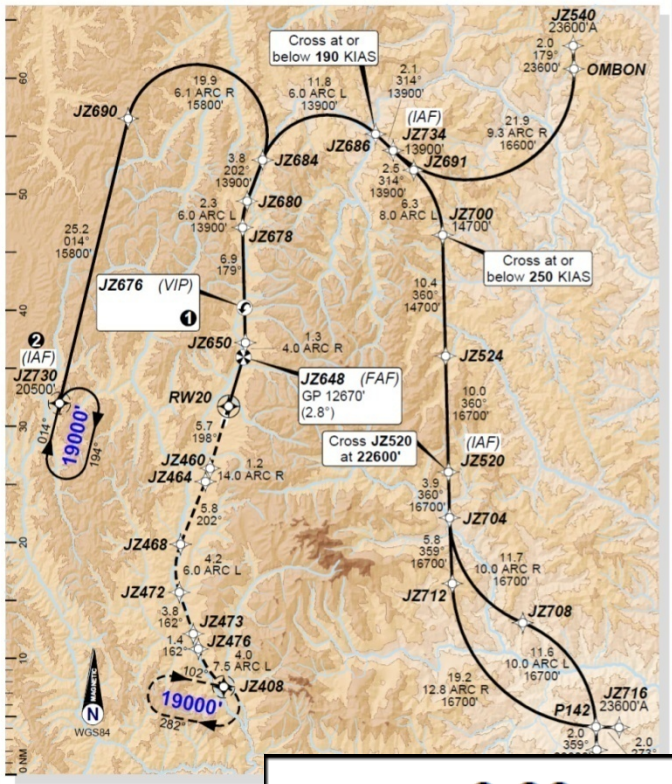
CHENGDU Center	JIUZHAI Tower	SPECIAL A… AUTHORIZATIO…
123.7	118.45 (118.7)	

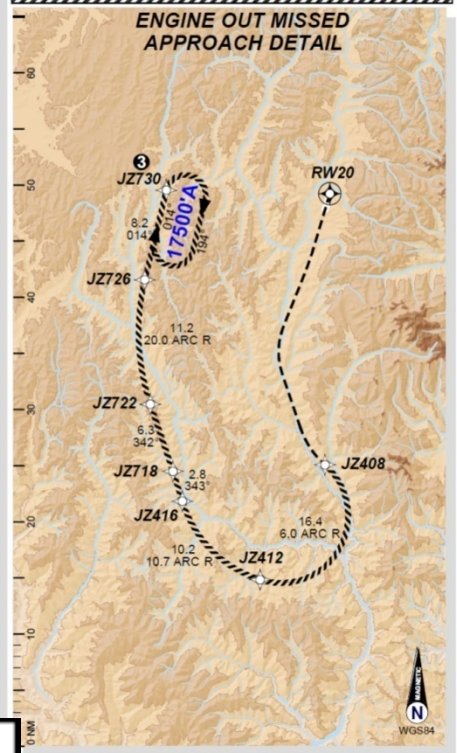
RNAV (RNP)	Apt Elev. 11311' / TDZE 11304'	JZ676(VIP)	JZ648 (FAF)	Trans Level
JZ730 JZ540 JZ548 JZ716			GP 12670' (2.8°)	SEE NOTE

❶ Vertical Intercept Point. Altitude inside VIP may vary per aircraft type.
❷ Hold only if assigned by ATC.
❸ IAF for RNAV (RNP) RWY02 and RWY20.

ED APPROACH:
19000' via the RNAV (RNP
and hold as published. Max holding

ENGINE OUT MISSED APPROACH:
If unable to cross **JZ408** at **19000'**, advise ATC and continue climb to **17500'** via the **RWY20 RNAV (RNP) ENGINE OUT MISSED APPROACH TRACK** to **JZ730** and hold. Maximum holding speed **230** KIAS. Engine Failure requires TO/GA thrust for **10** minutes.





TRANSITION LEVEL:
- 6600m

TRANSITION ALT:
- 6300m (QNH ≥ 1031)
- 6000m (1031 > QNH > 979)
- 5700m (QNH ≤ 979)

- below -17 or above 27 degrees C
- Approach not authorized using remote altimeter setting

WARNING:

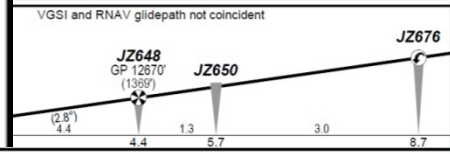
THESE PROCEDURES HAVE BEEN DESIGNED IN ACCORDANCE WITH NAVERUS INC. PROPRIETARY RNP AR DESIGN CRITERIA. DISTRIBUTION OF THESE CHARTS OR RELATED NAVIGATION DATA MAY NOT BE COMPLETED WITHOUT PRIOR COORDINATION WITH GE PBN SERVICES (NAVERUS., INC.).

EACH OPERATOR WHO CONDUCTS RNP AR OPERATIONS IN ACCORDANCE WITH THESE PROCEDURE DESIGNS MUST HAVE APPROPRIATE CHARTS, NAVIGATION DATA, AND SAFETY ASSESSMENTS ASSOCIATED WITH THEIR AIRCRAFT MAKE, MODEL, ENGINE CONFIGURATION, AND FMS MANUFACTURER.

THE ALTITUDES DEPICTED ON THESE CHARTS REPRESENT THE MINIMUM HEIGHT AIR TRAFFIC CONTROL CAN EXPECT AIRCRAFT TO CONDUCT OPERATIONS. EXCEPT FOR WHERE SPECIFIC ALTITUDE CROSSINGS ARE IDENTIFIED, SOME AIRCRAFT MAY FLY ALTITUDE PROFILES HIGHER THAN DEPICTED.

RNP **0.30**

DA(H) **#'** (#')



NOT ASSOCIATED WITH NAVIGATION DATABASE

PREPARED BY NAVERUS, INC.
GENERAL ELECTRIC COMPANY PROPRIETARY AND CONFIDENTIAL

Revision: New

JIUZHAI PUBLIC RNP AR

CAAC

ZUJZ / JZH
JIUZHAI HUANGLONG

GE Aviation

A319
B737

JIUZHAIGOU, CHINA

E DEPARTURE

Apt Elev	Trans ALT	CHENGDU Center	JIUZHAI Tower
11311'	SEE NOTE	123.7	118.45

RNP 02
RNAV (RNP) DEPARTURE
RNP 0.30
(PANDA1)
RWY 02

Requires weather minima of 800m visibili

20500' 25NM MSA JZH VOR

SPECIAL AIRC
AUTHORIZATION R

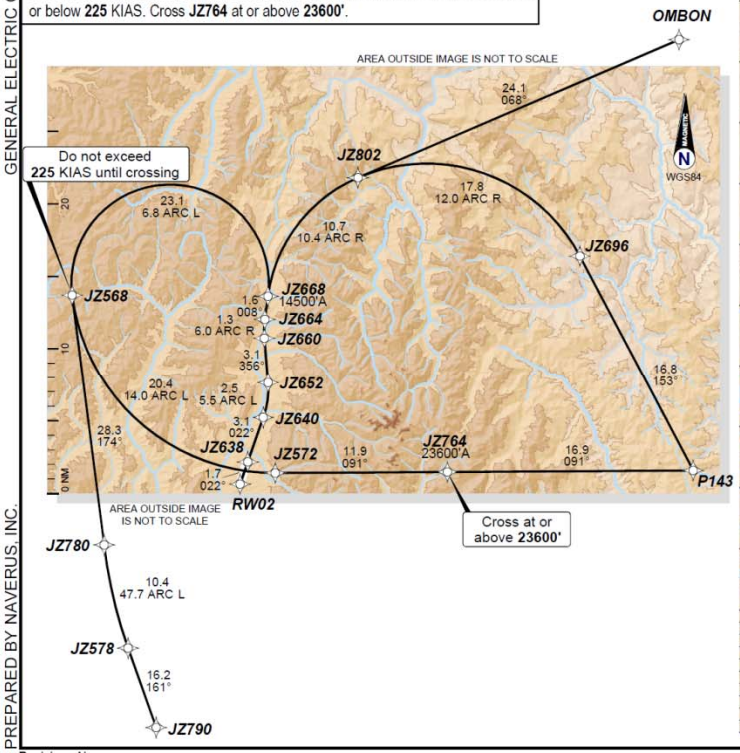
RNAV (RNP) ENGINE FAILURE
RNP 0.30
RWY 02

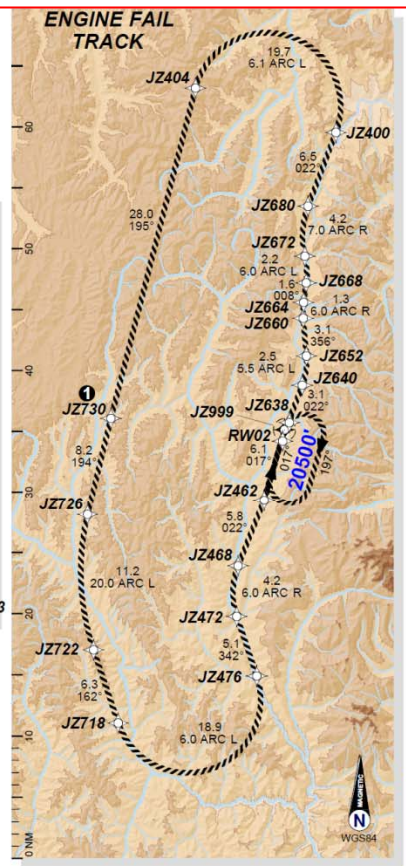
TAKE-OFF:

RWY 02: Fly the RNAV (RNP) track to **JZ668** and cross **JZ668** at or abo
Thence:

TRANSITIONS:

JZ790 (PANDA1.JZ790): Fly the RNAV (RNP) track to **JZ790**. Cross **JZ568** at or below **225** KIAS.
OMBON (PANDA1.OMBON): Fly the RNAV (RNP) track to **OMBON**.
JZ696 (PANDA1.JZ696): Fly the North RNAV (RNP) track to **P143**.
JZ764 (PANDA1.JZ764): Fly the South RNAV (RNP) track to **P143**. Cross **JZ568** at or below **225** KIAS. Cross **JZ764** at or above **23600'**.





