ADS-B SYSTEM IN CAFUC

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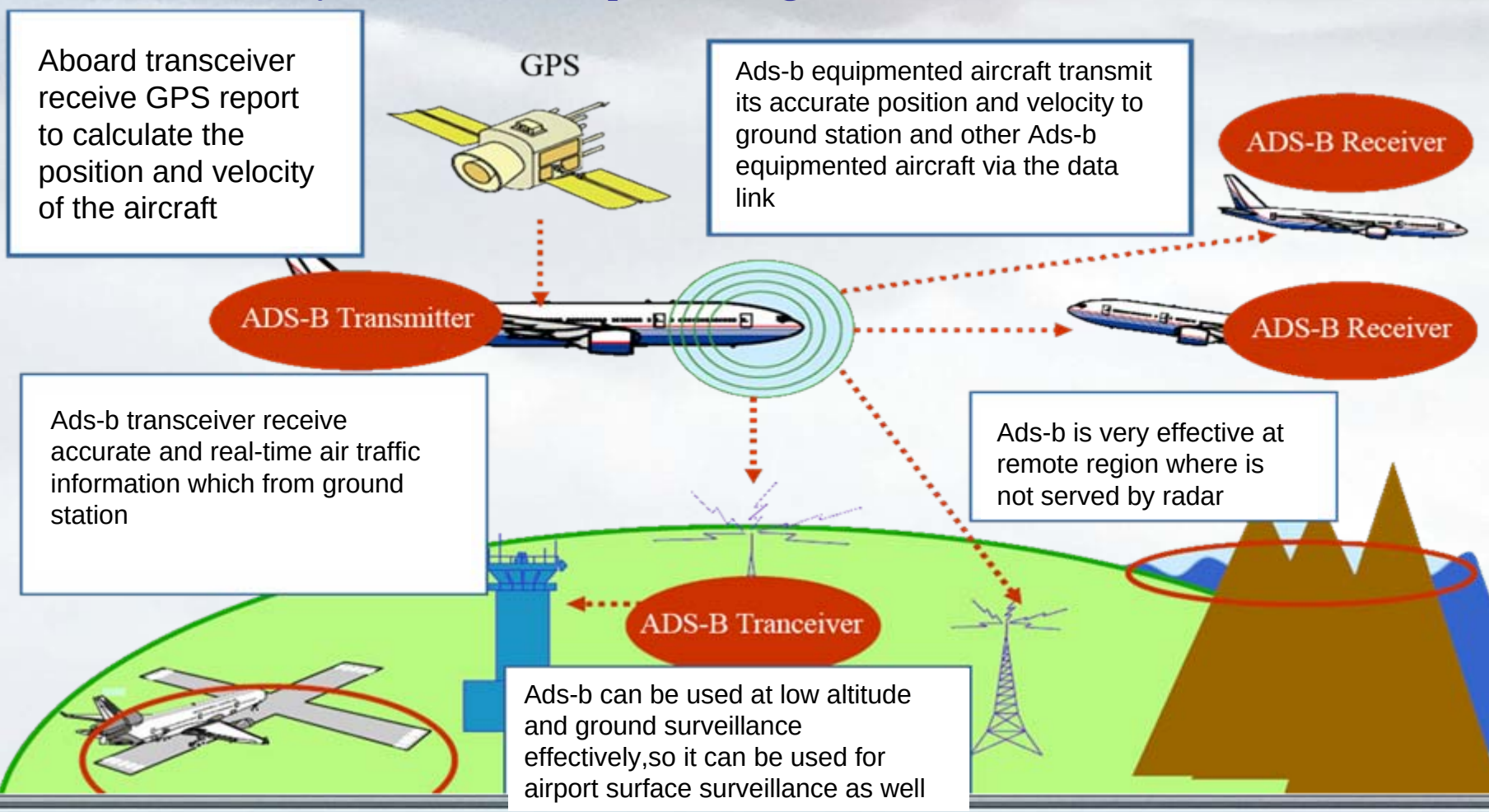
The principle and the composing components of ADS-B

- ADS-B system
- a. Automated Dependent Surveillance – Broadcast (ADS-B) makes use of the technique of GPS location and data link to surveil and command the target in air or on ground, so it can realize the functions of Secondary Surveillance Radar (SSR),TCAS,GPWS.
- b. Presently, there are three modes ADS-B, including: the Universal Access Transceiver (UAT),1090MH S mode Extending message(1090ES),mode 4 VHF data link(VDL-4).

The principle and the composing components of ADS-B

- ADS-B System Principle Diagram



The application of ADS-B technique

a. ADS-B is used to support air traffic services, and it can supply dummy radar service better than radar interval standard for vehicle in areas without radar coverage.

