中国飞行校验
CHINA FLIGHT INSPECTION

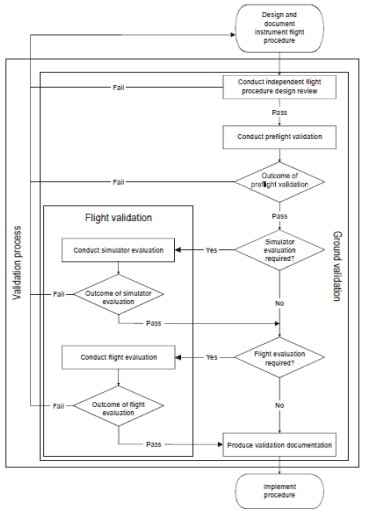
FLIGHT VALIDATION SYSTEM USED IN CHINA

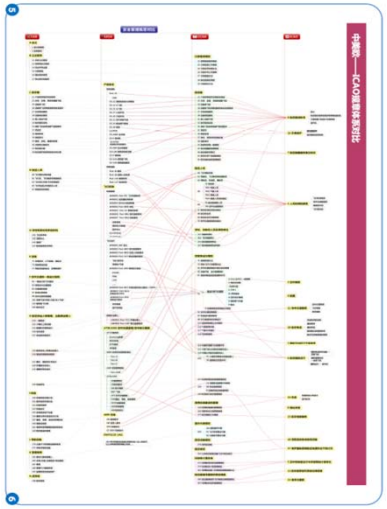
2020.10.28

SU WEI

Reference Regulations

- ICAO Doc.9906 Flight Procedures Quality Assurance Manual
- FAA Order 8200.1D Flight Inspection Manual
- CAAC (AC-97-FS-2012-02)《REGULATION OF FLIGHT VALIDATION FOR CIVIL AIRPORT IN CHINA》
- 《 REGULATION OF FLIGHT INSPECTION FOR FLIGHT PROCEDURE》(ACCORDING TO Doc.9906/8071/8200)





ICAO

- ICAO DOC 9906, Volume 5, about Verification of Instrument Flight Procedures: “The purpose of validation is to obtain a quality assessment of the Procedure design, and the Flyability and safety of obstacles, terrain and navigation data ” .

FAA

- FAA, Flight Inspection Manual 8200.1D. Chapter 6 specifies the contents of the flight procedure validation , The FAA provides a more detailed description and requirements for the validation of the entire instrument flight procedure, preparations prior to flight verification, implementation procedures, reference checklists, detailed explanations, process and results analysis, allowable tolerances, and also in 8200.1D. Chapter 3, The periodicity of the flight procedure validation is specified .

CAAC

- "Civil Airport Flight Procedures and Operational Minimum Standards Management Regulations" The Ministry of Transport of the People's Republic of China has issued Decree No. 75 of 2016 on January 1, 2017. The relevant provisions of the regulations have clearly defined the flight procedure validation .
- The lasted news is planning to combine A+B

  A (AC-97-FS-2012-02)《Regulation Of Flight Test For Civil Airport In CHINA》

  B《 Regulation Of Flight Inspection For Flight Procedure》(According To Doc.9906/8071/8200)

CAAC

- The lasted news is planning to combine A+B
  - A《Regulation Of Flight Test For Civil Airport In CHINA》
  - B《 Regulation Of Flight Inspection For Flight Procedure》
- 1.**Initial** validation + **periodic** inspection
- 2. Initial validation :
- **Ground** validation + **simulator** validation + **real** validation
- Done by **flight inspection organization** or **airlines**
- 3. periodic inspection(less than 5 years)
- **real** validation
- Done by **flight inspection organization**

CAAC

- The lasted news is planning to combine A+B
  - A《Regulation Of Flight Test For Civil Airport In CHINA》
  - B《 Regulation Of Flight Inspection For Flight Procedure》
- 4.Use **same real validation standard** in **Initial** validation or **periodic** inspection
- **Safety** (**Obstacles and terrain**, 9 important requirements)
- **Data** (**navigation/database of procedure** ,3 important requirements)
- **Fly ability** (**achieve target of FP**,13 important requirements)
- **Human factor** (**normal pilots can perform FP**, 5 important requirements)

CAAC

- The lasted news is planning to combine A+B
  - A《Regulation Of Flight Test For Civil Airport In CHINA》
  - B《 Regulation Of Flight Inspection For Flight Procedure》
- 5. **Same requirement to flight validation pilot** (Flight inspection pilot or Airlines pilot)
- **Initial** training and **periodic** training
- 6. **Same report form** to fill
- 22 important requirements in the real validation (same for both **Initial** and **periodic** validation)
- **Cover all** requirements of ICAO Doc 9906

