Савјетодавни материјал за израду аеронаутичке студије и издавање изузећа

Датум: **08.08.2016**
Број: **1-5-02-3-397/16**
Одобрио: **ген.директор Ђ.Ратковица**

Садржај

1 Сврха

Сврха овог савјетодавног материјала је да упути аеродромске операторе у израду аеронаутичке студије, те прикаже важност и значај аеронаутичке студије у циљу смањења ризика до прихватљивог нивоа безбједног одвијања летачких активности на аеродрому и начин издавања изузећа.

2 Појмови и скраћенице

Појмови:

аеронаутичка студија	*подразумијева студију проблема којима се идентификује и врши одабир могућих рјешења која су прихватљива, а неће нарушити безбједност*
прописи	*подразумијевају законске и подзаконске акте који се објављују у Службеном гласнику БиХ, а који се односе на имплементацију ICAO Стандарда и препоручене праксе и имплементацију прописа садржаних у ECAA споразуму, Анекс I са свим његовим измјенама и допунама које су на снази. Прописи у смислу ове одлуке не подразумијевају EC Уредбе (EC regulation) које се примјењују директно.*

Скраћенице:

AGA	*Aerodromes, air routes and ground aids* – *Аеродроми, ваздушни путеви и земаљска средства*
AIP	*Aeronautical Information Publication* – *Зборник ваздухопловних информација*
ANAD	*Air Navigation and Airport Division* - Сектор за ваздухопловну навигацију и аеродроме
BHDCA	*Bosnia and Herzegovina Directorate of Civil Aviation* - Дирекција за цивилно ваздухопловство Босне и Херцеговине
DG	*BHDCA Director General*– Генерални директор BHDCA
ICAO	*International Civil Aviation Organization* - Међународна организација цивилног ваздухопловства

3 Веза са другим документима

- Правилник о условима и начину издавања потврде аеродромском оператору, Измјене и допуне Правилника о условима и начину издавања потврде аеродромском оператору
- Одлука о висини накнада за услуге из надлежности Дирекције за цивилно ваздухопловство БиХ
- Правилник о аеродромима
- Manual on Certification of Aerodromes – ICAO doc.9774 AN/969
- Safety Management Manual – ICAO doc.9859

4 Аеронаутичка студија

Аеронаутичка студија је студија проблема којима се идентификује и врши одабир могућих рјешења која су прихватљива а неће нарушити безбједност. (ICAO doc.9774).

Аеронаутичка студија је писани документ у којем се на основу важећих законских прописа, те научних и стручних приручника примјеном једне или више одговарајућих научних метода од стране овлашћеног инжењера технологије ваздушног саобраћаја утврђује:

- Да ли, у којем степену и на који начин, одговарајуће одступање од важећих законских прописа утиче на безбједност операција ваздухоплова, те ако утиче
- Могуће алтернативне мјере и поступке у циљу обезбјеђивања максималне безбједности операција ваздухоплова, као и
- Степен ефикасности сваке од предложених мјера и поступака, усмјерених на смањење утицаја на безбједност, узрокованог анализираним одступањем од важећих прописа.

4.1 Циљ

Аеронаутичка студија се израђује у циљу:

a) Доказивања да су већ изграђени или планирани (нови) објекти на аеродрому и у његовој непосредној околини, те препреке у простору, у складу са важећим законским прописима, или

b) Утврђивања да ли, у којем степену и на који начин, одговарајуће одступање од важећих законских прописа утиче на безбједност операција ваздухоплова, те ако утиче

c) Дефинисања могућих алтернативних мјера и поступака у циљу обезбјеђивања максималне безбједности операција ваздухоплова, као и

d) Детаљне процјене ефикасности сваке од предложених мјера и поступака усмјерених на смањење утицаја на безбједност узрокованог одговарајућим изузећем.