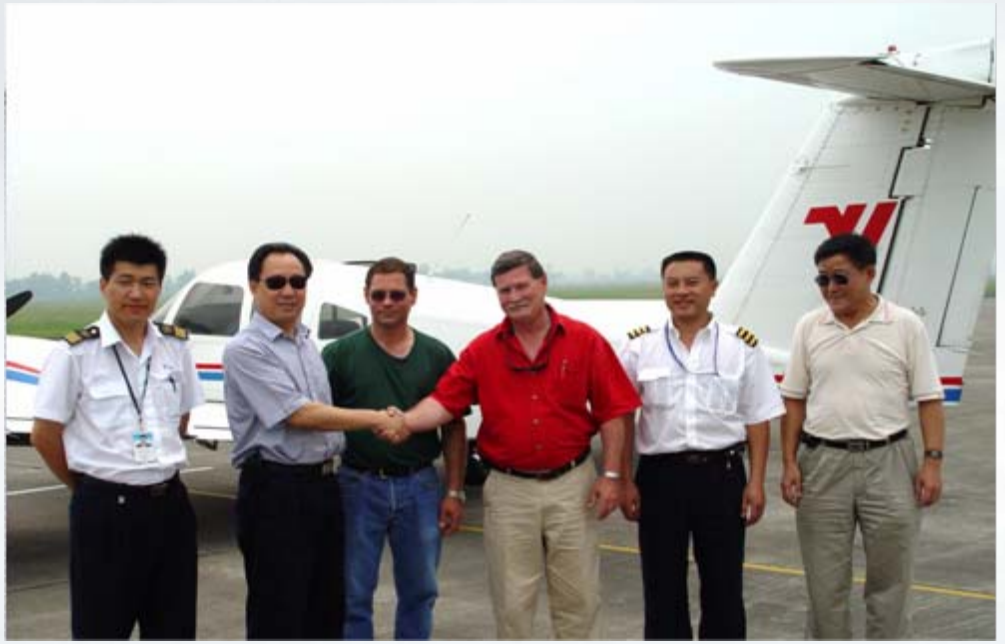
b. Even though, in areas with radar coverage, ADS-B can enhance the surveillance ability and the terminal capability without increasing radar device in a very low cost.

c. ADS-B can supply kinds of message service for operating aircraft by using uplink data broadcasting.

d. Some applications of ADS-B are focused on airport surface operations， so it can realize aircraft’s surface surveillance by low cost.

The investment and development of ADS-B in CAFUC

In July and November 2005, the application of ADS-B was validated in CAFUC Guanghan airport by installing ADS-B on two Seminole aircrafts.



The investment and development of ADS-B in CAFUC

Since 2006, the project of the constructing and installing ADS-B has been developed in CAFUC.To this day, the accomplished project has including:

a. Airborne ADS-B equipments have been installed on 193 airplanes ,including 8 type aircrafts.

b. 6 Ground-Based Stations have been built in Xinjin, Guanghan, Luoyang, Mianyang, Suining and Nanchong.

c. 2 network data collection servers and a data validation server were installed in Guanghan airport, which can surveil all the flight training course in Sichuan province without blind spot.

d. Since 110 surveillance clients were installed, besides tower,ATC leaders on duty both in CAFUC and the sub-colleges, together with traffic control department, maintenance department and safety supervising department can learn the flight situation about CAFUC.

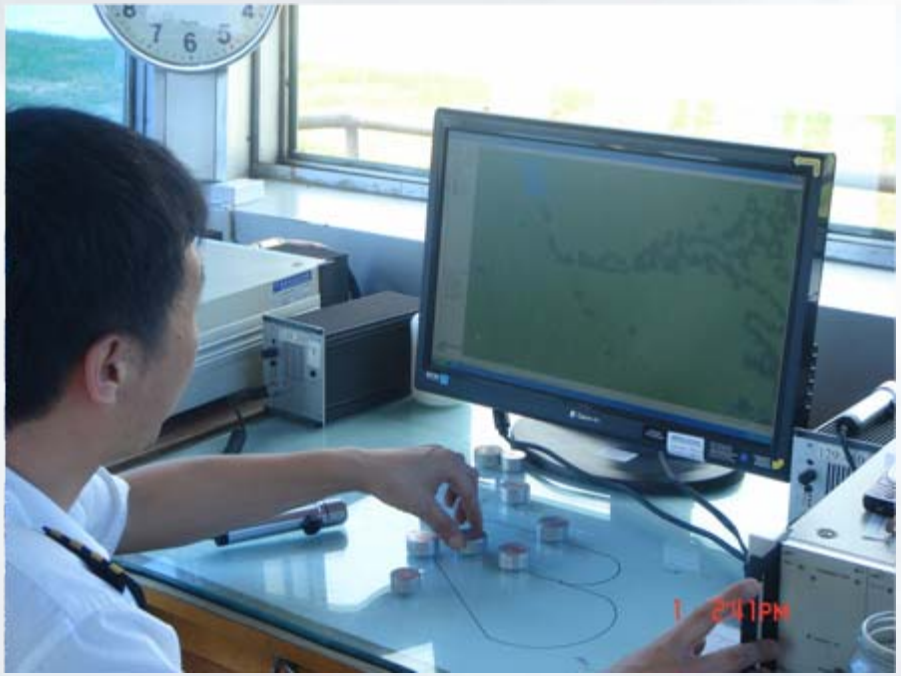
The investment and development of ADS-B in CAFUC