0m (QNH ≥ 1031)
0m (1031 > QNH > 979)
0m (QNH ≤ 979)

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GENERAL ELECTRIC COMPANY PROPRIETARY AND CONFIDENTIAL

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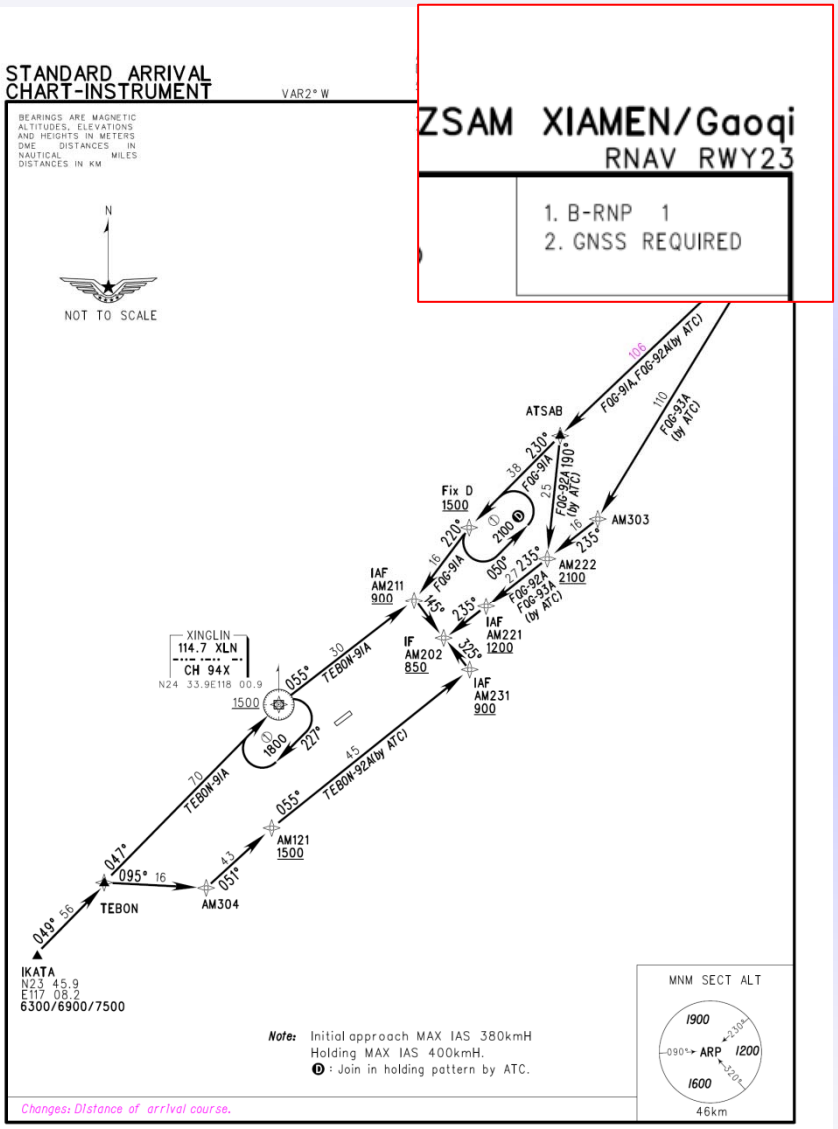
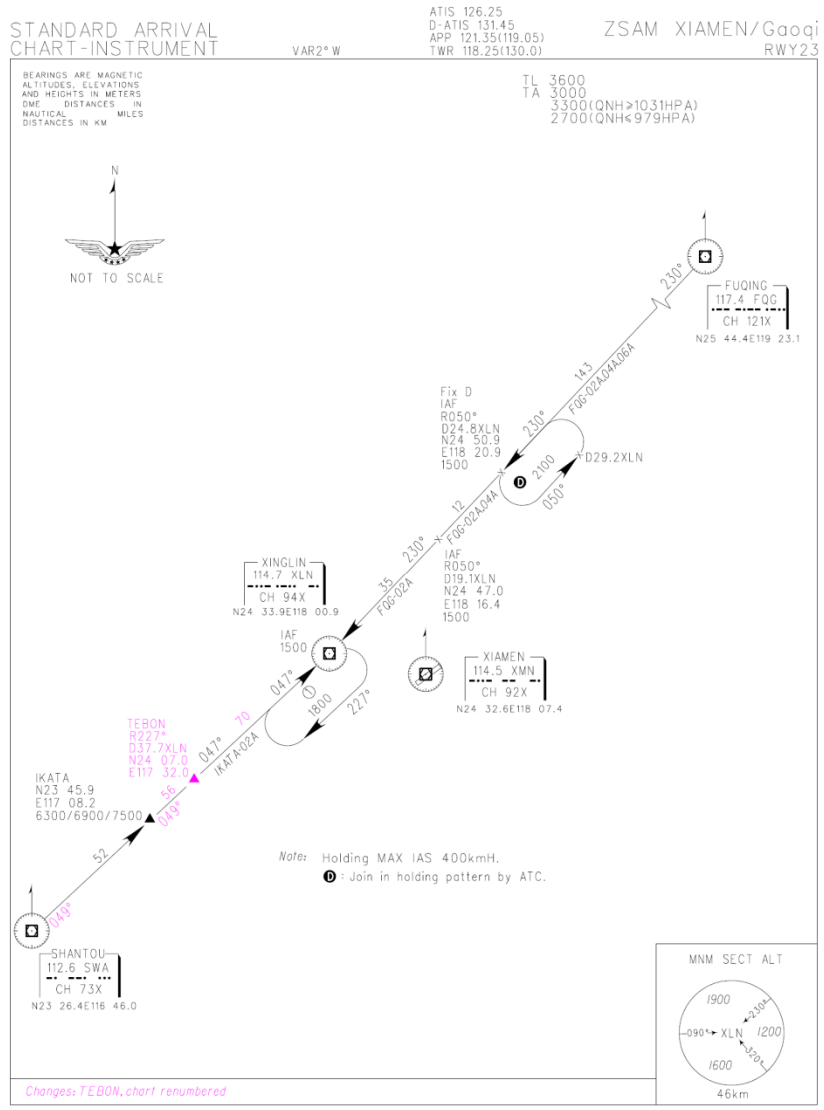
Revision: New

CAAC

XIAMEN RNP APCH





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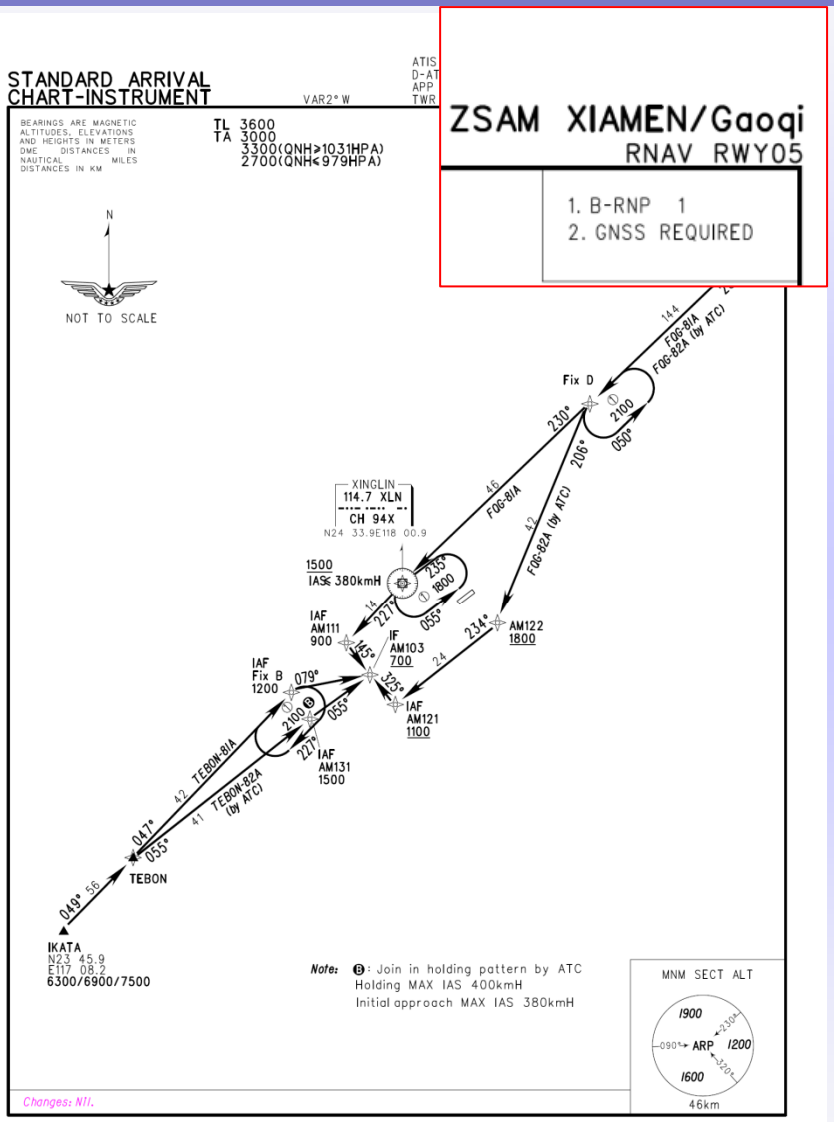