FLIGHT VALIDATION BY CFI

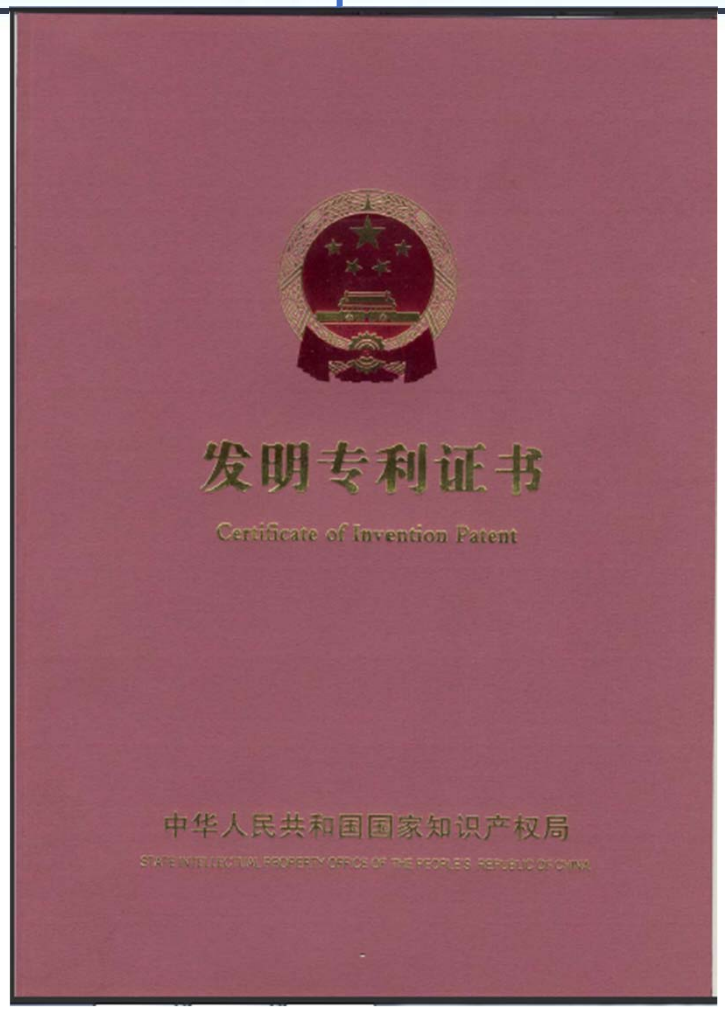
No.	AIRPORT	TIME	
1	ZBUL	2014/10/12	PBN
2	ZYHE	2014/11/24	PBN
3	ZYBS	2014/10/28	PBN
4	ZBCZ	2014/12/15	PBN
5	ZBDT	2014/12/16	PBN
6	ZYMH	2015/2/6	LOW TEP PBN
7	ULAANBAATAR	2015/3/18	PBN
8	KHUVSGUL MUREN	2015/3/19	PBN
9	ZBHH	2015/5/6	PBN
10	ZGSY	2015/6/4	PBN UPDATE
11	ZBBD	2015/6/30	PBN
12	ZYCY	2015/8/26	PBN
13	ZYYJ	2015/9/17	PBN
14	ZBCB	2015/11	PBN
15	ZBXL	2015/11	PBN
16	ZUZH	2015/12	PBN
17	ZUTC	2015/12	PBN
18	ZBER	2016/3	PBN
19	ZBHL	2017/1	PBN

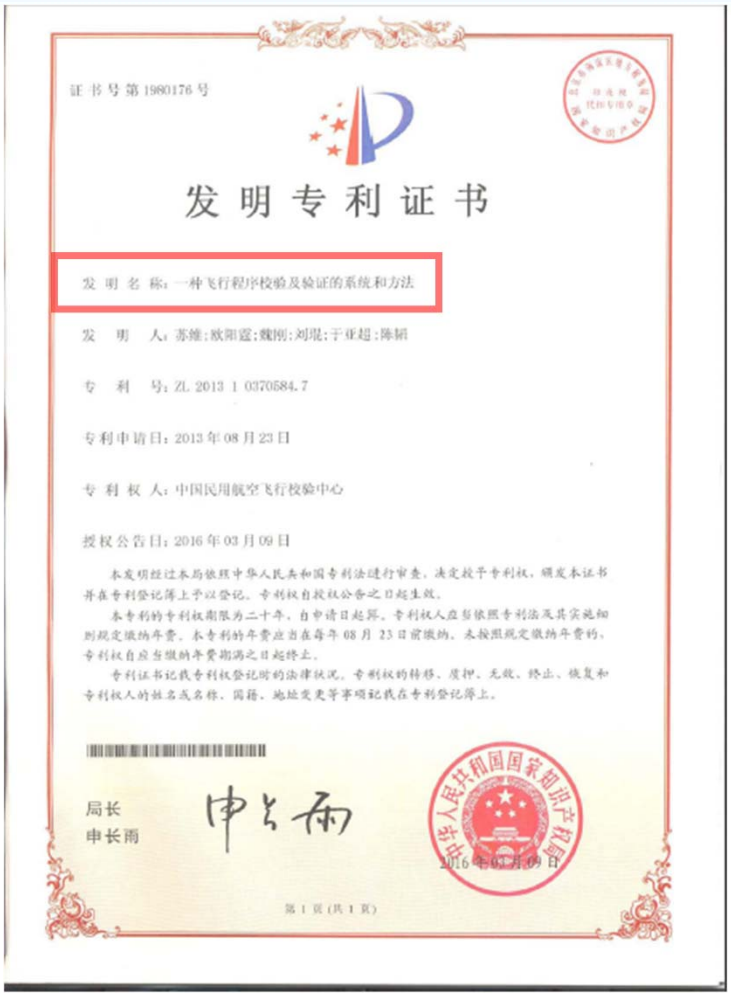
Mainly job

- environment around the airport
- lighting system
- Flight procedures
- Flight procedure validation system