Airborne ADS-B equipments have been installed on 193 airplanes ,including 8 type aircrafts in four sub-college(Hawk 500).

The investment and development of ADS-B in CAFUC

6 Ground-Based Stations have been built in Xinjin, Guanghan, Luoyang, Mianyang, Suining and Nanchong. In order to surveil the ADS-B network'operation, two network data collection servers and a data validation server were installed in Guanghan airport.

About 110 surveillance clients were installed in CAFUC.

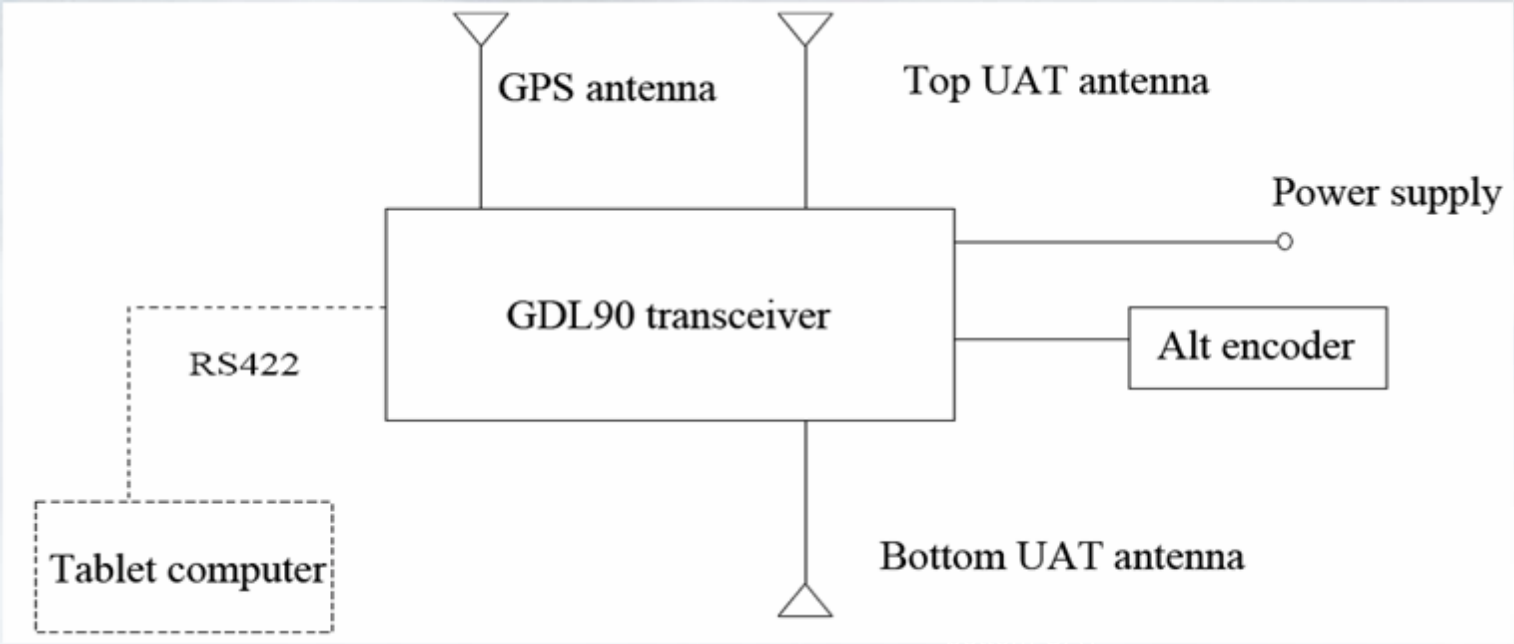


The layout and the operation of ADS-B in CAFUC

a. Airborne proportion
b. Ground-base station
c. Airborne and ground display proportion