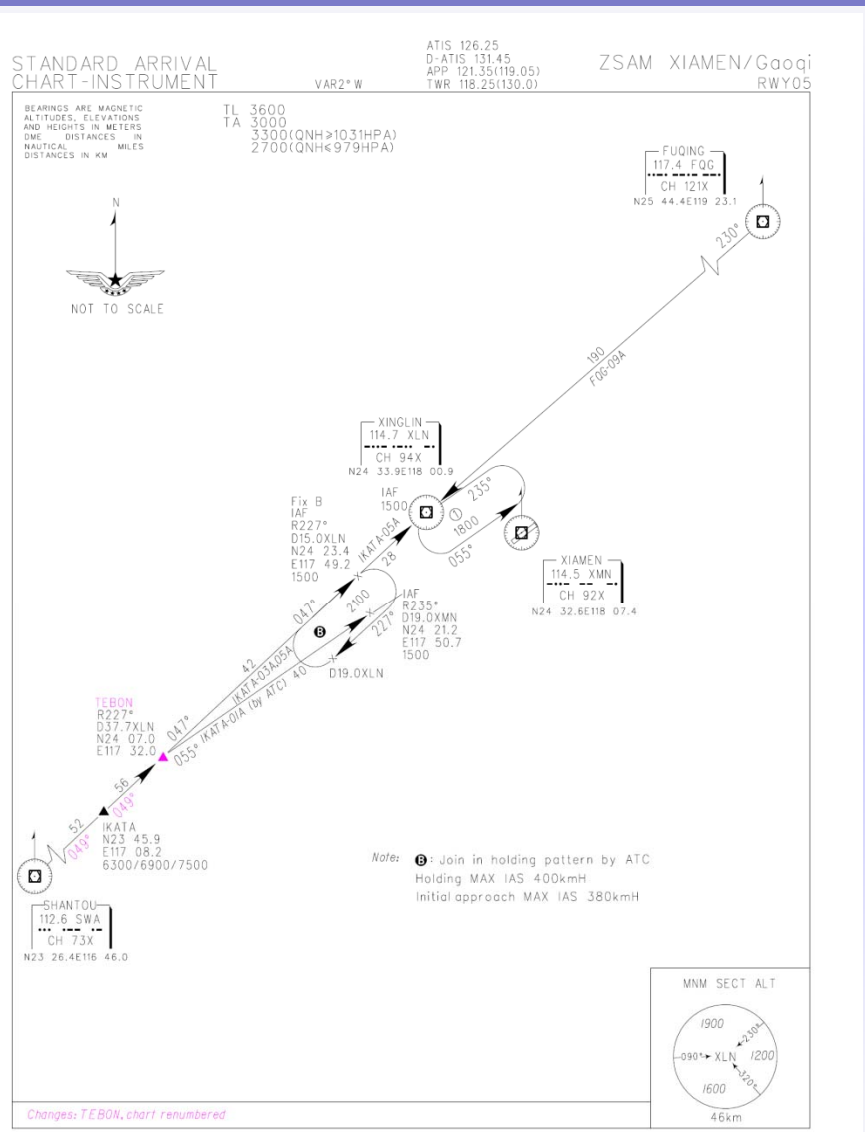

XIAMEN RNP APCH

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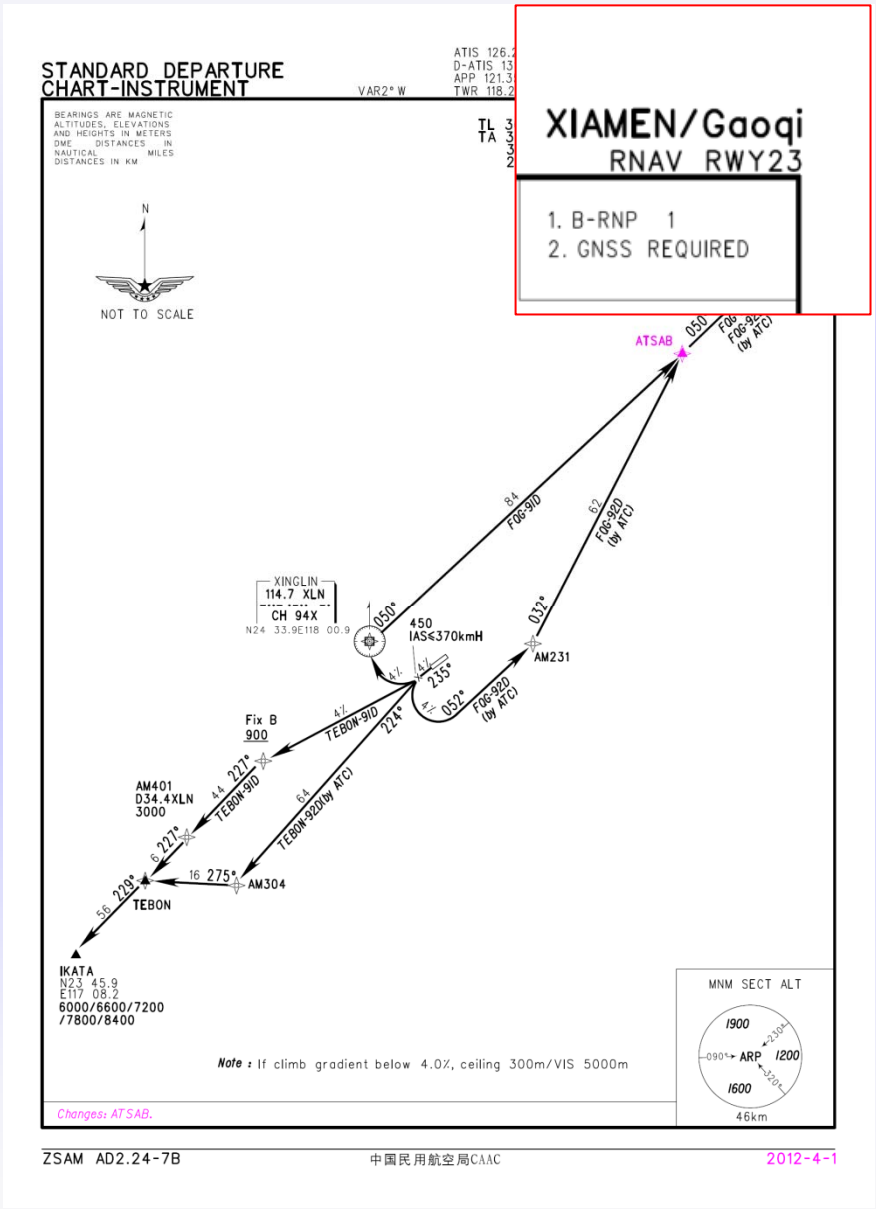

