CAAC Flight Standards Department

Advisory Circular

AC No: AC－121－21

Issuing Date: March 2, 2007

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High Elevation Airport Operation Regulation for Air Carriers

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1. Purpose

1.1 As the further extension of CCAR－121, this advisory circular is issued to provide guidelines for air carriers (hereinafter "airlines") who apply for high elevation airport operation and implement safety management at high elevation airport.

1.2 This advisory circular is issued to assist CAAC in approving and supervising high elevation airport operation.

2. Applicability

This advisory circular applies to air carriers who operate under CCAR-121.

3. Definition

General High Elevation Airport: Airport elevation at or above 1500 m (4922 ft) but below 2438 m (8000 ft).

Very High Elevation Airport: Airport elevation at or above 2438 m (8000 ft).

High elevation airport includes **General High Elevation Airport** and **Very High Elevation Airport**.

4. Background

There is a significant amount of plateaus and mountains in the vast territories of China. With increasing number of high elevation airport being built or planned in recent years, more and more airlines have started or applied for high elevation airport operations. However, the special characteristics of high elevation airport and high altitude route make operations more demanding and challenging in terms of ensuring safety.

On Oct. 28 and 29, 2004, a seminar on High Elevation Airport Operation Management and Support was held by CAAC in Chengdu to review the industry's experience of high elevation airport operation in the past decades. Building on this meeting, and by seeking opinions and suggestions from the regional administration offices and airlines that have abundant experiences in high elevation airport operation, CAAC has formulated this AC.

For better management and application, instead of setting up requirements for each high elevation airport, the entry conditions and operational requirements are classified into two categories: General High Elevation Airport and Very High Elevation Airport.

5. Entry Requirements of High Elevation Airport Operation

5.1 Airlines

a. Unless item 5.1(c) is satisfied, newly established airlines which are not based at any high elevation airport shall operate continuously for one year before entering into operations at General High Elevation Airport; and operate for two consecutive years in General High Elevation Airport and accumulate at least 500 takeoffs and landings before entering into operations at Very High Elevation Airport.

b. Unless item 5.1 (c) is satisfied, newly established airlines which are based at General High Elevation Airport shall pass CAAC's technical evaluation before operating in other General High Elevation Airport other than its base airport; and operate in General High Airport for two consecutive years and accumulate at least 500 takeoffs and landings before entering into Very High Elevation Airport.

c. No new airlines are allowed to base in Very High Elevation Airport, or deviate from the above (a) and (b) to apply for the reduction of entry time limitation for high elevation airport operation, unless the following conditions are met:

(1) The airline senior management (deputy general manager of operations or chief pilot, deputy general manager of maintenance and engineering or chief engineer) has at least three-year experiences of Very High Elevation Airport operation and maintenance management within the last 10 years.

(2)Middle-level management (head of operations control, head of flight technology management, head of maintenance and engineering) of the airline operational system has at least two years of operations and maintenance experiences at Very High Elevation Airport within the last 10 years.

5.2 Aircraft

No aircraft may operate at high elevation airport unless:

a. Airport elevation is within the takeoff and landing envelop specified in the Airplane Flight Manual.

b. The aircraft capability of oxygen supply shall accord to the supplemental oxygen requirements for high elevation airport operation and en-route emergency descent and first aid, and satisfy the necessary oxygen supply requirements for the flight crew during the period of after the previous landing and before next takeoff.

c. For Very High Elevation Airport operation, the aircraft's cabin pressurization system has to be type certified for such operation or otherwise approved to takeoff and land at Very High Elevation Airport.

d. Each engine of the aircraft operated at Very High Elevation Airport shall have an average EGT margin higher than 8℃ or equivalent limitation. Twin-engine aircraft shall have power system reliability criteria equivalent to 120-minute ETOPS requirements.

e. Operating at Very High Elevation Airport, the aircraft's engines and APU are preferable to have self-start capabilities.

5.3 Pilot

a. Unless otherwise approved by CAAC, the captain who carries out Very High Elevation Operation should be under the age of 55.

b. Related theory training on operations at General High Elevation Airport and Very High Elevation Airport is a must for pilots before they start operating in the corresponding airport category. For Very High Elevation Airport operation, the training shall also include a Level D simulator equipped with Very High Elevation Airport vision with emphasis on EOSID training. (Refer to Annex I for training requirements).

c. No pilot may operate at Very High Elevation Airport as the First Officer unless he has accumulated 1200 or more flight hours, which should include 100 or more flight hours for the operating aircraft type. However, such restrictions do not apply to pilots already qualified for Very High Elevation Airport operation.

d. No pilot may operate at high elevation airport as the Captain unless:

(1)He has accumulated 200 or more flight hours in General High Elevation Airport or 300 or more flight hours as Captain, and is qualified as Captain for General High Elevation Airport operation after evaluation.