The layout and the operation of ADS-B in CAFUC

a. airborne proportion



The Cross-link diagram of airborne device

The layout and the operation of ADS-B in CAFUC

GDL90 transceiver

Flat-panel display computer

GPS receiver

Altitude Encoder

Top/Bottom UAT antenna

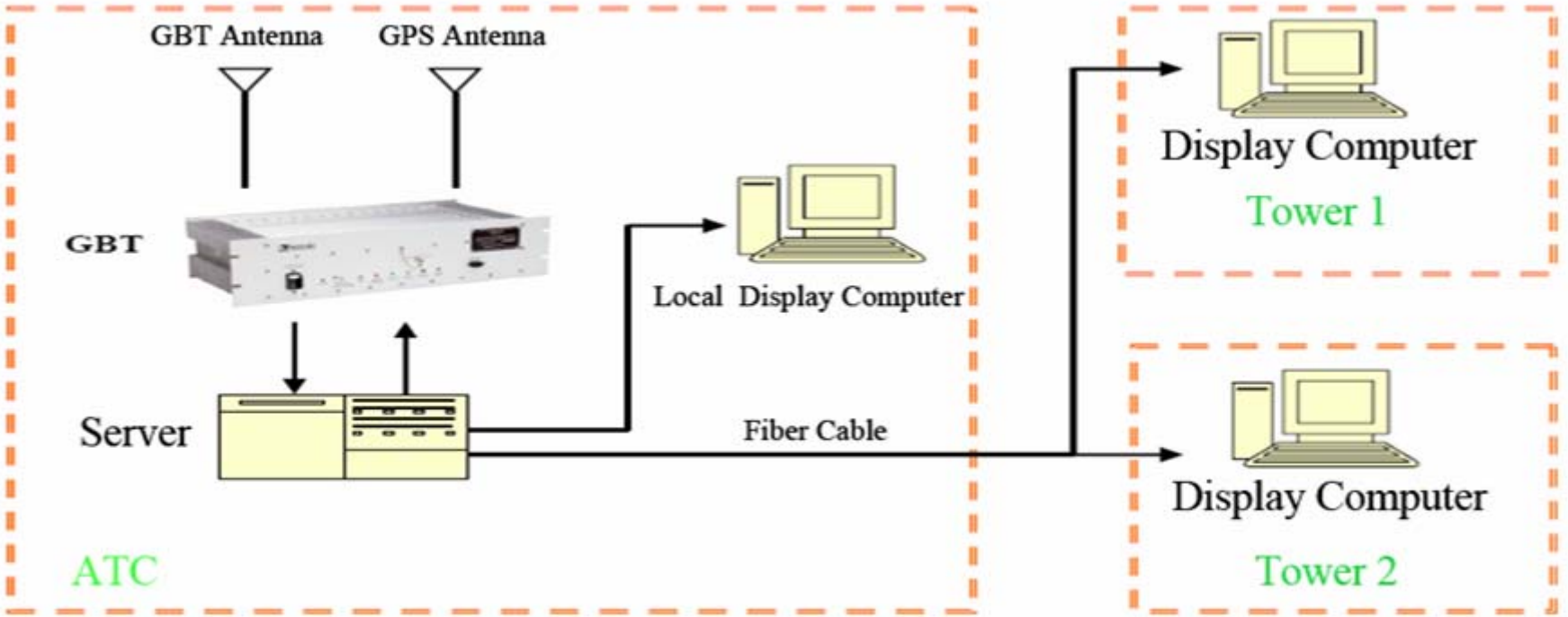
The actual picture of airborne device

The layout and the operation of ADS-B in CAFUC

The installation drawing of airborne device

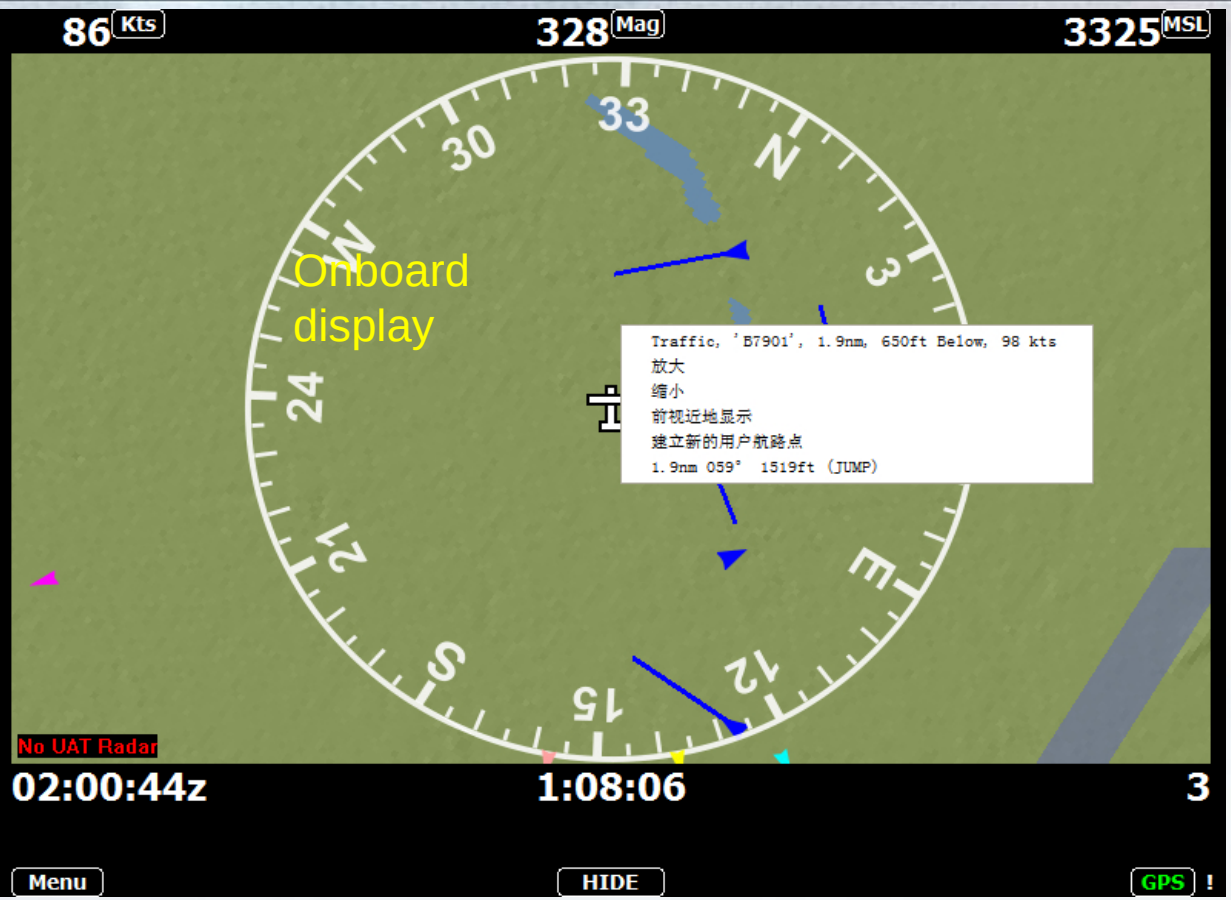
The layout and the operation of ADS-B in CAFUC