4.2 Примјењивост

Аеронаутичка студија се израђује увијек када:

- Се планира изградња новог или надоградња или реконструкција постојећег објекта на аеродрому и у његовој близини, те када
- Због одређених објективних чињеница није могуће поштовати важеће законске прописе, а у циљу добивања сљедећих докумената од BHDCA:
  1. Рјешење за употребу аеродрома,
  2. Потврду за аеродром,
  3. Посебно одобрење (сагласност) за пројектовање, градњу или означавање аеродрома и других објеката који могу утицати на безбједност ваздухоплова,
  4. Претходне сагласности за изградњу и постављање ваздухопловних препрека изван области аеродрома које прелазе прописану висину,
  5. Сагласности на предложене корективне мјере у циљу отклањања неусклађености утврђених током редовних и ванредних надзора оператора аеродрома.

4.3 Учесници у изради аеронаутичке студије

Аеронаутичку студију може израдити аеродромски оператор или овлашћено физичко или правно лице које је компетентно и стручно у области цивилног ваздухопловства.

4.4 Израда аеронаутичке студије у 9 корака

Аеронаутичка студија подразумијева систематски и документовани приступ проблему који се може израдити кроз 9 корака, а то су:

1. Опис проблема и циљева
2. Одабир процедура, метода и извора података
3. Идентификација нежељених догађаја
4. Анализа узрочних фактора, озбиљност и вјероватноћа
5. Опис ризика
6. Идентификација могућих мјера ублажавања
7. Процјена ефективности мјера ублажавања
8. Избор мјера ублажавања
9. Излагање резултата.

5 Прихватање/одбијање аеронаутичке студије од стране регулатора (BHDCA)

Право прихватања или одбијања резултата аеронаутичке студије почива искључиво на регулатору.

6 Изузећа

Изузеће се односи на то да оператор аеродрома може одступити од одређених стандардних прописаних услова и процедура, који се могу постићи на други начин, а при томе се не нарушава безбједност операција.

Одступање оператора је условљено тиме да оператор ради у складу са условима и процедурама одређеним у потврди, будући да је то од битног интереса за безбједност операција на аеродрому.

Оператор аеродрома је, уз захтјев за изузеће, обавезан доставити у BHDCA и доказ о уплати ради провођења поступка одобравања изузећа, а у складу са чланом 45. став (1) Одлуке о висини накнада за услуге из надлежности Дирекције за цивилно ваздухопловство БиХ. На захтјев оператора аеродрома, BHDCA може, након укупно проведеног поступка, одобрити одговарајуће изузеће у писменом облику.

Одобрење за изузеће од важећих прописа доноси BHDCA на основу израђене аеронаутичке студије и потписане од овлашћеног инжењера технологије ваздушног саобраћаја, у случају када је предложеним алтернативним мјерама и/или поступцима обезбијеђена највећа безбједност операција ваздухоплова. Одобрење за изузеће од важећих прописа BHDCA може издати:

- На одређени временски период, са ограниченим роком трајања, или
- Трајно.

На основу издатог одобрења којим оператору аеродрома BHDCA допушта одступање од важећих законских прописа, оператор аеродрома је обавезан у Зборнику ваздухопловних информација (АИР) да објави сљедеће:

- Сажет опис одступања од прописа за које је издато одобрење,
- Временски рок у којем је одступање од законских прописа одобрено,
- Мјере и поступке чија је примјена обавезна у циљу отклањања посљедица које одобрено одступање може имати по безбједност операција ваздухоплова,
- Све евентуалне опасности по безбједност операција ваздухоплова које могу настати примјеном одобрених алтернативних мјера и поступака, одобрених у циљу отклањања опасности, узроковане одобреним одступањем од важећих законских прописа.