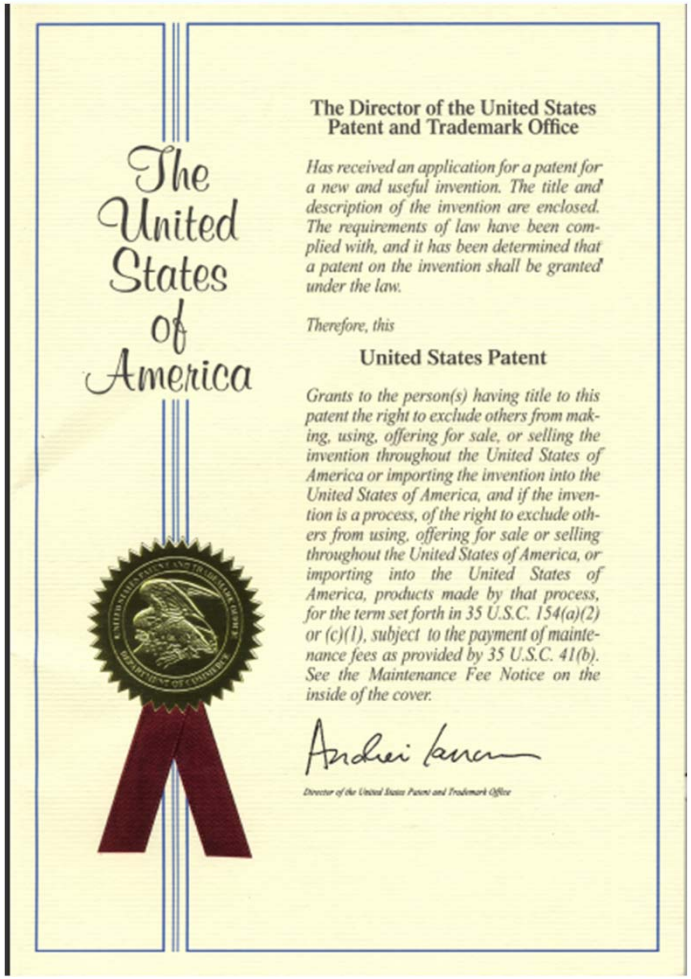


Chinese patent





US patent



The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

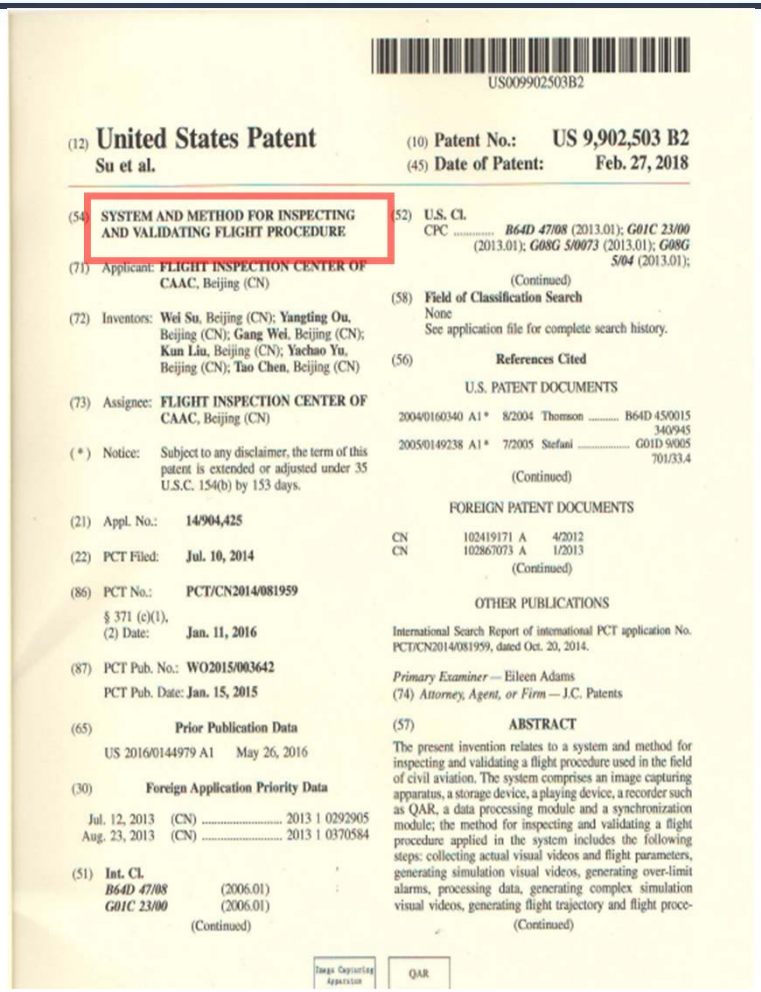
Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Andrei Iancu

Director of the United States Patent and Trademark Office



US009902503B2

(12) **United States Patent**
Su et al.

(10) **Patent No.: US 9,902,503 B2**
(45) **Date of Patent: Feb. 27, 2018**

(54) **SYSTEM AND METHOD FOR INSPECTING AND VALIDATING FLIGHT PROCEDURE**

(71) Applicant: **FLIGHT INSPECTION CENTER OF CAAC**, Beijing (CN)

(72) Inventors: **Wei Su**, Beijing (CN); **Yangting Ou**, Beijing (CN); **Gang Wei**, Beijing (CN); **Kun Liu**, Beijing (CN); **Yachao Yu**, Beijing (CN); **Tao Chen**, Beijing (CN)

(73) Assignee: **FLIGHT INSPECTION CENTER OF CAAC**, Beijing (CN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 153 days.