The structure diagram of ground system



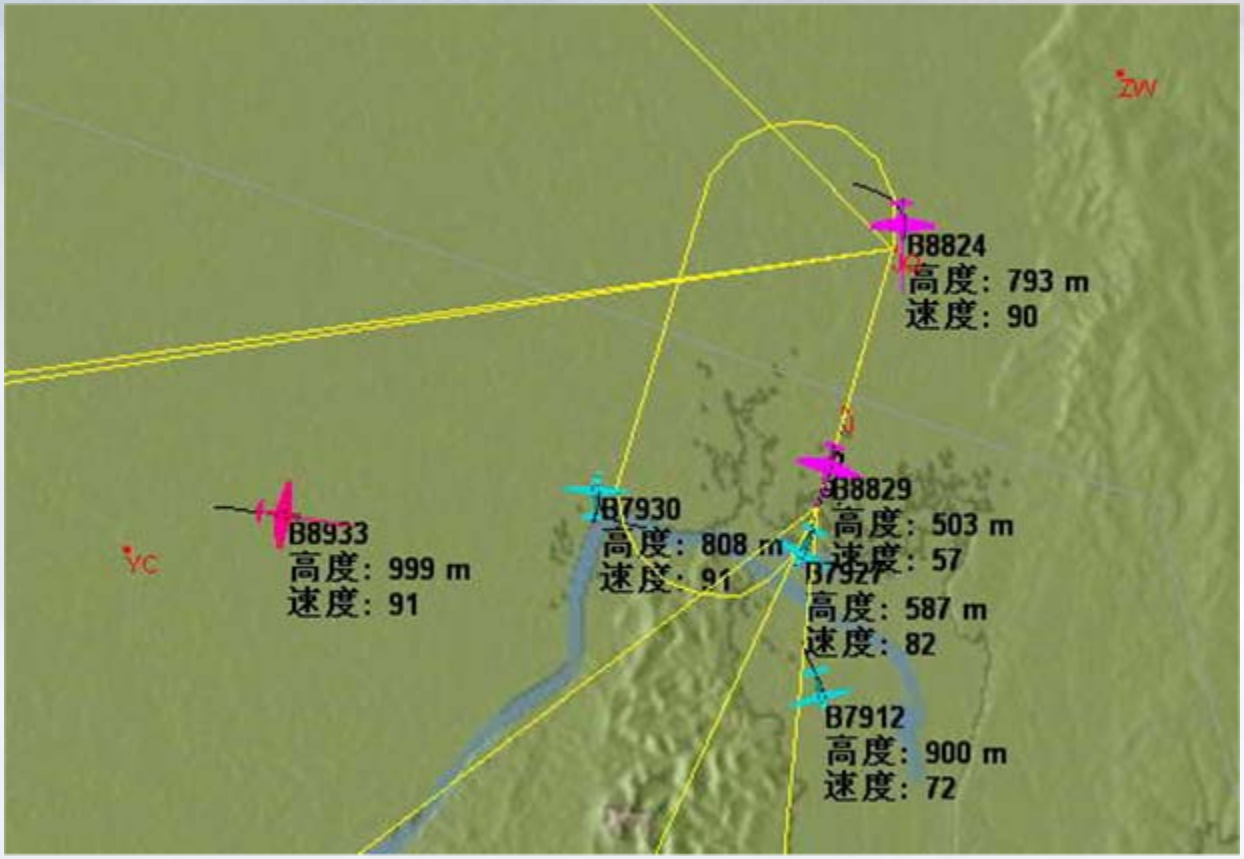
The Cross-link diagram of ground system

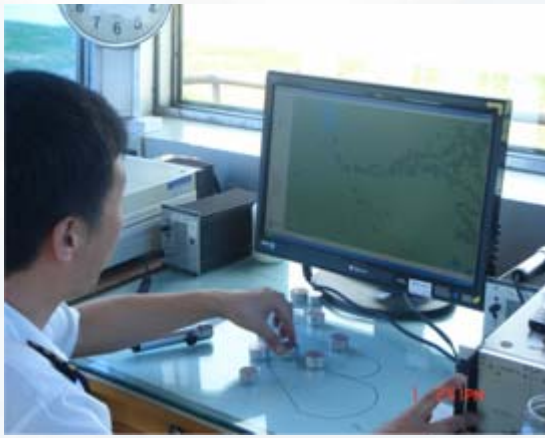
The layout and the operation of ADS-B in CAFUC