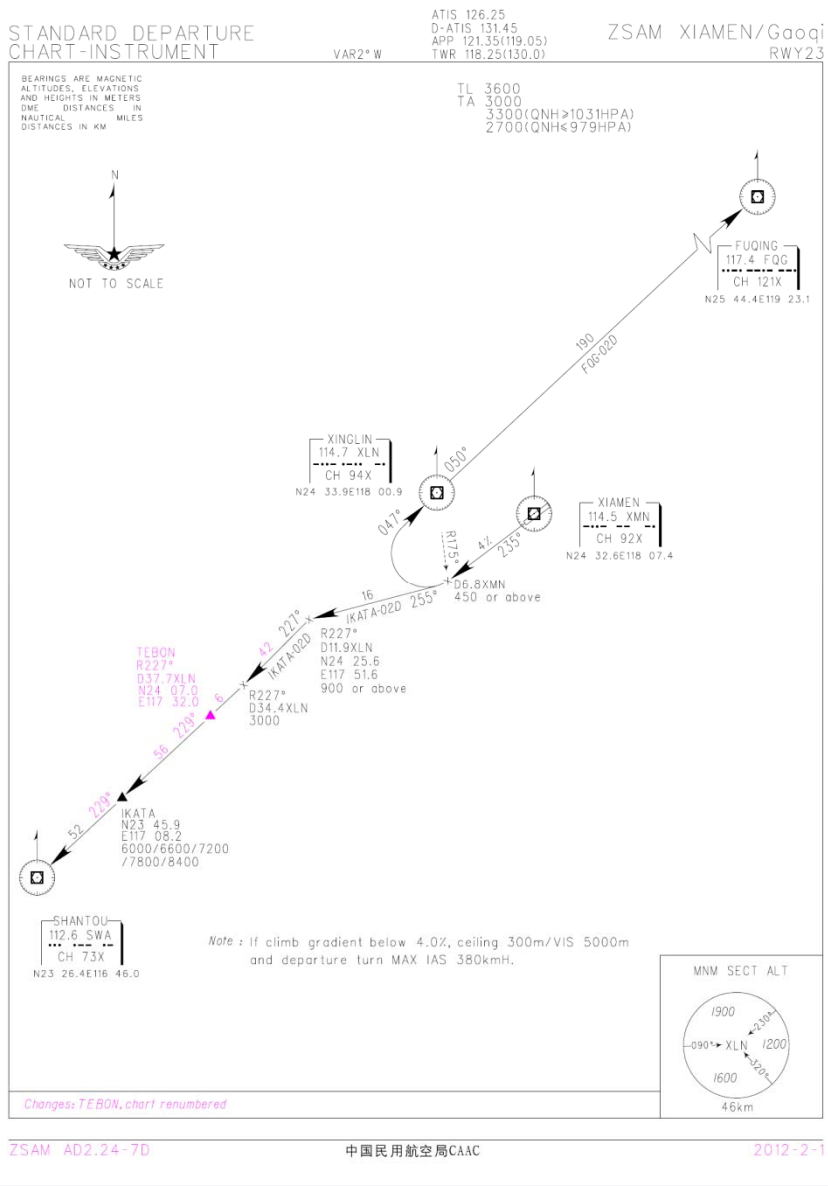

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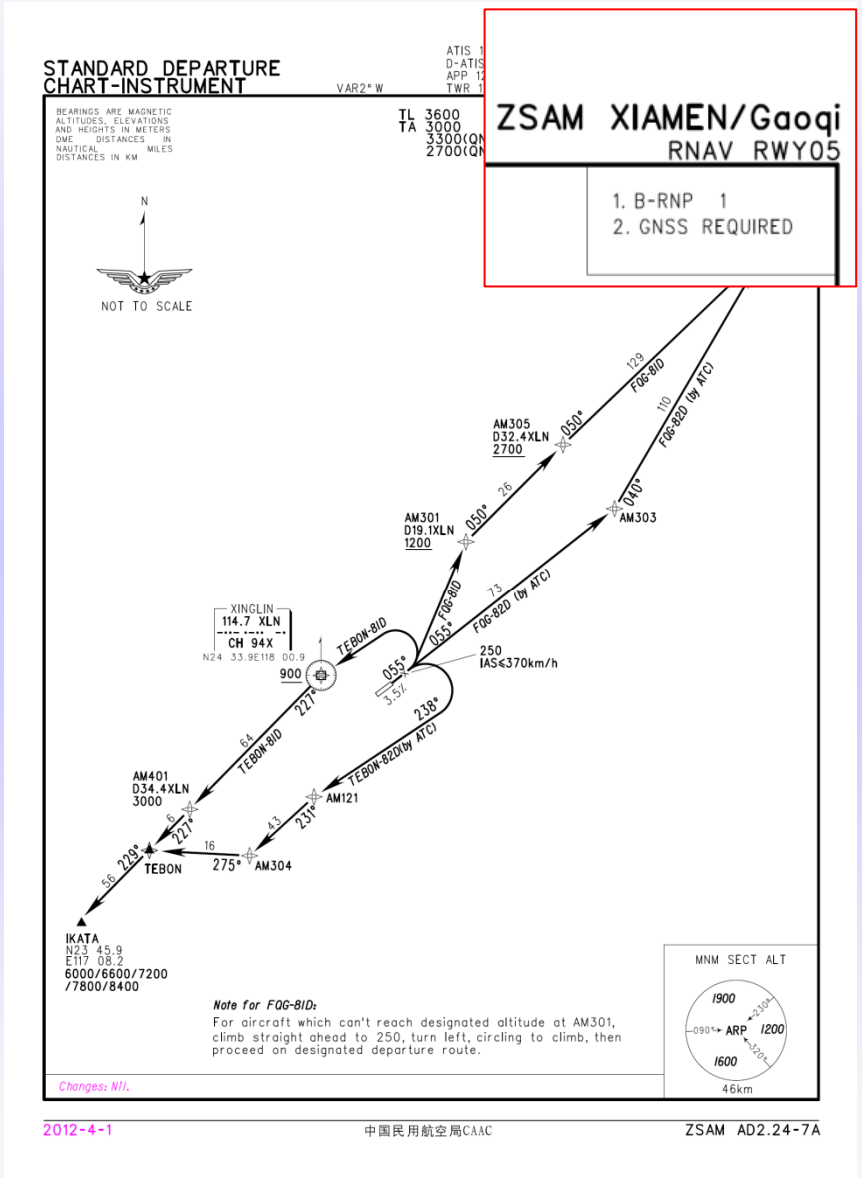

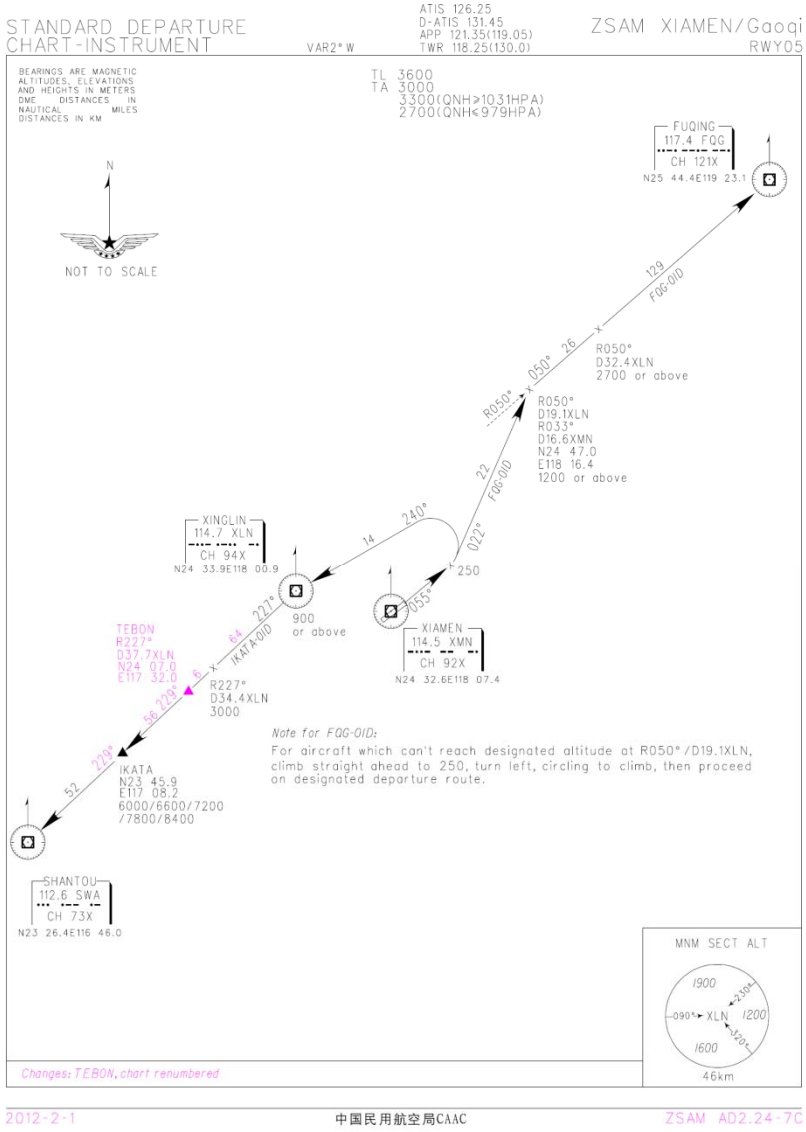

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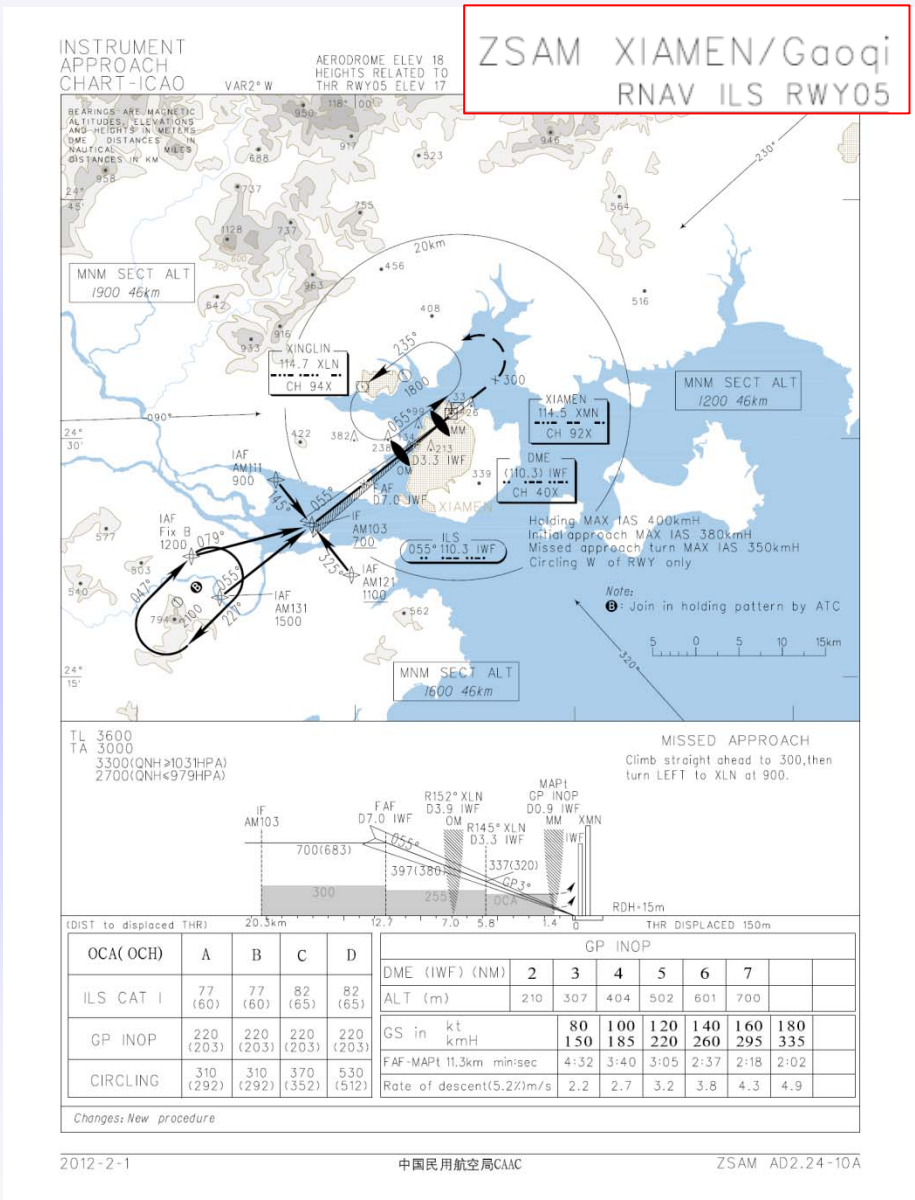