(21) Appl. No.: **14/904,425**

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(86) PCT No.: **PCT/CN2014/081959**
§ 371 (c)(1),
(2) Date: **Jan. 11, 2016**

(87) PCT Pub. No.: **WO2015/003642**
PCT Pub. Date: **Jan. 15, 2015**

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(30) **Foreign Application Priority Data**

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Aug. 23, 2013 (CN) 2013 1 0370584

(51) **Int. Cl.**
B64D 47/08 (2006.01)
G01C 23/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B64D 47/08*** (2013.01); ***G01C 23/00*** (2013.01); ***G08G 5/0073*** (2013.01); ***G08G 5/04*** (2013.01);
(Continued)

(58) **Field of Classification Search**
None
See application file for complete search history.

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Primary Examiner — Eileen Adams
(74) *Attorney, Agent, or Firm* — J.C. Patents

(57) **ABSTRACT**

The present invention relates to a system and method for inspecting and validating a flight procedure used in the field of civil aviation. The system comprises an image capturing apparatus, a storage device, a playing device, a recorder such as QAR, a data processing module and a synchronization module; the method for inspecting and validating a flight procedure applied in the system includes the following steps: collecting actual visual videos and flight parameters, generating simulation visual videos, generating over-limit alarms, processing data, generating complex simulation visual videos, generating flight trajectory and flight proce-
(Continued)

Image Capturing Apparatus

QAR

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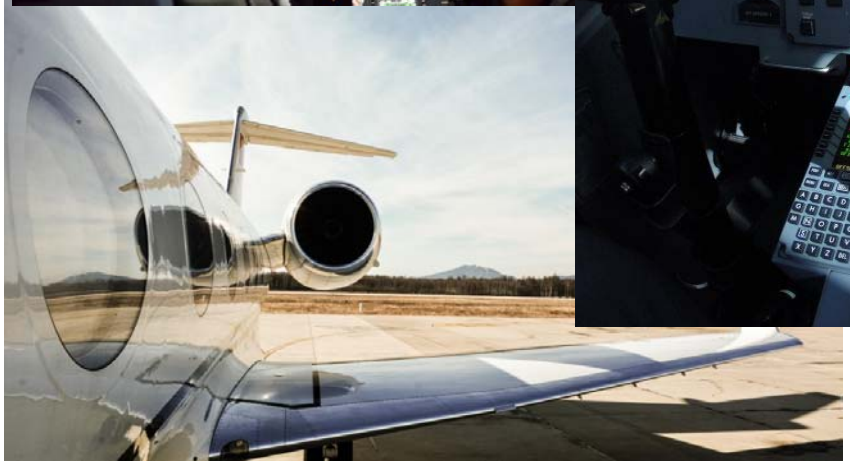
CHINA FLIGHT INSPECTION

FLIGHT VALIDATION SYSTEM



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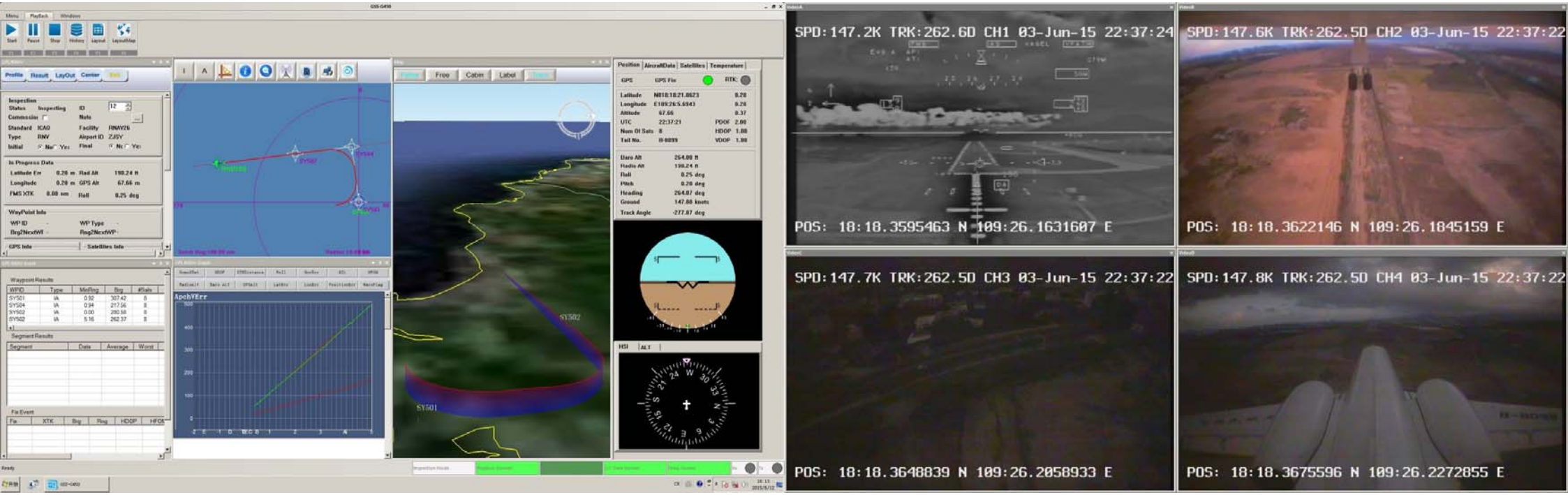