7 Прилог

7.1 Примјер: „Aeronautical Study from Aeroports de Paris (AdP) on runway and shoulder width“

AERONAUTICAL STUDY
FROM
AEROPORTS DE PARIS (AdP)
ON
RUNWAY AND SHOULDER WIDTH
-
A380 ACCOMMODATION
AT
PARIS CHARLES DE GAULLE AIRPORT (CDG)
ON
RUNWAY 1 (09R/27L) AND RUNWAY 2 (08L/26R)

TABLE OF CONTENT

IV RFF (Rescue Fire Fighting) ground vehicles unable to use the runway shoulder

V to by-pass aircraft

VI Difficulties of snow removal due to the position of the runway edge lights

VII Damage of the runway edge lights, if not embedded, due to jet blast at take-off

VIII Erosion of the side of the runway by jet blast, resulting in a subsequent risk of ingestion

5 – CONCLUSION

EFFECTS ON THE USE OF THE RUNWAYS

1 – SCOPE

a) Site, aircraft and infrastructures

This safety study is focused on the way the A380, a code F aircraft according to ICAO Annex 14 definitions, is expected to come into service from 2006 at Paris Charles De Gaulle Airport (CDG).

The study shows the justifications of the differences between the ICAO code F specifications and the provisions planned to accommodate the A380 on Runways 1 and 2 (respectively 09R/27L and 08L/26R).

b) Proposed provisions

Provisions proposed by Aéroports de Paris (AdP) for the A380 accommodation on these runways comply with the recommendations of the "A380 Airport Compatibility Group (AACG)" or even exceed them in specific areas (see points below in italics):

- A minimum central 45m of pavement of full load bearing strength (see AACG recommendations, Annex 1 - Part 2.2).
- Shoulders width of 15m on both sides of the runway, being capable of supporting the occasional passage of the aeroplane without inducing structural damage to the aeroplane; of supporting ground vehicles, which may operate on the shoulder; and of providing protection against erosion. The total paved surface width including these shoulders is therefore 75 meters, thus complying with the overall width specified for Code F. *The width capable of supporting the occasional passage of the aeroplane is 15m on both sides thus exceeding AACG recommendation* (Annex 1 - Part 2.2)*, which only require that capability on the first 7,5m (inner shoulders).*
- The runway edge lights to be embedded (see Annex 3 - Part 5 for work performed on lighting).
- Runways 3 and 4 do not require a specific study for A380 accommodation, having recently been built in accordance with code F specifications.

2 - REGULATORY FRAMEWORK

a) Planning of new facilities: ICAO Annex 14 and French Regulation (Technical Instruction on Civil Aerodromes - ITAC)

In ICAO Annex 14, the runway width is a recommendation.

b) Regulations for upgrading existing facilities

The usual process is to make reference to the provisions as specified in ICAO Annex 14 and in the ITAC, which are considered, in this context, as the state of the art. But should that be impossible to comply with, adaptation of the provisions is permitted. In case there are provisions that are not covered by any international publications, the approval of such provisions and of safety aeronautical studies they are justified by, is of the responsibility of the National Civil Aviation Authority.

The ICAO Circular on Operations of New Larger Aeroplanes (NLAs) at Existing Aerodromes (Cir 305) recognizes this practice and provides guidance, based on worldwide aeronautical studies available[2], to National Civil Aviation Authorities responsible for approval of provisions taken by each airport.

c) Technical elements recommended by the National Civil Aviation Authority

The French Civil Aviation Authority, the DGAC, has not yet published a technical document relating to the operations of A380s or NLAs at existing airports. However, the DGAC favorably considered the AACG analyses and indicated it would consider the inclusion of the AACG specifications into the national regulation[3]. Therefore, Aeroports de Paris (AdP) considered that such analyses and recommendations of the AACG could be used as a basis for this study.

d) AACG Recommendations

The Common Agreement Document of the AACG (final version from participating Authorities in December 2002 and January 2003) recommended:

- In Chapter III.2, Item "Runway width": "a minimum central 45m of pavement of full bearing strength shall be provided" based on "the A380 certification on 45m wide runways".

[2] Aeronautical Studies also used by the AACG as a base.