(2)He has accumulated 500 or more flight hours as Captain and 8 or more takeoffs and landings (simulator takeoffs and landings excluded) in Very High Elevation Airport, and is qualified as Captain for Very High Elevation Airport operation after evaluation. However, this restriction does not apply to Captain who is already qualified for Very High Elevation Airport operation and has recent experience of such operation.

5.4 Airlines Operations Management

Before entering into high elevation airport operation, airlines shall establish specific manual or add relevant information into the existing manual based on the requirements of this AC, and manage the operation accordingly.

6. Operational Requirements of High Elevation Airport Operation

6.1 Aircraft Maintenance

Twin-engine aircraft operated at Very High Elevation Airport should be

maintained according to 120-minute ETOPS standards.

6.2 Aircraft Performance Analysis

a. When calculating takeoff weight, obstacle clearance, tyre speed and maximum brake energy limitations shall be taken especially into account.

b. When operating at Very High Elevation Airport, V1/VR/V2 value should be calculated by using airplane performance software or found from flight manual. Values found directly from FMS or QRH shall not be used.

c. When operating at high elevation airport, landing analysis is required. If landing limitation exists, the table of landing weight is required. For Very High Elevation Airport operation, the table of landing weight is required in all cases.

d. For high elevation airport operation, quick turnaround time limitation and brake cooling shall be taken into account when scheduling flights.

e. Airlines should develop EOSID procedure for each aircraft type in operation and for each corresponding runway of the operating airport per CAAC requirements, unless one of the following three requirements is met and related written analysis is submitted to CAAC:

(1)Calculation and analysis indicate that by controlling takeoff weight, the engine out climb gradient of the aircraft type is able to satisfy relevant requirements in the departure procedure;

(2)It is validated that the aircraft type is able to clear obstacles safely and meet the required altitude (for purpose of obstacle clearance) according to departure procedure in the case of one engine failure;

(3)If only one runway direction which satisfies the departure requirement is used by the aircraft type for takeoff, i.e. no other runway direction (EOSID is required) is used for departure (one direction takeoff).

f. For high elevation airport operation, airlines should perform oxygen provision check for cabin depressurization and drift down check for en-route one engine failure. If applicable, related contingency plan shall be put in place.

6.3 Demonstration Flight

Before airlines start operating an aircraft type at a General High Elevation Airport,

CAAC will determine whether a demonstration flight is necessary, taking into account the airlines' operational experience and aircraft types operated in the said airport. However, for Very High Elevation Airport operation, a demonstration flight without loading any passengers is required for each aircraft type at the operating airport.

6.4 Dispatch

a. Airport and en-route actual weather and weather forecast shall be closely followed in the dispatch process where dispatch criteria shall be strictly applied. In order to improve dispatch reliability in Very High Elevation Airport operation, airlines can consider employing their own meteorological analysts to collect weather information and assist the dispatcher to make the right judgment.

b. The dispatch department should be able to validate the aircraft's adaptability and the pilot's qualification for high elevation airport operation before dispatching.

c. The dispatch shall be strictly in line with the MEL for high elevation airport operation. For airport requiring EOSID, the airport navaid and relevant airborne equipment required for the EOSID procedure should be considered in the dispatch process.

d. The take-off weight shall be strictly controlled when dispatching an aircraft for high elevation airport operation. Fuel checks shall be carried out especially on the flights that need to carry fuel for return trip, or that operate in areas with fewer alternates. In addition, back-up plan for payload reduction or en-route diversion due to deterioration of the outside environment shall be prepared.

e. Real-time flight tracking and monitoring should be strengthened in high elevation airport operations. That whether aircraft passes critical waypoints (drift down PNR, cabin depressurization PNR and en-route diversion point) should be checked and confirmed.

f. Training related to high elevation airport dispatch should be incorporated in the initial and annual recurrent training for dispatchers working at high elevation airports.

6.5 Crew Training and Relevant Requirements

a. Pilot Training

Pilot who performs high elevation airport operation should complete the training according to the approved training syllabus.

b. The recent flight experience of a captain who performs Very High Elevation operation shall be in line with CCAR121.469.

c. Cabin Crew Training

Airlines operating at high elevation airport shall adapt their cabin crew training syllabus to high elevation airport operation by adding relevant training content (refer to Annex 2 for details). Airlines can organize separate high elevation airport operation training for cabin crews, or incorporate such training into annual recurrent training, taking into account their operational requirements.

