Design Essentials of Forest Aviation Fire Airport

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Abstract. As an important facility for forest fire prevention and fighting, forest aviation fire airport (hereinafter referred to as forest airport) plays an important role in preventing and fighting forest fires and protecting forest ecosystem with its advantages of fast, efficient and less limited by geographical space. Based on the analysis of the current situation of forest airport construction, this paper puts forward the design points of forest airport, and combines with case study, in order to provide reference for similar projects.

1. Introduction
China has entered a critical period of ecological civilization construction, and forest fire prevention is the safety guarantee of ecological civilization construction. Forest aviation fire fighting is a leading force in fighting forest fires, an important part of forest equipment modernization, and a priority development direction of forest fire prevention. It provides forest safety protection with unparalleled air superiority.

2. Current situation of the construction of the forest aviation fire airport
At present, there are 20 full-function terminals (including terminals and forest defense airports), 11 supporting terminals (only including terminals) and 27 forestry airports in China. 80 aircrafts were rented, and 19 provinces (autonomous regions, municipalities directly under the central government) carried out air forest protection.

In the national forest fire prevention plan (2016-2025), it is specified to strengthen the construction of forest aviation fire fighting capacity. Increase the number of forest aviation fire fighting aircraft, improve the direct fire fighting capacity of forest aviation fire fighting; improve the existing air forest protection station (point) facilities, reasonably layout new terminals, and achieve the National Forest aviation fire fighting coverage rate of 75% in the near future and 90% at the end of the planning period.

3. Design essentials of forest aviation fire airport

3.1. Site selection
In addition to following the general principles of airport location, the following basic requirements should also be emphasized:

• the site shall meet the requirements of national forest aviation fire protection planning and expand the coverage of forest aviation fire protection most effectively.
- the distance between the site and the urban area is moderate. Both the safe distance of the terminal work and the convenience of the living area should be considered. It is better to be within 10km from the center of the county.
- the site shall focus on collecting meteorological data within the period of forest aviation fire fighting operation as the basis for determining the runway direction of forest airport.
- the location of field apron and water intake pool shall be considered for the site. The field apron should be selected in the open area with key forest areas, flat terrain, good headroom conditions and a slope of less than 5°; the distribution interval of water intake pool should be less than 70km. [1]

3.2. Aircraft models selection
The model of forest aviation fire airport is selected according to the level. Different levels have different requirements for the number of fixed wings and helicopters. See the following table for details:

| Airport level | Aerodrome reference code | Full-function terminals |
|---------------|--------------------------|-------------------------|
|               |                          | aircraft | heliport |
| Lin-I         | 3D                       | 2-3      | ≥7       |
| Lin-II        | 3C                       | 2        | ≥5       |
| Lin-III       | 1B                       | 2        | ≥4       |
| Lin-H I       |                          | ≥3       |
| Lin-H II      |                          | 2        |

Lin-I airport reference Y8 aircraft; lin-II airport reference Y7 aircraft; lin-III airport reference Y5, Y12 aircraft. The helicopter adopts the fire-fighting models such as Ka-32, M-26 and M-171.

3.3. Airfield area planning
According to the classification, the design of the forest aviation fire airport determines aerodrome reference code and the types and sorties of the aircraft on the apron. Refer to the following table for the main construction engineering indexes:

| Order number | Construction Project | Construction classification | Unit | Aircraft parking demand (sortie) |
|--------------|----------------------|-----------------------------|------|----------------------------------|
| 2.1          | primary runway       | m                           | 1200-1800 | 1200-1800 | <800 | 7200 | 250 | 250 |
| 2.2          | secondary runway     | m                           | <800 | <800 | <800 |
| 2.3          | apron                | m²                          | 27200 | 21000 | 12700 | 7200 | 2500 |
|              | aircraft             | m²                          | 13200 | 10000 | 7800 | X | X |
|              | heliport             | m²                          | 14000 | 11000 | 4900 | 7200 | 2500 |
| 2.4          | taxiway              | m                           | 850 | 600 | 400 | 350 | 100 |

3.3.1. Runway length.
The airport has been listed in the national forest fire prevention plan and upgraded according to the Lin-I standard. According to table 2, the main runway length of Lin-I terminal shall be 1200-1800 meters. Due to the limited investment, 500 meters will be built first, and the remaining runway will be left for later construction. Runway operation category is non-instrument visual inspection.
3.3.2. Runway width
In consideration of the safety and efficiency of emergency rescue, the largest model of airport operation is M-26 (full-size D of helicopter is 40.025m, full width W of helicopter is 32m); in addition, M-171 (full-size D of helicopter is 25.35m, full width W of helicopter is 21.29m) and the following models, of which M-171 is the common model, considering the requirements of helicopter parking, the runway width is determined to be 30m, both sides are respectively set 1.5m shoulder.

3.3.3. Taxiway
In this project, the helicopter taxiway is designed according to the air taxiway setting requirements and safety margin in the technical standard for flight site of civil Heliport (MH5013-2014). According to different helicopter types, the width of taxiway is 15m and 10.5m respectively; the width of shoulder on both sides is 1.5m; the total width is 18m and 13.5m respectively.

3.3.4. Apron
According to table 1, there are 2-3 aircrafts of Lin-I terminal, and the number of helicopters is not less than 7. Due to the limited investment, only helipads will be built in this phase to meet the requirements of 5 helicopters parking (2 M-26, 3 M-171 and below).

3.3.5. Apron
Due to the small rainfall, large evaporation and good soil permeability, V-shaped open earth ditch is set up on the inner side of the patrol road in the flight area according to the terrain of the airfield area to collect the rainwater in the field and drain the rainwater in the field to the water outlet.

3.3.6. Ancillary works
Airside fence (with barbed wire) will be set around the airfield with a height of 1.8m. The project is equipped with 4 gates, including one landside airside gate, which is of ordinary steel with a clear width of 8m; one landside gate is located at the entrance of the airport, using slide rail manual gate with a clear width of 8m. One emergency crash gate with a clear width of 6m shall be set at the South and North ends of airside.

3.3.7. General layout of airfield area
The layout of the airport is arranged according to the proposed model, site terrain conditions, land occupation factors, operation management and other factors as follows:

The runway is arranged on the west side of the existing helipad, and two helipads are planned on the south side. Two FATOs are set on the runway, and the distance between the runway and helipad meets the requirements of obstacle limitation surface.

Figure 1. General layout of airfield area
3.4. Terminal work area planning
According to the needs of the project, the integrated air traffic control building, power station and other buildings will be built, and the tower and office will be jointly built into the integrated air traffic control building. The power station includes the substation, water pump room and fire pool.

4. Conclusion
The construction funds of the air forest protection station are all from the central investment, and there is a limit on the amount every year. Therefore, in the planning and design, attention should be paid to the connection between the short term and the long term, try to achieve “one-time planning, phased implementation” and clear phased implementation plan.

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