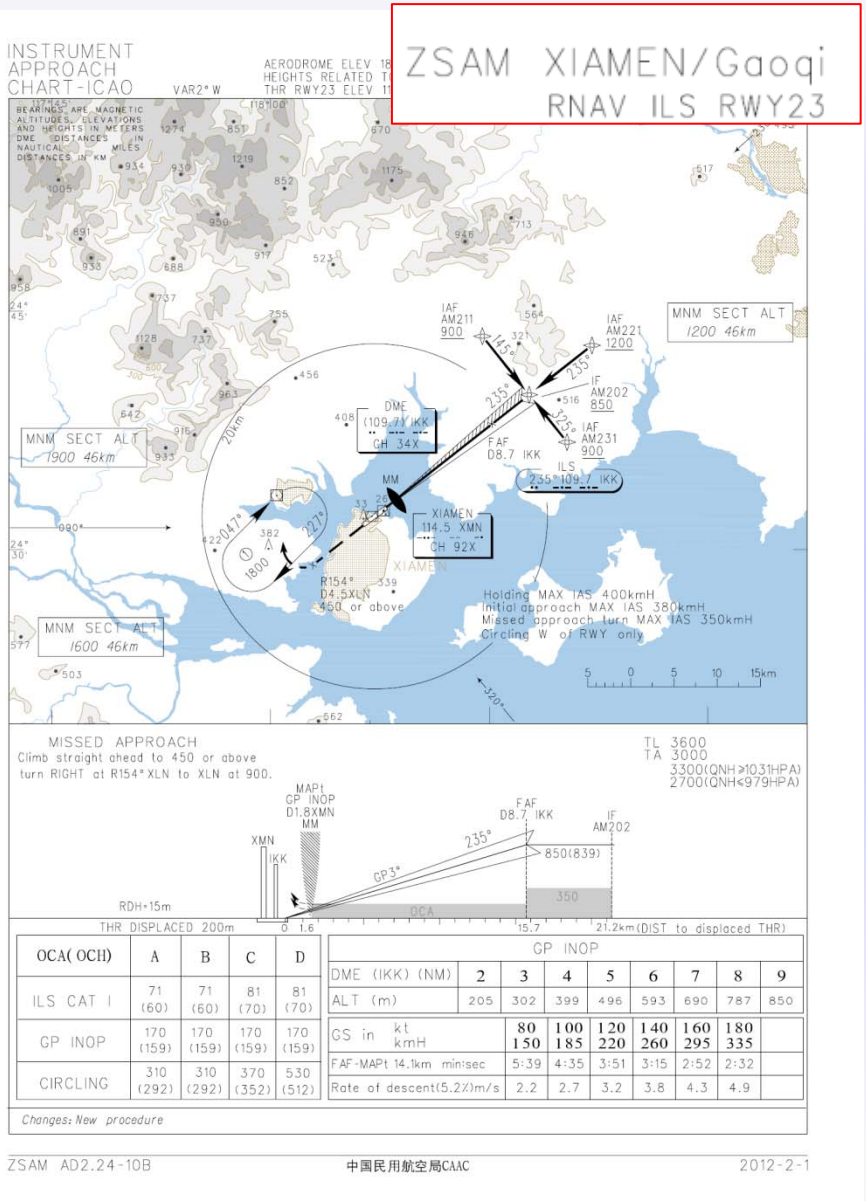

XIAMEN RNP APCH

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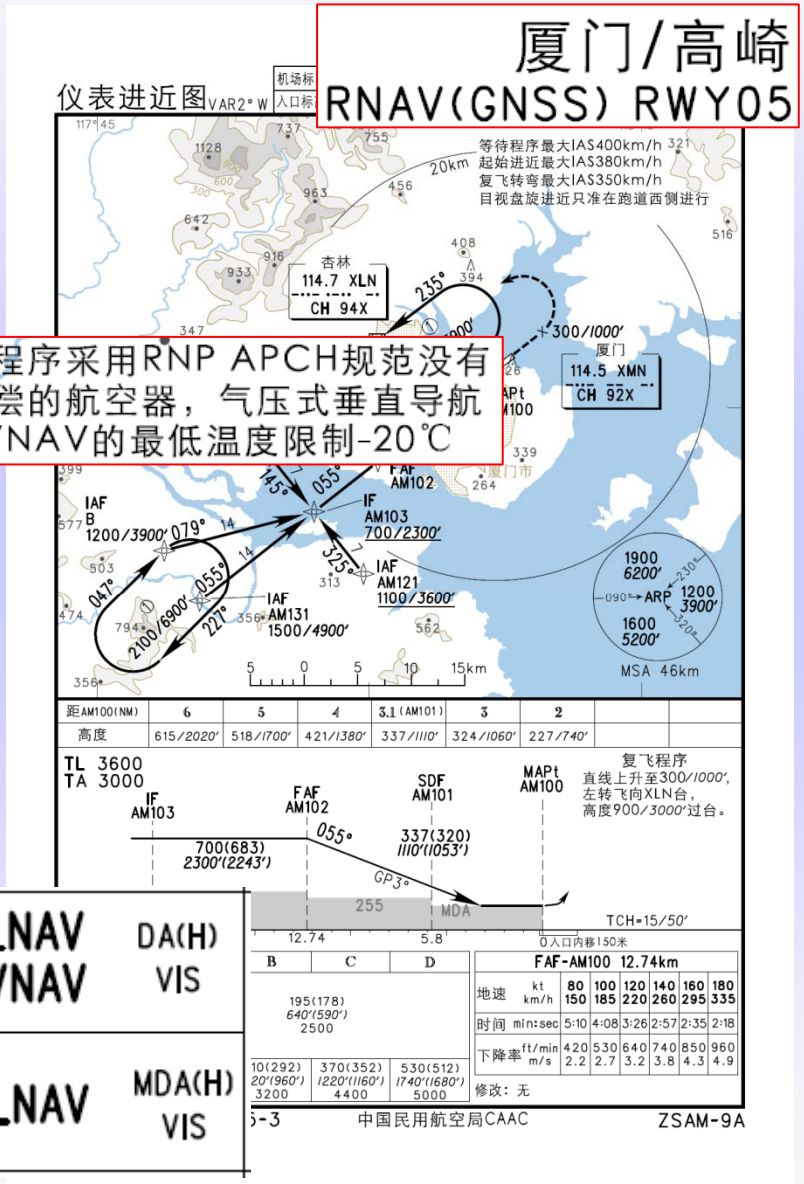
厦门/高崎 RNAV(GNSS) RWY05

该进近程序采用RNP APCH规范没有温度补偿的航空器，气压式垂直导航Baro-VNAV的最低温度限制-20℃



厦门/高崎 RNAV(GNSS)RWY23

该进近程序采用RNP APCH规范没有温度补偿的航空器，气压式垂直导航Baro-VNAV的最低温度限制-20℃

SHANGHAI PUDONG RNAV

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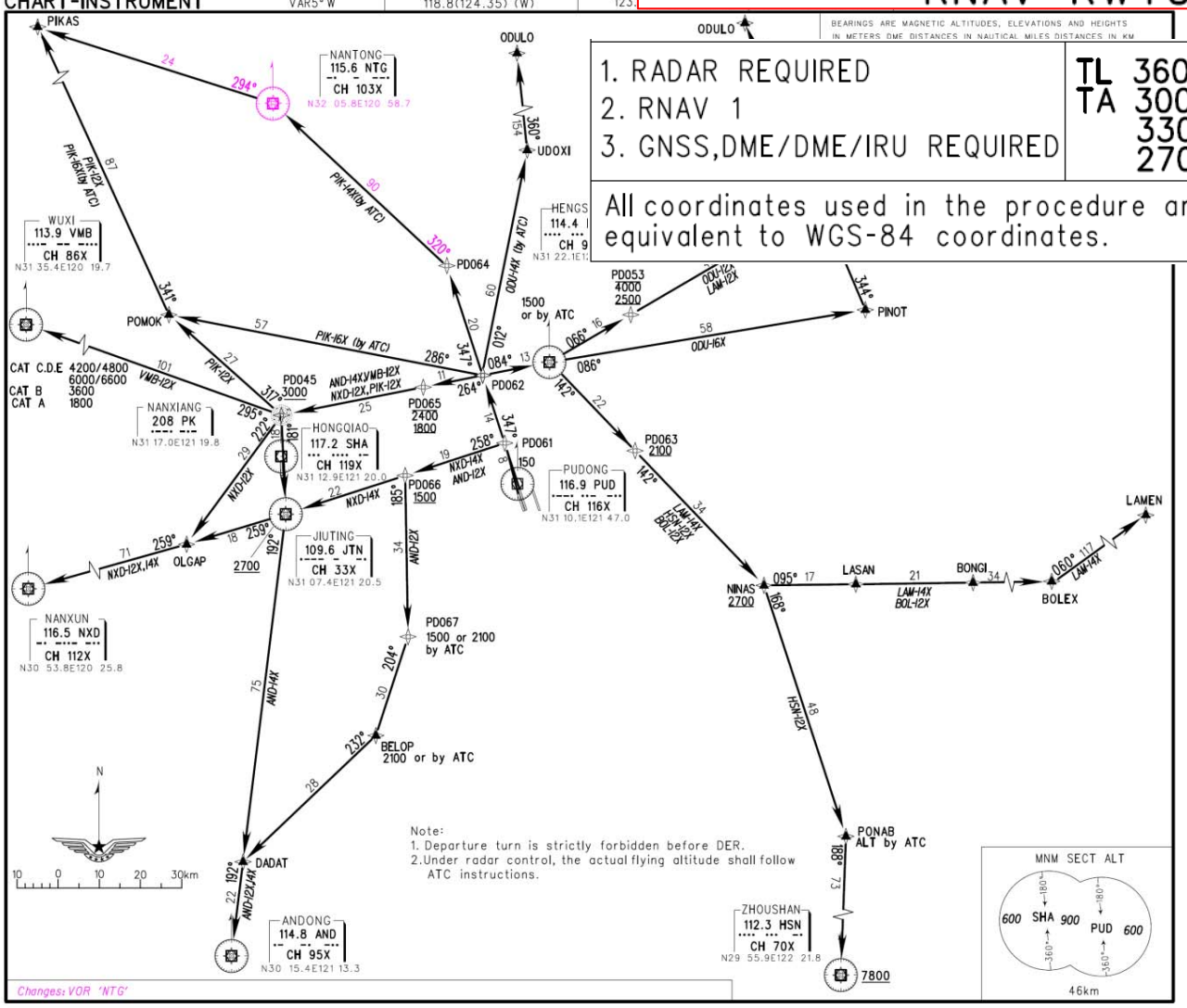
ZSPD SHANGHAI/Pudong
RNAV RWY35L/35R