[3]Letter DGAC: N°03/01/19 DG of January 27, 2003 addressed to the ICAO General Secretary

- In Chapter III.2, Item “Width of Runway Shoulders”: on existing 45m wide runways, at least 2x7.5m wide “inner” portion of runway shoulders so as to be capable of supporting the occasional passage of the aeroplane without inducing structural damage to the aeroplane; and additional 2 x 7,5m wide “outer” portion of runway shoulders, being a transition between the paved surface and the runway strip, prepared for jet blast protection, engine ingestion protection, and for supporting ground vehicles.

In addition, Annex 5 of the AACG document contains a risk analysis related to runway width and runway shoulder width. This analysis is summarized in Part 2.3.

e) Aircraft certification

It should be noted (see Annex 2 - Part 1.2) that the specifications for aircraft certification (EASA/FAR 25) traditionally base the certification process on a maximum lateral deviation of 30ft, whatever the code of the aircraft as defined by ICAO Annex 14. Hence, the correlation in

Annex 14 between the increase of runway width from Code E to Code F (15m) and the increase in wingspan (also 15m) does not appear to correspond to the design specifications of aircraft.

The ability to use a runway of a given width (i.e. 45m or 60m) is related to the aircraft performance and specifically its capacity to correct an accidental lateral variation (a function of control surfaces' aerodynamics, flight control efficiency, landing gear geometry, etc). This forms part of aircraft design specifications and can, consequently, only be validated during the design validation process i.e. the aircraft certification. Certification specifications are clarified in Annex 2 - Part 1.

Furthermore, the aircraft manufacturer has indicated that the A380 will be certified for operations on 45m wide runways[4].

The European Aviation Safety Agency (EASA), taking over from the Joint Aviation Authorities (JAA), will carry out the A380 certification according to EASA CS-25 rules. For certification purposes, runway widths are not usually considered but in the A380 case, this will be the subject of a "Certification Review Item" (CRI), the contents of which were presented by the aircraft manufacturer and accepted by the EASA (see Annex 2 - Part 2 on the frame and objectives of the certification).[4] References: Airbus letters addressed to the General Manager of the Civil Aviation Authorities: BNEJ 823.04.96/01 dated Sept 14, 2001 and BNE 820.0190/01 dated August 23 2001

Certification validates aircraft handling qualities and performance in an environment equivalent to the expected operating environment with a standard of piloting equivalent to that of normal airline pilots. It will thus be appropriate – and this is one of the objectives of this study- to check that the prevailing environmental conditions on Runways 1 and 2 at CDG are within the bounds of those on which the certification is based.

3 – OBJECTIVE AND METHOD

a) Safety Objective

It is considered appropriate to evaluate the level of safety of the proposed provisions with those resulting from Annex 14. If those provisions are at least equivalent to those of a generic code E aircraft on a code E runway, then the level of safety for the A380 will be valid.

b) Method

The method consists in evaluating the safety objective for each risk identified by the AACG study ("Common Agreement Document of the AACG", Annex 5) by using the methods of analysis recommended by that document, and in certain cases by complementary relevant analyses.

4 – RISK ASSESSMENT

The risks and the types of accidents considered by the AACG study are the following:

I Runway lateral veer-off;

II Structural damage to the aeroplane during passage on runway shoulder in the event of a runway lateral veer-off;

III RFF (Rescue Fire Fighting) ground vehicles unable to use the runway shoulder to by-pass aircraft;

IV Difficulties of snow removal due to the position of the runway edge lights;

V Damage of runway edge lights, if not embedded, due to jet blast at take-off; and

VI Erosion of the side of the runway by jet blast, resulting in a subsequent risk of ingestion

The risks linked to runway strips and to bridges on Runways 1 and 2 were not treated in this document since those two items comply with ICAO Annex 14 code F specifications.

i) Runway lateral veer-off

The AACG identifies this risk as Type A (controlled by the balance between aircraft performance and infrastructure characteristics). The A380 will be certified for 45m wide runways. This point is explicitly documented in the aircraft specification process, which is a first in aircraft certification. The fact that this point is monitored, from the design phase to the flight tests, allows to consider that this risk of runway lateral veer-off from a 45m wide runway is as low as or possibly lower than existing Code E aircraft that operate today on Code E 45m wide runways.