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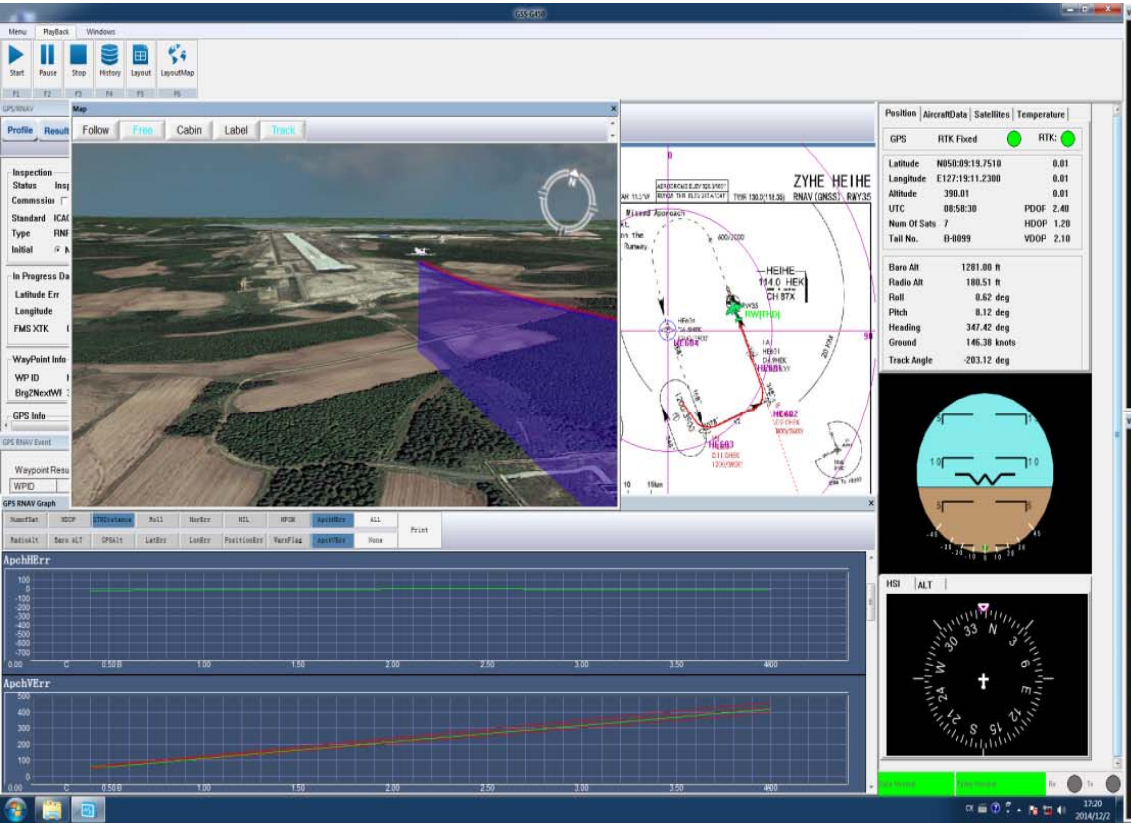
CHINA FLIGHT INSPECTION

FLIGHT PROCEDURE VALIDATION SYSTEM



中国飞行校验 CHINA FLIGHT INSPECTION

THE MISTAKES OF DATABASE/SIMULATOR/FLIGHT VALIDATION

COORDINATE	SURVY, NOT ACCURATE （FAF MAPT .xxS）	5AIRPORTS
	WRONG SYSTEM （ 54 VS 84）	2AIRPORTS
VOR/DME INFORMATION	NOT SUPPLY / WRONG DATA（FOR CF CODE）	9AIRPORTS
ILS INFORMATION	NOT SUPPLY （RNP1 ILS）	4AIRPORTS
	WRONG DATA（LOC、GP、DME，.xxS）	3AIRPORTS
AIRPORT/RW INFORMATION	NOT SUPPLY （BUILD AIRPORT DATABASE，COORDINATE、MAG VAR、ELEVATION、LENGTH、WIDTH\、COORDINATE OF TRHs）	2AIRPORTS
	WRONG DATA（RW TRUE HEADING 1 DGREE DIFFERENCE）	2AIRPORTS
RNP1 ILS	NOT SUPPLY	5AIRPORTS
PROCEDURE ALTITUDE	WRONG DATA（METER TRANSFOR TO FEET）	3AIRPORTS
	CHART NOT MATCH CODING LIST	2AIRPORTS
TURN DIRECTION	WRONG DATA（CODING LIST）	3AIRPORTS
FLYOVER OR FLYBY	CHART NOT MATCH CODING LIST	2AIRPORTS
SPEED LIMITATION	CHART NOT MATCH CODING LIST	4AIRPORTS
NAME OF WP	WRONG DATA	3AIRPORTS
NAV AIDS INFORMATION	TRACK ANGLE DIFFERENCE MORE THAN 1 DEGREE	2AIRPORTS
FAF\IF\SDF COORDINATE	CACULATE BY COORDINATE OF TRH、TRUE HEADING、DISTANCE，NOT ACCURATE	3AIRPORTS
	0.1-0.5 DEGREE DIFFERENCE，FINAL APP WILL NOT ALGIN RW	
ASSIGN ALTITUDE TURN	LOW THAN 300M WILL LEAD TO CAN NOT BACK TO WP/NAV AIDS	2AIRPORTS
TEP LIMITATION	NOT ASSIGN	4AIRPORTS
PAPI INDICATION	AIR CREW CONFUSE	2AIRPORTS

3.2.5 In order to adequately validate instrument procedures, FVPs should possess the following basic underpinning knowledge of:

— Standards, procedures and guidance pertinent to aeronautical information services (i.e. Annex 15);