ZSPD AD2.24-7K 中国民用航空局CAAC 2012-3-1

SHANGHAI PUDONG RNAV

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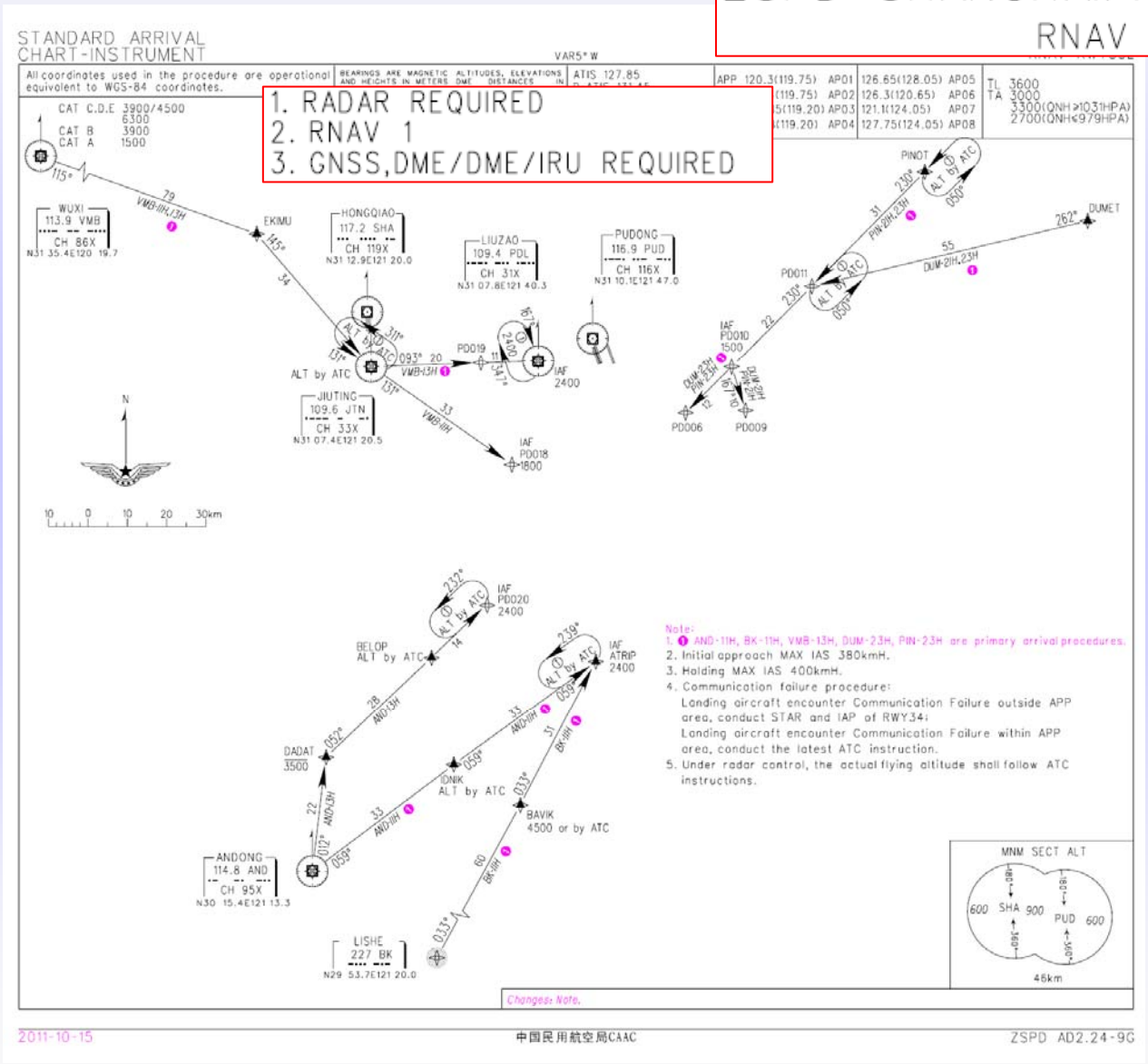
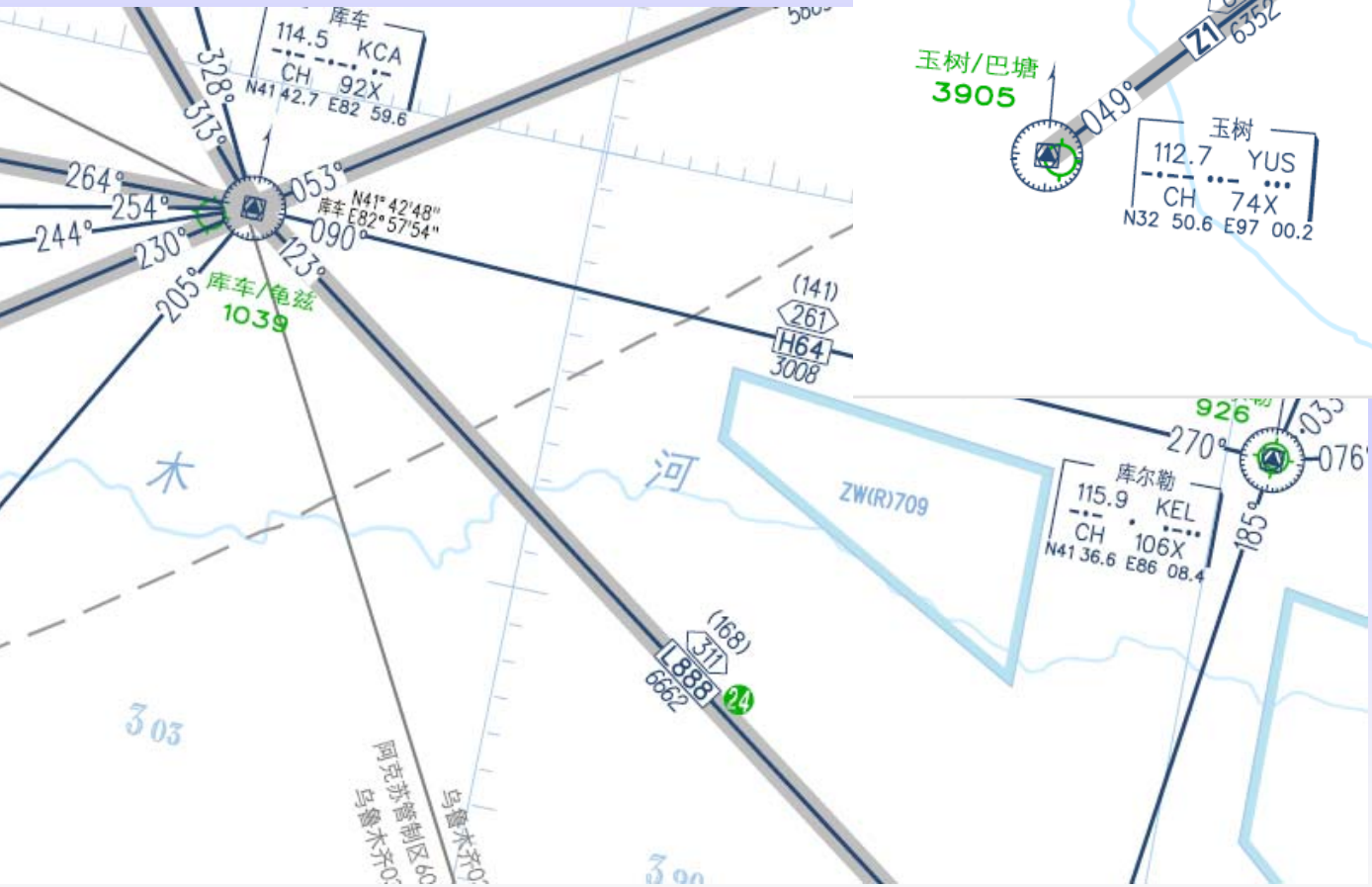
ZSPD SHANGHAI/Pudong
RNAV RWY35L



RNP4 L888 in Western China

L888，YUSHU to XININ（Z1), Z2, Z3, and Z4



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PBN Status of airports in China until the end of 2012

Navigation Specification / AREA	RNAV	RNP APCH	RNP AR
Northern China	Beijing, Tianjin, Shijiazhuang	Hailar, Ordos, Bayan Nur, Handan, Zhangjiakou	
Eastern China	Pudong, Hongjiao, Nanchang, Fuzhou, Jinan, Hangzhou	Huaian, Wenzhou, Xiamen, Nantong, Wuxi, Quanzhou, Linyi, Yangzhou	Huangshan, Wuyishan
Central and Southern China	Guangzhou, Shenzhen, Changsha, Wuhan, Zhengzhou, Nanning, Haikou, Zhuhai	Sanya, Luoyang, Nanyang, Meixiang, Jieyang, Shenzhen, Yichang	Zhangjiajie
Southwest China		Mianyang, Dazhou, Daocheng, Baoshan, Mangshi, Zhaotong, Tongren, Qianjiang	Lhasa, Nyingchi, Bangda, Jiuzhai, Lijiang, Ali, Rikaze, Kangding
Northwest China	Xi'an, Lanzhou	Golnud, Guyuan, Jinchang, Zhangye, Dunhuang, Xining, Yinchuan, Yulin, Jiayuguan, Zhongwei, Qingyang	Yushu
Northeast China	Dalian	Dalian, Yichun, Jiagedaqi, Anshan, Jinzhou, Mohe, Mudanjiang, Jiamusi	Yanji
Xingjiang	Urumqi	Yining, Bole, Tacheng, Karamay Tulufan, Altay, Kuqa	
Total (88)	21	54	13