Runways 1 and 2 do not present any particularities, which could invalidate studies and tests that are carried out in the frame of the aircraft certification:

- The longitudinal slopes comply with regulations and recommendations (<1%, and locally 1,25%; <0,8% in the first 900 meters);

- The transverse slopes of up to 2% exceed the ICAO recommendations (i.e. <1,5%) on the central 30m on a portion of Runways 1 and 2. Resurfacing, carried out with decreasing thickness from the axis towards the edges, leads to slopes of up to 3% (Runway 2) and 3,5% (Runway 1) beyond the 30 meters central band. Details of this excess on specific portions of the runways are shown in Annex 3 - Parts 3.2 and 3.3. It should be noted that, since its first overlay with this type of transverse slopes, there have been more than 71,000 B747-400 movements on the runway in all weather conditions without incident.

  Slopes specified by ICAO and by ITAC are recommendations, not standards, and neither document indicates if, and up to what point, slopes in excess of the recommendation may have an impact. Chapter 5 of Annex 2 includes an Airbus note* indicating the impact in the case of the A380 (load on and structural behavior of the landing gear, capacity to correct yaw, braking). For the points reviewed, Airbus considers the slopes acceptable (up to 2% in the centre and 3,5% on the edges)*. Risks of grip loss, in case of runway contamination, due to increased slope are mitigated by the changes in the procedures of snow removal linked to the runway edge lights being embedded instead of elevated (i.e. earlier execution of the snow removal operations).

* Note of the translator: based on the data available at that time

- At CDG on Runways 1 and 2, there are no curved approaches or departures.
- Prevailing weather conditions in Paris are moderate, and no extreme phenomenon[5] were recorded over the 5 last years, which would lead to frequent exposure to the certification limit (see Annex 3 - Part 3.4). Furthermore the certification process should take into account all operating conditions which the aircraft will meet, including climates that are much more extreme than those experienced in the Paris region; and
- Procedures, ensuring the quality of the pavement surface, comply with the international regulations or recommendations (inspection, warning to pilots in the event of snow removal / rubber removal, etc).

Consequently, the A380 certification on 45m wide runways according to CRI B11 and K3 specifications will guarantee that the risk of an A380 from veering off one of the Runways 1 or 2 (09R/27L or 08L/26R respectively) will not be greater than for an existing code E aircraft on those runways.

ii) Structural damage to the aeroplane during passage on runway shoulder in the event of a runway lateral veer-off

Accident studies show a residual probability of runway excursion for all aircraft, independent of their certification basis. Mitigation of this residual risk is one of the functions of the runway shoulder, which should be capable to support the occasional passage of an aeroplane without damaging the aeroplane, which could be caused either by the shoulder itself or by the runway edge lights. With regard to paved surfaces, structures of the inner and outer shoulders of Runways 1 and 2 (09R/27L or 08L/26R respectively) were compared (see Part 3.1 of document "*Justified Parameters*") with those tested by the STBA* in Toulouse (the test carried out by the STBA is summarized in Annex 3 - Part 2; the final report of this experimentation should be published soon). The structures on Runways 1 and 2 are identical to or more constraining than the "type 1" structure tested by the STBA in the framework of the Pavement Experimental Programme conducted with Airbus in Toulouse. It resisted to a static load of a simulated A380 dual tandem landing gear (Wing Landing Gear – WLG) over 18 hours without apparent damage. The dual tandem landing gear (WLG) is the external gear of A380 and therefore is the most likely to veer onto the shoulders and also in principle the most penalizing for the paved surfaces.

Considering that the foreseeable operational conditions will be less demanding than the experimental conditions of the STBA tests, it is justifiable to consider that the shoulders of Runways 1 and 2 are capable, over the entire width, of supporting an A380 passage without damaging it. The total width of the paved runway and its shoulders (75m) complies with code F specifications.