— Standards, procedures and guidance pertinent to flight inspection (i.e. Annex 10, Doc 8071);

— Standards, procedures and guidance pertinent to aerodromes (i.e. Annex 14; the *Airport Services Manual* (Doc 9137) and the *Aerodrome Design Manual* (Doc 9157);

— Standards, procedures and guidance pertinent to charting and aviation publications (i.e. Annex 4 and the *Aeronautical Chart Manual* (Doc 8697)) and;

an understanding of:

— performance-based navigation (PBN) and conventional instrument procedure construction such as standard instrument departures/standard instrument arrivals (SIDs/STARs) and holding/reversal procedures, (i.e. PANS-OPS, Doc 8168);

— the PBN concept (i.e. the *Performance-based Navigation (PBN) Manual* (Doc 9613));

— the basic concept of and differences between flight validation and flight inspection;

— ARINC 424 coding;

— Human Factors (i.e. the *Human Factors Training Manual* (Doc 9683));

— different types of aircraft operations (such as air ambulance, arctic flying versus domestic airlines) and aircraft performance (i.e. limitations and equipment);

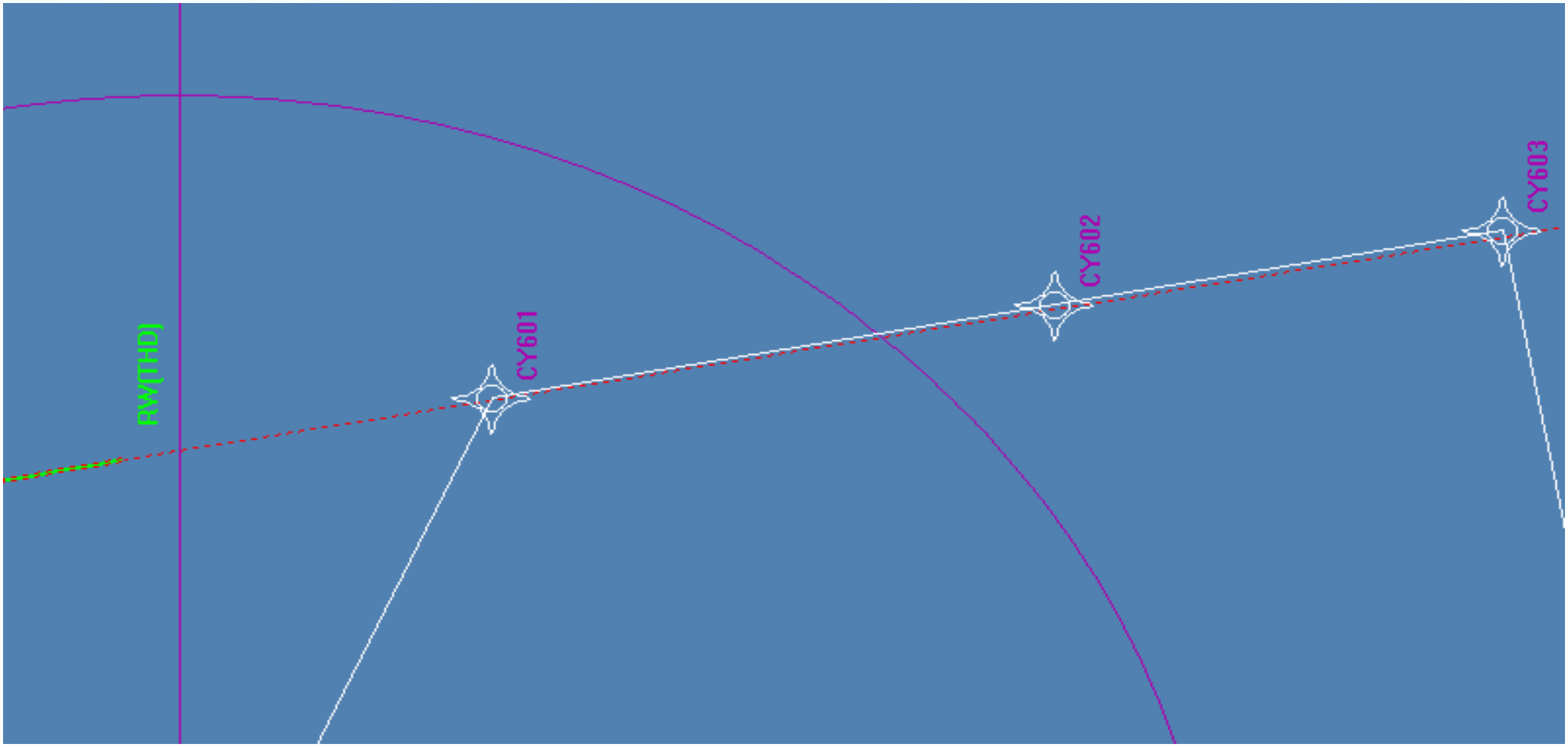
— obstacle assessment methodology;

— safety assessment process;

— geodesy (i.e. Doc 9906, Volume 2, 3.3.3.8); and

— a comprehensive understanding of Doc 9906, Volume 5.