CAAC

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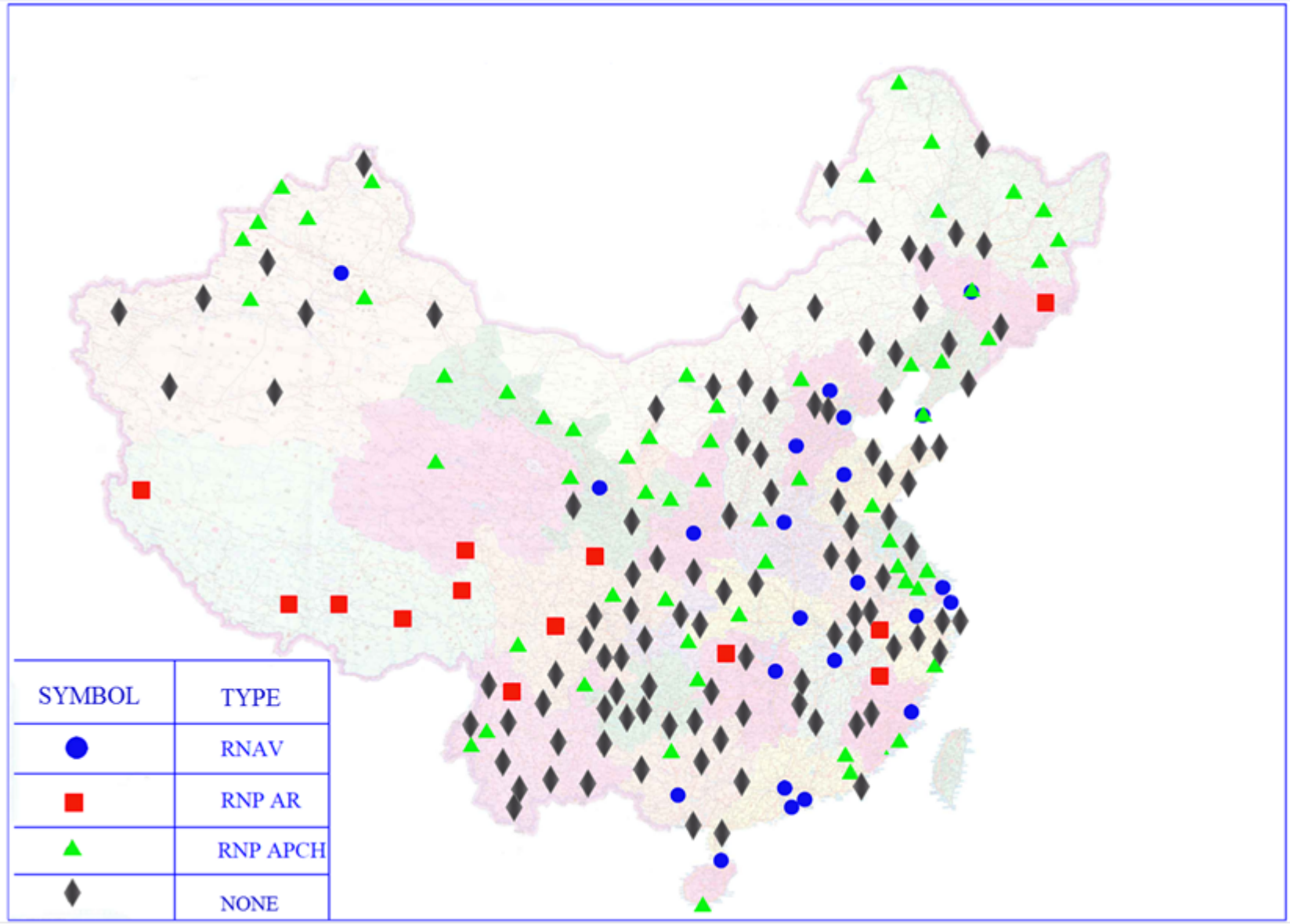

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Operational approval of airliners

Accelerating PBN supplementary operational approval for airlines is one of the important jobs.

Full set of ACs on PBN certification

Till first half of 2012,

- all of the 33 airlines have possessed RNAV operational approval;
- most of them have possessed RNP APCH operational approval;
- and part of them have possessed AR operational approval.

中国民用航空规章第 121 部/135 部运行规范　　CAAC 格式批准号

CCAR-121/135 OPERATIONS SPECIFICATIONS　　AC-121-001R1

C0061. 使用 RNP RNAV 系统实施 RNP RNAV SAAAR 第 I 类仪表进近

批准许可证持有人在被批准的机场和跑道使用所需导航精度区域导航（RNP RNAV）实施 RNP RNAV SAAAR 第 I 类仪表进近，并且在实施所有此类运行时遵从这些运行条款的规定。

a. 飞机和设备被授权用于 RNP 。当按照被批准的飞机飞行手册和次运行规范进行运行时，批准许可证持有人使用下列飞机和 RNP RNAV 系统实施终端区仪表进近满足 RNP 要求：

b. 限制规定和条款_

飞机型号 M/M/S	RNP RNAV 系统 M/M 和软件	批准的最低 RNP
注:目前仅批准 B2836 在拉萨实施		

(1) 开始进入最终进近航段前，飞行机组必须证实 RNAV 系统的实际导航性能(ANP)或推算位置误差(EPE)等于或小于运行指定的 RNP 。

(2) 在最后进近定位点之后，除非处于目视条件下，当出现 ANP 或 EPE 大于运行指定 RNP 的情况时，飞行机组必须执行复飞。

(3) 必须使用 AFM 中确定的适用于进近 RNP 水平的飞行指引系统模式。

c. 飞行机组每个成员都满意的完成了许可证持有人被批准的关于使用的设备和特殊程序的训练和批准程序，许可证持有人才能实施本规范批准的运行。

1. 由中国民用航空_____地区管理局颁发。

2. 本运行规范在中国民用航空局指导下批准。

主任运行监察员签名_____

3. 批准的生效日期_____年___月___日　修订号：_____

4. 合格证持有人接受本条运行规范。

合格证持有人代表签名_____职务_____日期_____年___月___日

C0061-1

_____ 航空公司　　运行合格证编号：_____

生效日期：　　年　月　日

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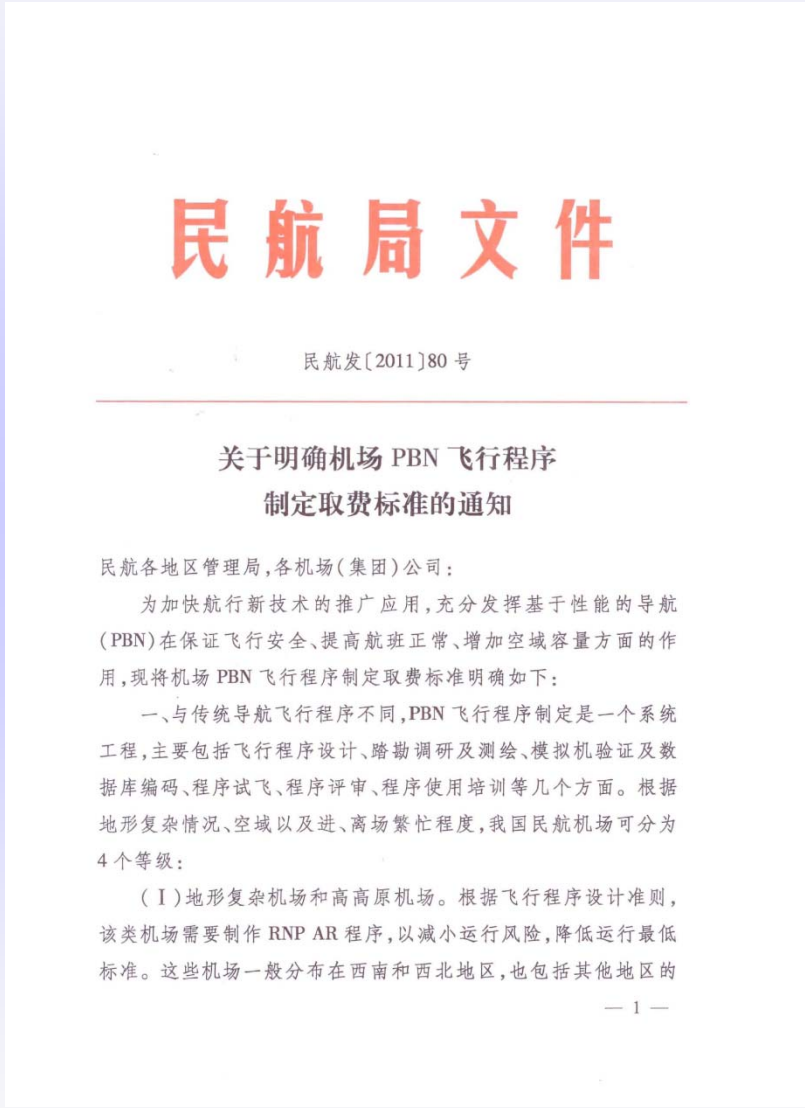
CAAC's Financial support for propelling PBN

CAAC has provided the airports in China the full-amount subsidy for the development of PBN procedure, in order to nationalize these procedures.



民航局文件

民航发〔2011〕80号

关于明确机场PBN飞行程序制定取费标准的通知

民航各地区管理局，各机场（集团）公司：

为加快航行新技术的推广应用，充分发挥基于性能的导航（PBN）在保证飞行安全、提高航班正常、增加空域容量方面的作用，现将机场PBN飞行程序制定取费标准明确如下：

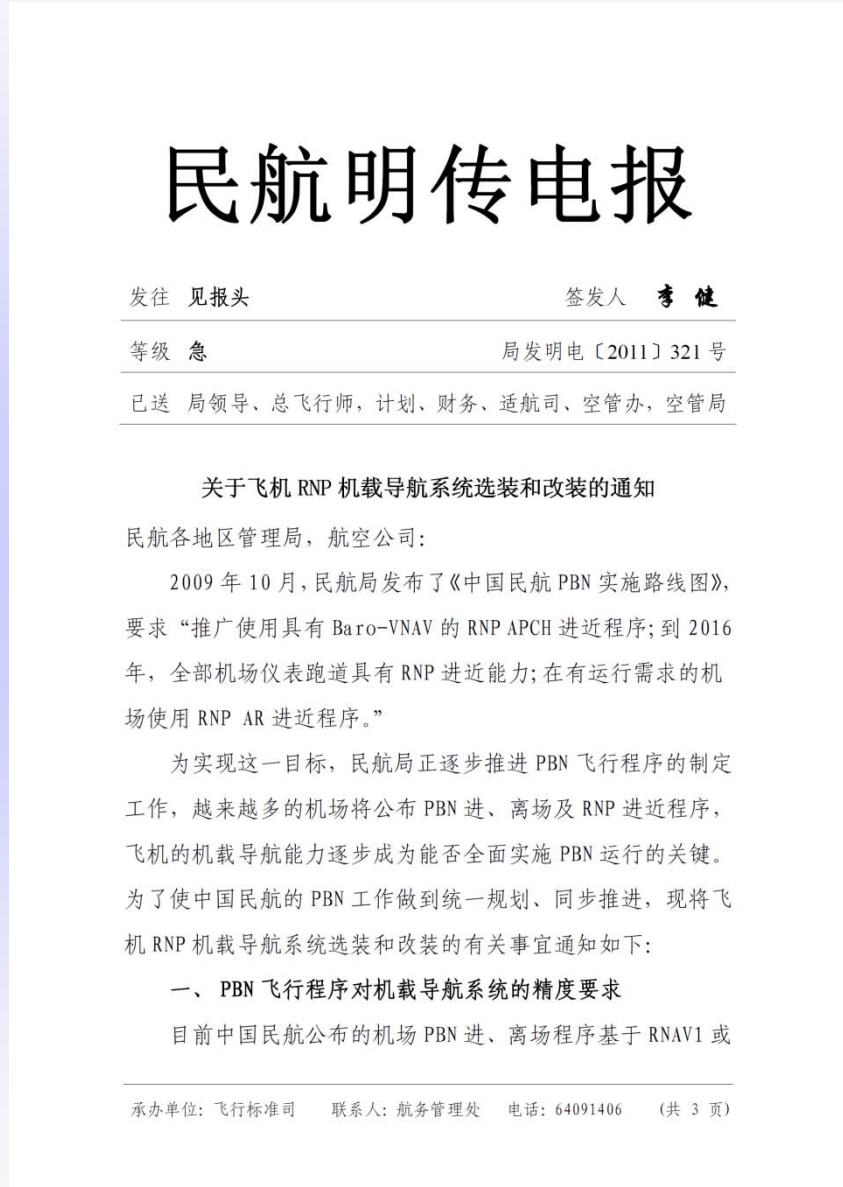
一、与传统导航飞行程序不同，PBN飞行程序制定是一个系统工程，主要包括飞行程序设计、踏勘调研及测绘、模拟机验证及数据库编码、程序试飞、程序评审、程序使用培训等几个方面。根据地形复杂情况、空域以及进、离场繁忙程度，我国民航机场可分为4个等级：