The display of airborne device

The layout and the operation of ADS-B in CAFUC





The display of ground system

The layout and the operation of ADS-B in CAFUC

The integration and share of ADS-B data

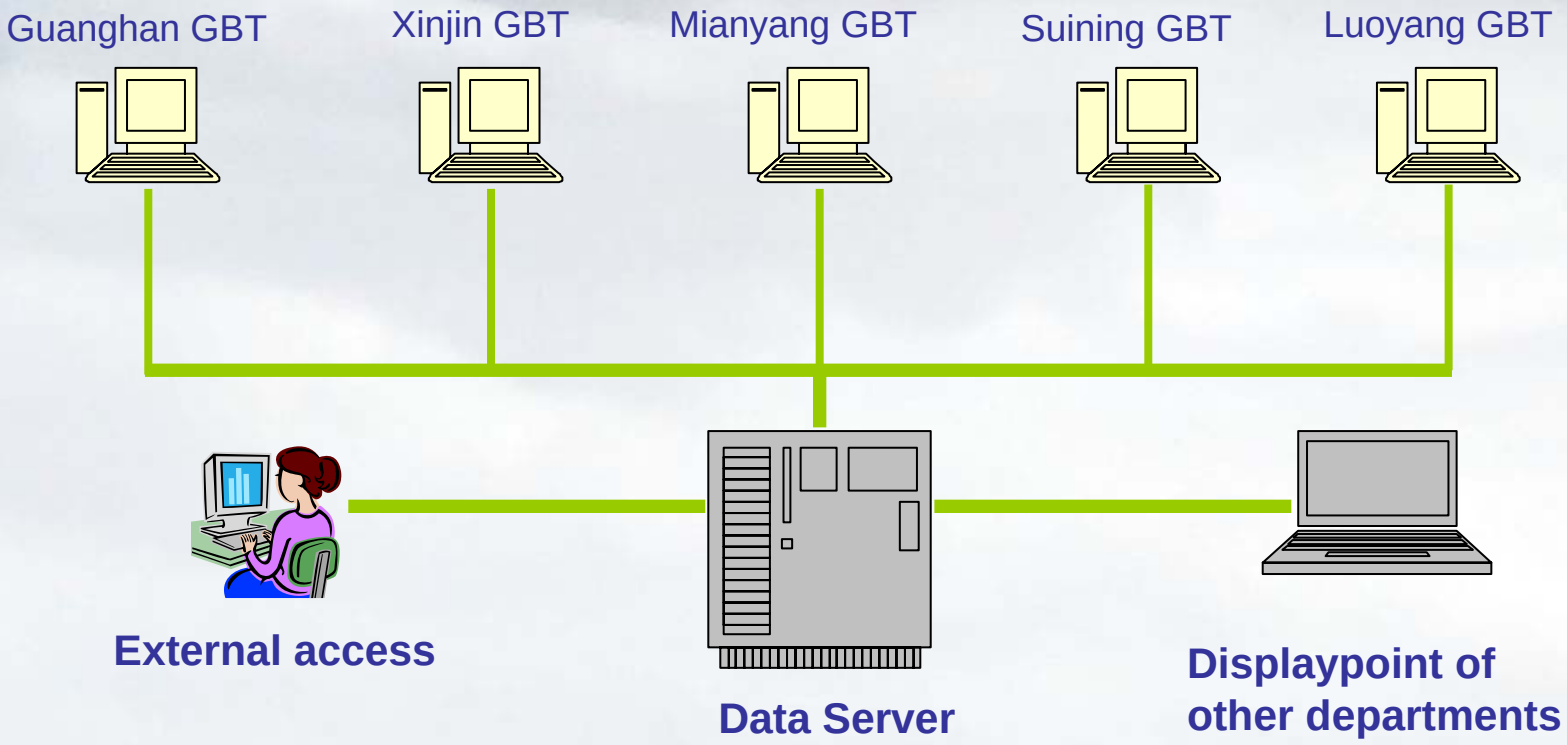
The six ground-base stations in sub-college can share the data with the main ADS-B server via campus network, so the whole process of all the transfer flight among four GBT in Sichuan province, from takeoff to landing can be surveilled in real time. The leaders both in CAFUC and the sub-colleges, together with flight standard department, traffic control department, maintenance department and air traffic control college can learn the flight situation about CAFUC and develop some applications about flight training and traffic control training and so on.

Function:

- Surveillance independently in six airports.
- Netting Surveillance in six airports.
- Remote maintenance and management in six airports