FLIGHT VALIDATION SYSTEM



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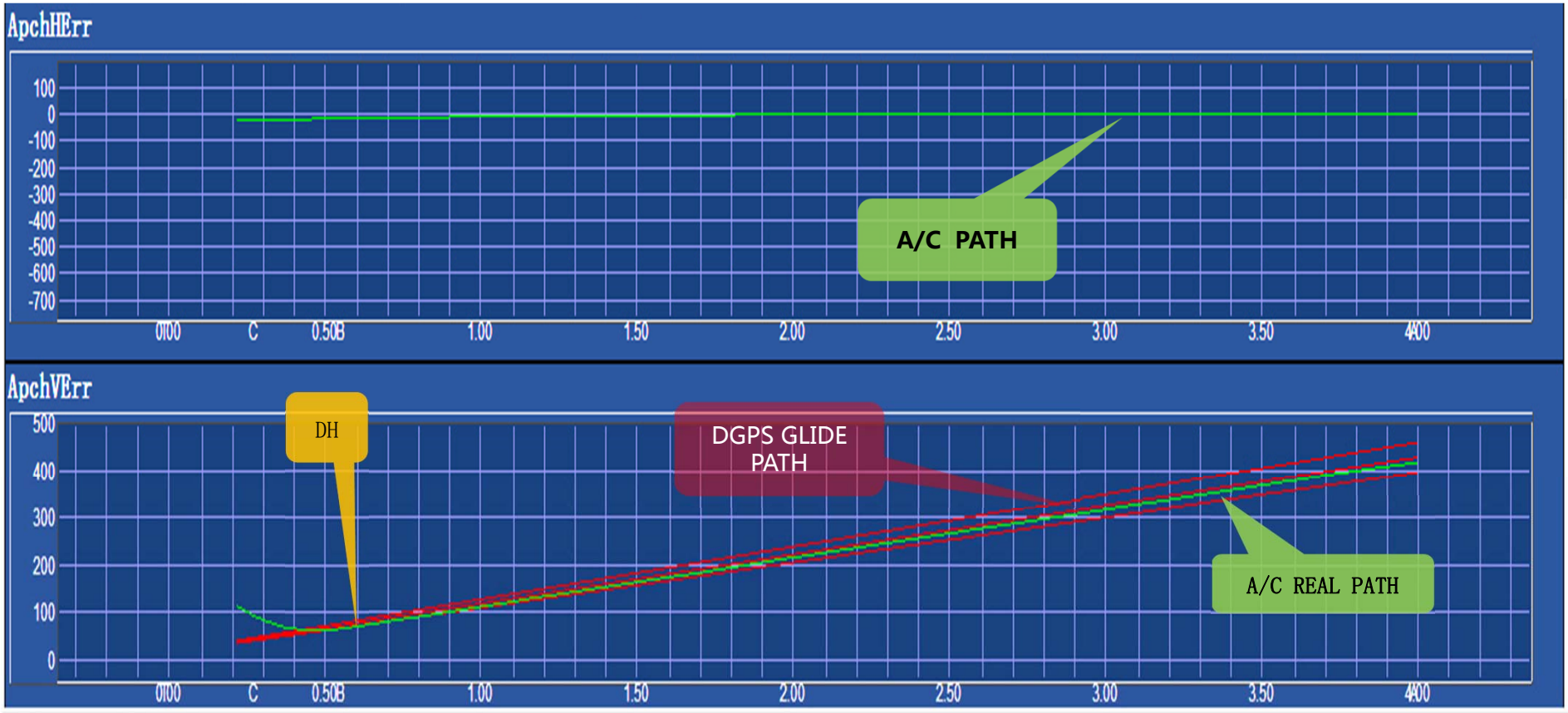

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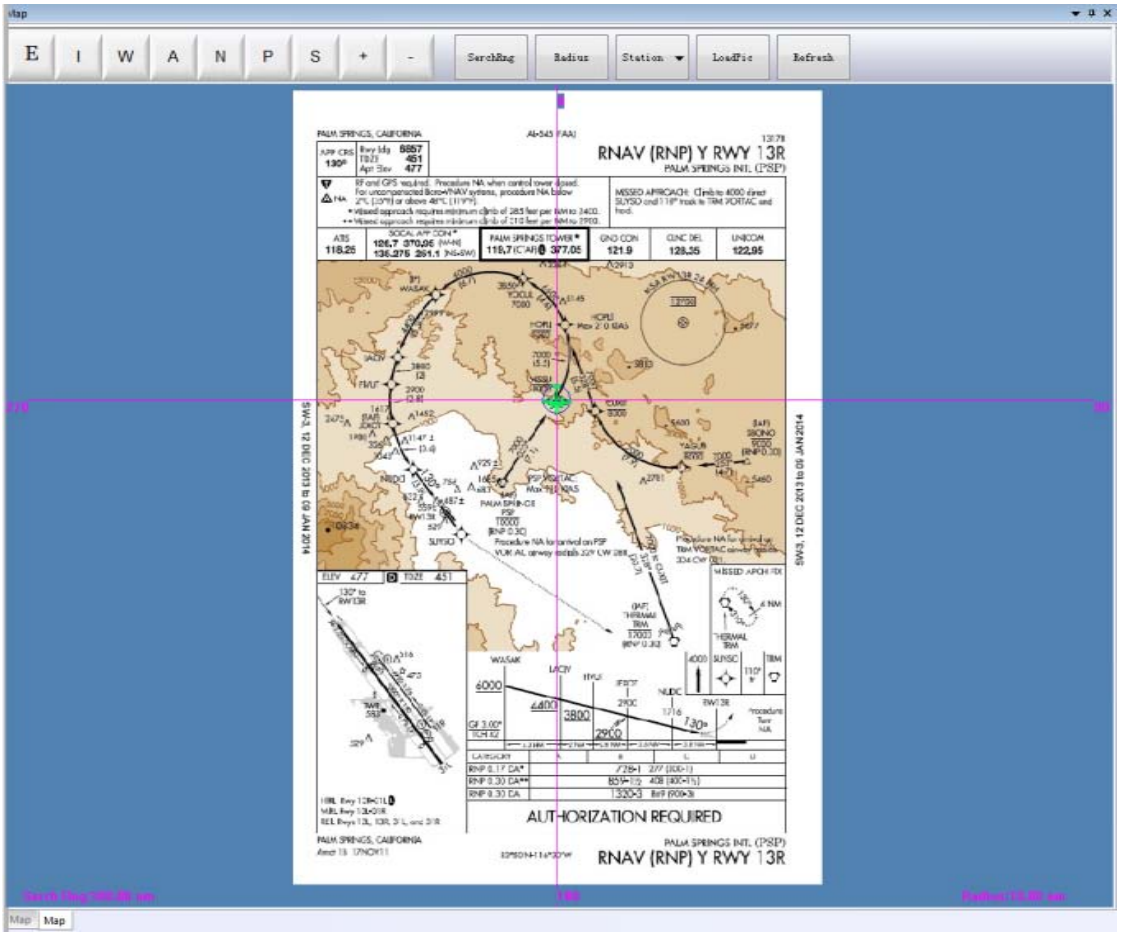