[5] Excluding the storm of December 26 1999 which paralyzed air traffic at CDG

* Note of the translator: The STBA -now named STAC- is the Technical Service of the French CAA (DGAC)

The decision of embedding the runway edge lights on Runways 1 and 2 removes the risk of damaging the aircraft by the top of the elevated lights.

The risk of an aircraft structural damage due to the passage on the runway shoulder in the event of a lateral veer-off beyond the runway width for which the aircraft will be certified will not be higher than that of a generic Code E aircraft on Code E runways[6].

iii) RFF (Rescue Fire Fighting) ground vehicles unable to use the runway shoulder to by-pass aircraft

As far as this risk is concerned, Runways 1 and 2 comply with code F specifications thanks to the 75m paved surface width, which is capable of supporting these vehicles.

iv) Difficulties of snow removal due to the position of the runway edge lights

The existing Code E aircraft have their outboard engines within a 45m runway width, but the A380 will not. Therefore snow removal must be carried out at least up to the position of the outboard engines to avoid the snow ingestion i.e. Runways 1 and 2 will be cleared beyond their full bearing strength width.

There is no risk of damaging the runway edge lights by snow removal equipment because such equipment can pass over the embedded lights.

The situation (in terms of risk of damaging the top of the edge light or in terms of ingestion) will be thus equivalent to that of today.

v) Damage of the runway edge lights, if not embedded, due to jet blast at take-off

With embedded lights, this risk is not significant.

vi) Erosion of the side of the runway by jet blast, resulting in a subsequent risk of ingestion

Runways and shoulders provide jet blast protection up to 75m wide, complying with Code F specification.

6 The total runway+shoulder width on which the aircraft can operate without being damaged is 75m, equivalent to Code F.

5 - CONCLUSION

Items (iii) and (vi): the objective described in 4a) is achieved since they comply with Code F specifications.

Item (iv): the provisions of embedding the runway edge lights will be taken so that the risk is controlled.

Item (v): embedding the runway edge lights eliminates the risk.

Items (i) and (ii): the risk is not higher (and even lower thanks to the certification process) than for generic Code E aircraft on Code E runways. The provisions taken on the Runways 09R/27L or 08L/26R thus appear adequate for the accommodation of A380s.

6 – EFFECTS ON THE USE OF THE RUNWAYS

A certain number of points discussed above have consequences on the use of Runways 1 and 2. The principal ones are:

- Checking the state of runway shoulders in the event of occasional runway lateral veer-off: the overall shoulder structure is (see Annex 3 - Part 3) at least equivalent to that which STBA[7] identified to support a passage of an A380 dual tandem landing gear (WLG) without apparent damage. In this case, inspection may not be done immediately and will be done during regular procedures. In comparison to current practice with respect to paved surfaces, these inspections will be more frequent and extended to visual and technical examination of the shoulders (e.g.: deflection measurements, radar, core sampling) to ensure the durability of the shoulder (current and future measurements are presented in Annex 3-Part 4).

- Consequences resulting from the choice of embedding the runway edge lights:

    - More frequent cleaning of the embedded lights, which will become dirty more quickly than the elevated runway edge lights;
- Earlier execution of snow removal operations, as the embedded lights are likely to be covered more quickly in the snowfall; and

[7] See Annex 3 - Part 2

    - In addition, during the preparation of the ICAO Circular on NLA Operations at Existing Aerodromes (Cir 305), pilots' representatives stressed that embedded lights are bi-directional, and that it was , in some cases, useful (e.g. for visual reference to the airport in a downwind leg) to maintain the omni-directional guidance. At CDG airport, Runways 1 and 2 are respectively close and parallel with Runways 3 and 4 (384m apart), which will keep elevated lights. Thus elevated lights of Runways 3 and 4 will still be available for guidance.

----- КРАЈ ДОКУМЕНТА ----