6.6 Aviation Sanitation

a. Airlines shall stipulate measures to guarantee the health of crew members in high elevation airport operation.

b. Airlines shall pay more attention to protect, observe and record the crew's health condition, and carry out crew health inquiry before they perform such assignments.

c. Airlines shall frame the training plan and syllabus for aviation medical knowledge (refer to Annex 3) for high elevation airport operation crew members, and submit to the regional administration bureau for approval before implementation.

d. Airlines shall set up medical release standard for Very High Elevation Airport operation crew members (refer to Annex 3) and carry out physical checks for the flight crew on the day they perform the flight, especially checks on cardiovascular and respiratory function, and release the medical certificate to the crew members.

e. Airlines operating at high elevation airport shall have contingency plan for plague.

f. Crew members shall abide by the oxygen usage related regulations in CCAR-121 when operating at airports above sea level 3,000 m.

7. Supplementary Operational Certification and Continuous Supervision

7.1 Airlines' qualification for every high elevation airport operation is validated through the issuing of Operations Specification.

7.2 Supplementary inter-regional operations certification shall be implemented in line with "Notice on Further Defining Some Issues on Inter-regional Operation Management" (CAAC〔2006〕No.14).

7.3 Local supervision office should take pertinent supervision over the airlines, according to the characteristics of high elevation airport.

8. Other Matters Concerned

8.1 It is advised that airlines develop operational notes based on characteristics of different high elevation airports, and add them into the line operation manuals and other relevant manuals before entering into operation at a high elevation airport.

8.2 According to the characteristics of high elevation airports, airlines shall define MEL or add additional operational clause in MEL for relevant aircraft type operating at high elevation airport, with special attention to brake, reverser, flight control system, APU, RA, Air conditioning, weather radar, high frequency communication etc.

8.3 Due to short VHF communication distance, and occasionally shielded ground navigation signals at high elevation airport operation, aircraft surveillance becomes more difficult. Thus the airlines should adopt airborne equipment with better communication and navigation capability that is compatible with the ATM monitoring system.

8.4 As the terrain of high elevation airports is quite complex, it is important for the pilots to have visual knowledge of the airport terrain. So the airlines can make preflight preparation through various means of the image, multi-media or sand table model etc.

8.5 In order to improve safety and reliability of Very High Elevation Airport operation and reduce pilots' workload, airlines are suggested to fully use new

navigational technologies like RNP (Required Navigation Performance) etc.

8.6 In order to shorten the flight distance for arrival and departure, and further reduce the fuel consumption, airlines can define specific arrival/departure procedure according to the aircraft type, and implement them with CAAC approval.

8.7 If EOSID or special arrival/departure procedure applied, the airlines should provide relevant training for the flight operation agencies, loading personnel and air traffic controllers in high elevation airport.

8.8 Should a certain high elevation airport be a special airport at the same time, it should also abide by the rules and regulations in AC-121-17 (Classification Standards and Operational Requirements of Special Airport).

This AC is effective upon issuing. Airlines already in high elevation airport operation before the issuing of this AC shall examine and adapt existing practices according to this AC. The regional administration bureau of CAAC shall supervise airlines to make sure that all the requirements in this AC are fulfilled by Dec.31, 2007.

Annex 1. Syllabus of Pilot Training in High Elevation Airport Operation

The syllabus of pilot training in high elevation airport operation needs to cover following items as minimum:

I. Ground theory session

1. Time frame

6 hours lecture on theory.

2. Content

A. High elevation airport operation characteristics (see Annex 4);

B. Take-off performance analysis;

C .Supplementary procedure for high elevation airport operation;

D. Drift down performance and procedure;

E. En-route cabin depressurization handling procedure in high altitude route operation;

F. Crew and passenger oxygen supply envelope;

G. Definition of PNR;

H. Landing performance;

J. Arrival/departure procedure;

K. EOSID procedure.

II. Simulator training

Obtaining training in Class D simulator with Very High Elevation Airport vision is a prerequisite of Very High Elevation Airport operation. The instructor needs to have a currently valid instructor license granted according to CCAR-61, and the qualification of Very High Elevation Airport operation.

1. Time frame

2 sessions/4 hours.

2. Content

A. Characteristics of flight maneuver in Very High Elevation Airport operation;

B. Visual/instrument arrival and departure procedure at Very High Elevation Airport;

C. EOSID procedure;

D. Drift down procedure;

E. En-route cabin depressurization procedure in high altitude route operation.

Annex 2. Syllabus of Cabin Crew Training in High Elevation Airport Operation

1. Time frame

8 hours in total. 4-hour lecture on theory and 4-hour practical operations.