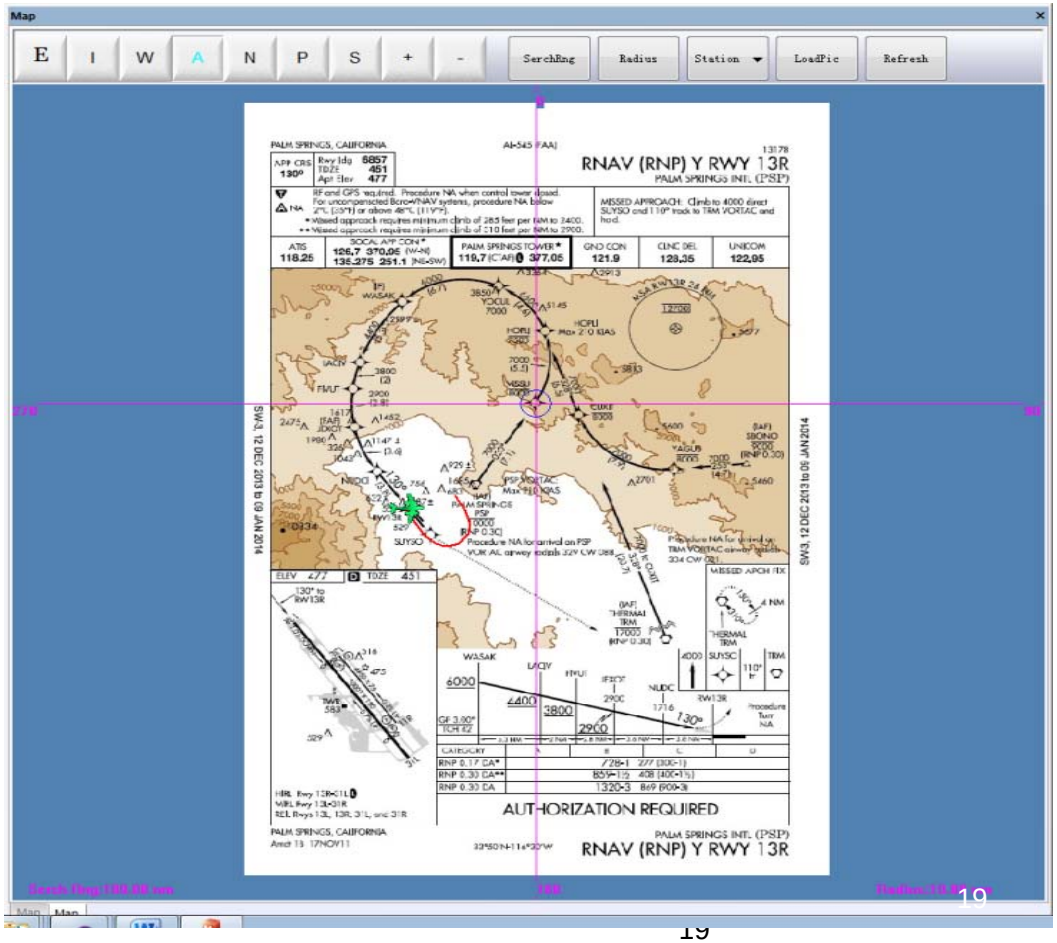

FLIGHT VALIDATION SYSTEM

FLIGHT VALIDATION SYSTEM

飞行验证





飞行验证的准备阶段 – 验证平台

- 塞斯纳560XLS PLUS + CFIS II型飞行校验系统
  - CFIS II校验系统使用了与主流大型运输飞机一致的GLU 925型多模接收机（柯林斯），并将该信号导入前舱，显示在前舱备用仪表上GH-3900（L3）
  - CFIS II型飞行校验系统还可使用实时差分信号，生成高精度轨迹，可作为飞行后数据分析的有力依据。
  - 差分接收机型号为：诺瓦泰PwrPak7，水平定位精度为1cm+1ppm，垂直定位精度为1.5cm +1.5ppm

FLIGHT VALIDATION SYSTEM

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国际民航组织 • ايكاو

video for PBN procedure validation

Thank You ！