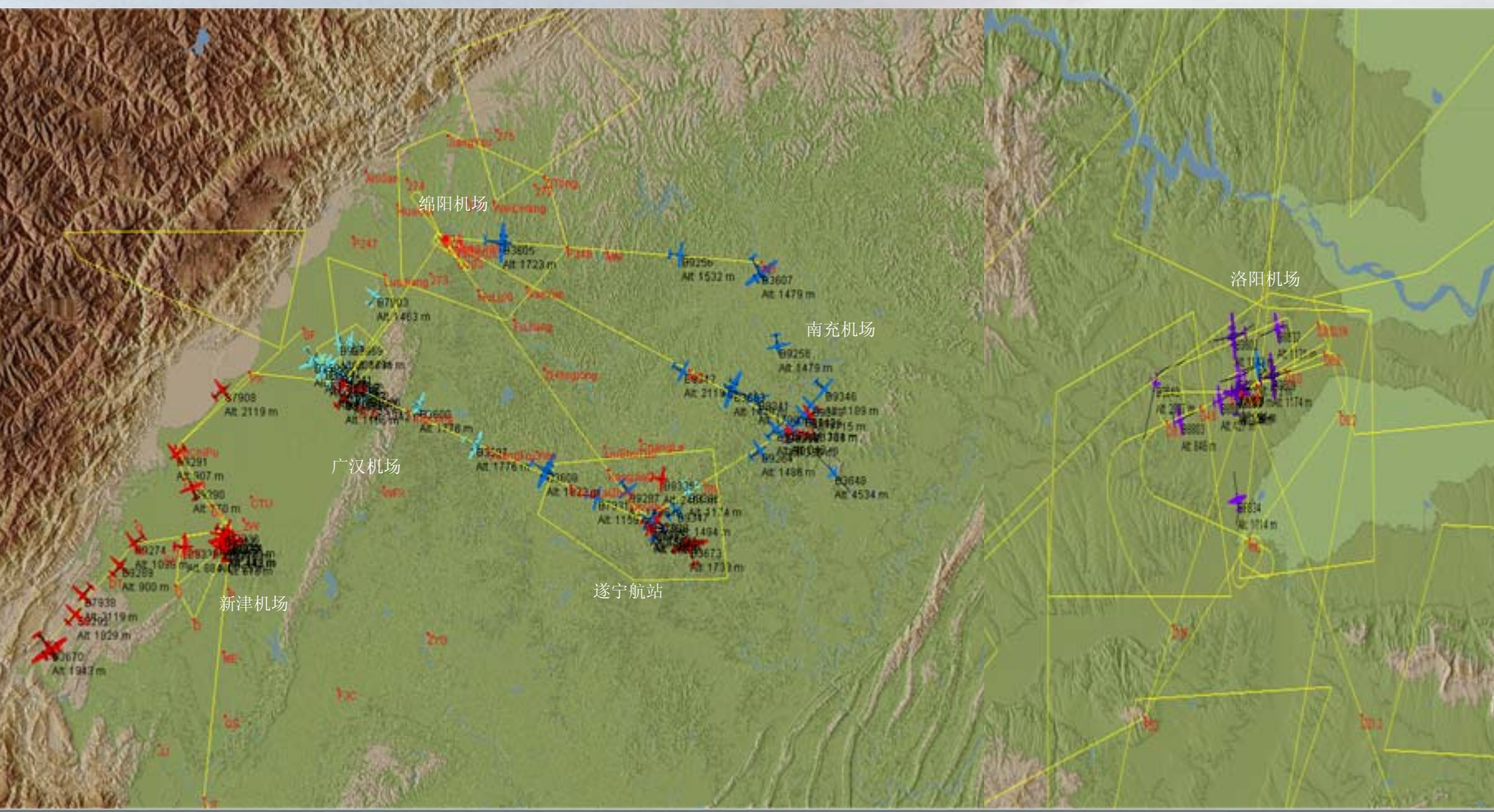
The layout and the operation of ADS-B in CAFUC

- The networks structure diagram of ADS-B



The layout and the operation of ADS-B in CAFUC

The whole display of the six GBT integration data



The significance in teaching

1. ADS-B changed the traditional traffic control way on “placing chess”, and enhanced the ability of surveillance for ATC and tower, improved flight safety.

2. ADS-B covered all the airport airspace and surface in CAFUC, so it helped to reduce the interval between aircrafts increased the flight density and improved training ability.

3. ADS-B also can be use in air traffic teaching process.

The significance in economy

1. It improved the surveillance level to a great extent by low cost, ensured flight safety, saved a hundred million to build SSR.
2. It enlarged flight capacity efficiently, increased the airport and airspace utilization ratio created economy benefit straightly. The annual training capacity has been augmented to 1300 students, 200 thousand flight hours from previous 500 students, 80 thousand flight hours, gaining 300 million RMB per year.
3. The ADS-B device being made in our country can save money about RMB 6.052 million.

The improvement of ADS-B in CAFUC

Due to the establishment of ADS-B laboratory, the follow objectives have been achieved:

a) All the software and hardware of ADS-B can be made in our country.

b) The software can be upgraded, and some new functions have been developed, such as: the view of ADS-B's circumrotating, the altitude conversion from the British System to the Metric System, etc.

c) The system made the ADS-B navigation map by collecting a number of longitude latitude dates about navigation points, report points, airspace and flight path.

d) The network of CAFUC has been optimized through changing transmission line in tower and ATC office.

e) The security certification mechanism has been improved, and a display terminal can link several ADS-B servers.

b. The actual picture of sample device

ADS-B scientific research group in CAFUC is carrying on some research tasks:

The key device in ADS-B----GBT with independent intellectual property rights has been developed in CAFUC, and the sample has been manufactured and tested. Once the test succeeds, the ADS-B device can be made in our country.

Front

Rear

The actual picture of sample device

The improvement of ADS-B in CAFUC

There are many advantages in this system, for example: the surveillance network consists of many ADS-B GBTs. But the framework of many GBTs' may cause some difficulty about maintenance and troubleshooting. The group is going to develop remote trouble inspection and troubleshooting system. Based on this system, the technician can judge and solve most troubles remotely, which can save additional money and time.

Now the ADS-B signal is being transmitted only on optical fiber among the tower, ATC, terminal and GBT. To avoid the system paralysis causing by optical fiber's destruction, the wireless LAN has been built in Luoyang sub-college and Mianyang sub-college, and the other sub-colleges are going to make use of wireless LAN backup for optical fiber.

Thank you !