2. Content of theory sessions

A. High elevation airport operation policies and requirements;

B. Characteristics of flying on high altitude routes;

C. Airborne emergency equipment in high altitude route operation;

D. Cabin safety in high altitude route flight;

E. Rescue knowledge on high elevation;

F. Characteristics and treatment methods of high altitude diseases.

3. Content of practical operation sessions

A. Emergency depressurization procedure in high altitude route operation;

B. First aid on high elevation

a. First aid treatment of traumatic injury;

b. Cardiopulmonary recovery;

c. Usage of oxygen cylinder.

Annex 3. Guidelines on Aeromedical Knowledge Training for Crewmember at High Elevation Airport Operation and Medical Dispatch Criteria for Crewmember at High Elevation Airport Operation

1. Guidelines on Aeromedical Knowledge Training for Crewmember at High Elevation Airport Operation

Airlines should put in place aeromedical training plans and syllabus. The following should be covered in the training:

A. How low atmospheric pressure at high altitude affects human body;

B. How lack of oxygen at high altitude affects human body and how will the body react;

C. How to prevent the negative effects of anoxic at high altitude on human body;

D. Contingency plan for emergency depressurization;

E. Contingency plan for plague at Very High Elevation Airport;

F. Medical dispatch criteria for crew members at Very High Elevation Airport operation.

2. Medical Dispatch Criteria for Crew Members at Very High Elevation Airport operation

A. No obesity;

B. No cardio-vascular diseases or coronary artery diseases;

C. No arrhythmia - Heart rate no less than 56 beats/min, and no more than 90 beats/min;

D. For high blood pressure patients

a. blood pressure within normal range (Low pressure <90 mmHg, high pressure<140mmHg) ;

b. no clinical symptoms showing damages related to heart, brain or kidney.

E. No anemia;

F. No impaired fasting glucose (IFG) or impaired glucose tolerance (IGT);

G. No chest or lung diseases and sequelae;

H. No headaches;

I. No upper respiratory tract infection (URI), fever, or acute or chronic respiratory diseases;

J. No ear baric dysfunction, or Eustachian tube dysfunction;

K. No poor-quality sleep or sleep disorder;

L. No negative emotions;

M. No alcohol within 24 hours before flight, no fatigue or excessive anaerobic exercises, and adequate sleep;

N. No other physical unfitness that might impair high altitude operation.

Annex 4. High Elevation Airport Features and Their Influences on Flight Operation

High elevation, low air density, low air pressure, complex topography, intense sunlight radiation, and imbalanced exposure to the sun - all these factors are contributing to the following features of high elevation airport operation:

1. Take-off and landing distance increase dramatically at high elevation airport due to faster true air speed and lower thrust compared with that in normal operation conditions with the same take-off and landing weight.

2. In the high elevation scenario, engine thrust decreases, leading to weakened aerodynamic performance and maneuver mobility, including degraded climb and obstacle clearance capability, longer in-flight acceleration and deceleration distance, and bigger turning radius.

3. In high elevation area, turbulence and windshear become common as strong winds occur often and the direction and speed of wind change wildly due to this area's topographical characteristics – strong winds at high altitude, imbalanced exposure to the sun, as well as the plateau landform.

4. The temperature in high elevation airport area changes significantly between day and night, and the weather varies tremendously between regions and zones, for instance, floating dust, sandstorm, thunderstorms, blizzard, cumulonimbus cloud, thundercloud, low level cloud, dense fog, low visibility, icing and freezing, extreme low temperature, which all impose a great threat to flight safety, and therefore, maintaining flights on time is extremely challenging.

5. The topography surrounding high elevation airport are complex, which means the air clearance is comparatively poor, and setting up navigation facilities is difficult. As a result, take-off, landing and go-around maneuvers become more difficult. In addition, the available maneuver airspace and maneuver altitude are limited, which also contribute difficulties to the air traffic control.

6. Radio interference occurs frequently because of the terrain masking and reflection effect caused by the complex topography. Ground communication signals are weak, and can only work within limited distance. VHF

Omnidirectional range/Distance Measuring Equipment (VOR/DME) covers limited area with unstable indication. False indication appears in certain directions of the Instrument Landing System (ILS).

7. Pilots are apt to fear to fly over high altitude and mountainous area due to the difficulties listed above, as well as the demanding flight operation and the poor maneuverability.