（Ⅰ）地形复杂机场和高高原机场。根据飞行程序设计准则，该类机场需要制作RNP AR程序，以减小运行风险，降低运行最低标准。这些机场一般分布在西南和西北地区，也包括其他地区的

— 1 —

CAAC's Financial support for propelling PBN

CAAC will formulate avionic standard for airplanes in service involving PBN upgrade, and provide comprehensive aids including financial support for Chinese aviation operators to achieve goals above.



民航明传电报

发往 见报头　　签发人 李 健

等级 急　　局发明电〔2011〕321号

已送 局领导、总飞行师，计划、财务、适航司、空管办，空管局

关于飞机 RNP 机载导航系统选装和改装的通知

民航各地区管理局，航空公司：

2009 年 10 月，民航局发布了《中国民航 PBN 实施路线图》，要求“推广使用具有 Baro-VNAV 的 RNP APCH 进近程序；到 2016 年，全部机场仪表跑道具有 RNP 进近能力；在有运行需求的机场使用 RNP AR 进近程序。”

为实现这一目标，民航局正逐步推进 PBN 飞行程序的制定工作，越来越多的机场将公布 PBN 进、离场及 RNP 进近程序，飞机的机载导航能力逐步成为能否全面实施 PBN 运行的关键。为了使中国民航的 PBN 工作做到统一规划、同步推进，现将飞机 RNP 机载导航系统选装和改装的有关事宜通知如下：

一、 PBN 飞行程序对机载导航系统的精度要求

目前中国民航公布的机场 PBN 进、离场程序基于 RNAV1 或

承办单位：飞行标准司　联系人：航务管理处　电话：64091406　(共 3 页)

CAAC

The Progress of PBN Application in China

- China Civil Aviation PBN Implementation Roadmap
- PBN Training in China
- The Airports with PBN flight procedures
- Operational approval of airlines
- CAAC's Financial support for propelling PBN
- Difficulties, Challenges and following plans

CAAC

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CAAC

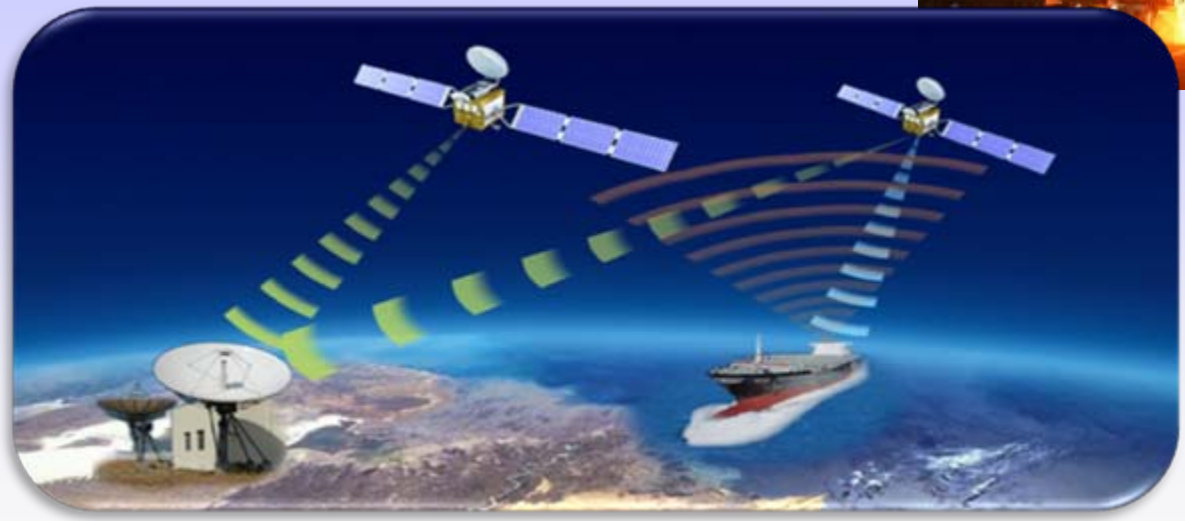
Difficulties, Challenges and following plans

- Complete operational approval for domestic airlines as soon as possible.
- Propel the implementation of foreign airlines in China.
- Improve implementation rate of procedures and implement them comprehensively and mandatorily step by step.
- Strength the training for controllers.
- Boost the airspace coordination work.
- Complete the specification and management of navigation database.

CAAC

GNSS - BEIDOU

China launched a project to develop an independent satellite navigation positioning system in 1983, and began development of the BeiDou-G1 dual-satellite navigation system in 1994. In April 2004, BeiDou-G1 was completed and began to provide services for civil users.



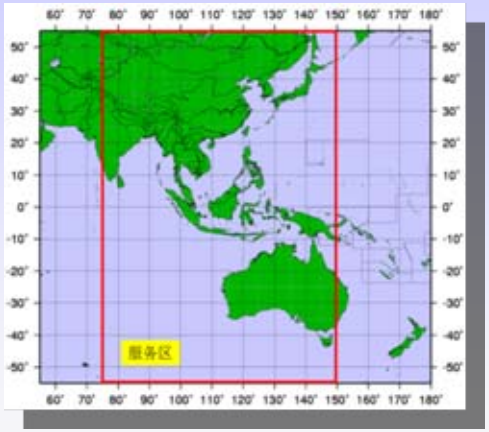
CAAC

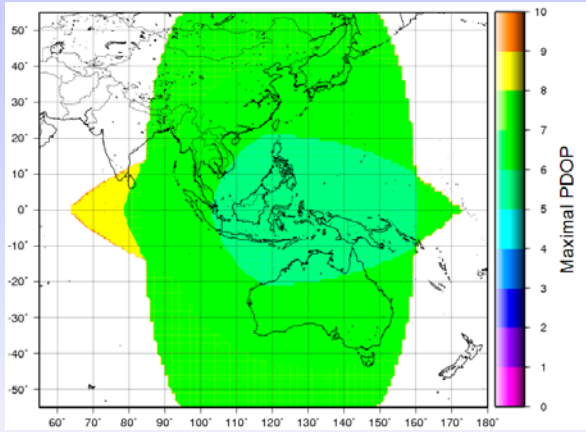
BEIDOU

On December 27, 2011, BeiDou Navigation Satellite System formally started to provide IOC.

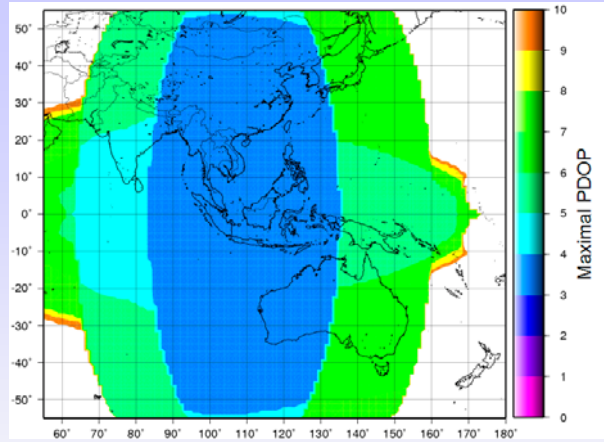
Since IOC, the system has performed stably. The space constellation performance has been improved apparently, and the user experience for the PNT service performance has been enhanced significantly

阶段	北斗导航试验卫星				北斗导航卫星												
序号	01	02	03	04	01	02	03	04	05	06	07	08	09	10	11	12	13
类型	GEO	GEO	GEO	GEO	MEO	GEO	GEO	GEO	IGSO	GEO	IGSO	IGSO	IGSO	IGSO	GEO	MEO	MEO
日期	2000.10.13	2000.12.21	2003.5.25	2007.2.3	2007.4.14	2009.4.15	2010.1.17	2010.6.2	2010.8.1	2010.11.1	2010.12.18	2011.4.10	2011.7.27	2011.12.2	2012.2.25	2012.4.30	2012.4.30
状态	离轨	离轨	正常工作	在轨维护	在轨试验	在轨维护	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作	正常工作





“3GEO+3IGSO”星座覆盖PDOP



“4GEO+5IGSO+2MEO”星座覆盖PDOP

CAAC

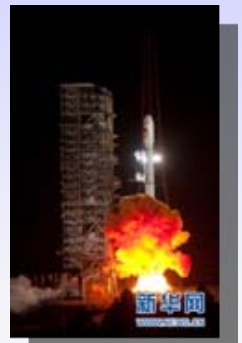
BEIDOU

- Beidou is the GNSS developed by China alone;
- According to the construction plan of Beidou and the publicated ICD, the performance has achieved the related GNSS requirements in ICAO annex 10;
- Now CAAC is testing Beidou's navigation performance and working on a plan to introduce Beidou into the civil aviation.

2011.4.10 | 2011.7.27 | 2011.12.2 | 2012.2.25 | 2012.4.30 | 2012.9.19





Office: 86-10-64091415 Mobile: 86-13910736500

Email: hh_yang@caac.gov.cn