Savjetodavni materijal za izradu aeronautičke studije i izdavanje izuzeća

Datum: **08.08.2016**
Broj: **1-5-02-3-397/16**
Odobrio: **gen.direktor Đ.Ratkovica**

Sadržaj

1 Svrha

Svrha ovog savjetodavnog materijala je uputiti aerodromske operatore u izradu aeronautičke studije, te prikazati važnost i značaj aeronautičke studije u cilju smanjenja rizika do prihvatljive razine sigurnog odvijanja letačkih aktivnosti na aerodromu i način izdavanja izuzeća.

2 Pojmovi i kratice

Pojmovi:

aeronautička studija	*podrazumijeva studiju problema kojima se identificira i vrši odabir mogućih rješenja koja su prihvatljiva, a neće narušiti sigurnost*
propisi	*podrazumijevaju zakonske i podzakonske akte koji se objavljuju u Službenom glasniku BiH, a koji se odnose na provedbu ICAO Standarda i preporučene prakse i provedbu propisa sadržanih u ECAA sporazumu, Aneks I sa svim njegovim izmjenama i dopunama koje su na snazi. Propisi u smislu ove odluke ne podrazumijevaju EC Uredbe (EC regulation) koje se primjenjuju izravno.*

Kratice:

AGA	*Aerodromes, air routes and ground aids – Aerodromi, zračni putevi i zemaljska sredstva*
AIP	*Aeronautical Information Publication – Zbornik zrakoplovnih informacija*
ANAD	*Air Navigation and Airport Division - Sektor za zrakoplovnu navigaciju i aerodrome*
BHDCA	*Bosnia and Herzegovina Directorate of Civil Aviation - Direkcija za civilno zrakoplovstvo Bosne i Hercegovine*
DG	*BHDCA Director General– Generalni direktor BHDCA*
ICAO	*International Civil Aviation Organization - Međunarodna organizacija civilnog zrakoplovstva*

3 Veza s drugim dokumentima

- Pravilnik o uvjetima i načinu izdavanja potvrde aerodromskom operatoru, Izmjene i dopune Pravilnika o uvjetima i načinu izdavanja potvrde aerodromskom operatoru
- Odluka o visini pristojbi za usluge iz nadležnosti Direkcije za civilno zrakoplovstvo BiH
- Pravilnik o aerodromima
- Manual on Certification of Aerodromes – ICAO doc.9774 AN/969
- Safety Management Manual – ICAO doc.9859

4 Aeronautička studija

Aeronautička studija je studija problema kojima se identificira i vrši odabir mogućih rješenja koja su prihvatljiva, a neće narušiti sigurnost. (ICAO doc.9774).

Aeronautička studija je pisani dokument u kojem se na temelju važećih zakonskih propisa, te znanstvenih i stručnih priručnika primjenom jedne ili više odgovarajućih znanstvenih metoda od strane ovlaštenog inženjera tehnologije zračnog prometa utvrđuje:

- Da li, u kojem stupnju i na koji način, odgovarajuće odstupanje od važećih zakonskih propisa utječe na sigurnost operacija zrakoplova, te ako utječe
- Moguće alternativne mjere i postupke u cilju osiguranja maksimalne sigurnosti operacija zrakoplova, kao i
- Stupanj učinkovitosti svake od predloženih mjera i postupaka, usmjerenih na smanjenje utjecaja na sigurnost, prouzročenog analiziranim odstupanjem od važećih propisa.

4.1 Cilj

Aeronautička studija se izrađuje u cilju:

a) Dokazivanja da su već izgrađeni ili planirani (novi) objekti na aerodromu i u njegovoj neposrednoj okolini, te prepreke u prostoru, sukladno važećim zakonskim propisima, ili

b) Utvrđivanja da li, u kojem stupnju i na koji način, odgovarajuće odstupanje od važećih zakonskih propisa utječe na sigurnost operacija zrakoplova, te ako utječe

c) Definiranja mogućih alternativnih mjera i postupaka u cilju osiguranja maksimalne sigurnosti operacija zrakoplova, kao i

d) Detaljne procjene učinkovitosti svake od predloženih mjera i postupaka, usmjerenih na smanjivanje utjecaja na sigurnost prouzročenog odgovarajućim izuzećem.

4.2 Primjenjivost

Aeronautička studija se izrađuje uvijek kada:

- Se planira izgradnja novog ili nadogradnja ili rekonstrukcija postojećega objekta na aerodromu i u njegovoj blizini, te kada
- Zbog određenih objektivnih činjenica nije moguće poštovati važeće zakonske propise, a u cilju dobivanja od BHDCA sljedećih dokumenata:
    1. Rješenje za uporabu aerodroma,
    2. Potvrdu za aerodrom,
    3. Posebno odobrenje (suglasnost) za projektiranje, gradnju ili označivanje aerodroma i drugih objekata koji mogu utjecati na sigurnost zrakoplova,
    4. Prethodne suglasnosti za izgradnju i postavljanje zrakoplovnih prepreka izvan područja aerodroma koje prelaze propisanu visinu,
    5. Suglasnosti na predložene popravne mjere u cilju otklanjanja neusklađenosti utvrđenih tokom redovnih i izvanrednih nadzora operatora aerodroma.

4.3 Sudionici u izradi aeronautičke studije

Aeronautičku studiju može izraditi aerodromski operator ili ovlaštena fizička ili pravna osoba koja je kompetentna i stručna u području civilnog zrakoplovstva.

4.4 Izrada aeronautičke studije u 9 koraka

Aeronautička studija podrazumijeva sustavni i dokumentirani pristup problemu koji se može izraditi kroz 9 koraka, a to su:

1. Opis problema i ciljeva
2. Odabir postupaka, metoda i izvora podataka
3. Identificiranje neželjenih događaja
4. Analiza uzročnih čimbenika, ozbiljnost i vjerojatnost
5. Opis rizika
6. Identificiranje mogućih mjera ublažavanja
7. Procjena učinkovitosti mjera ublažavanja
8. Izbor mjera ublažavanja
9. Izlaganje rezultata.

5 Prihvatanje/odbijanje aeronautičke studije od strane regulatora (BHDCA)

Pravo prihvatanja ili odbijanja rezultata aeronautičke studije počiva isključivo na regulatoru.

6 Izuzeća

Izuzeće se odnosi na to da operator aerodroma može odstupiti od određenih standardnih propisanih uvjeta i postupaka, koji se mogu postići na drugi način, a pri tome se ne narušava sigurnost operacija.

Odstupanje operatora je uvjetovano time da operator radi u skladu sa uvjetima i postupcima određenim u potvrdi, budući da je to od bitnog interesa za sigurnost operacija na aerodromu.

Operator aerodroma je, uz zahtjev za izuzeće, obvezan dostaviti u BHDCA i dokaz o uplati radi provođenja postupka odobravanja izuzeća, a sukladno članku 45. stavak (1) Odluke o visini pristojbi za usluge iz nadležnosti Direkcije za civilno zrakoplovstvo BiH. Na zahtjev operatora aerodroma, BHDCA može, nakon cjelovito provedenog postupka, odobriti odgovarajuće izuzeće u pismenom obliku.

Odobrenje za izuzeće od važećih propisa donosi BHDCA na temelju izrađene aeronautičke studije i potpisane od ovlaštenog inženjera tehnologije zračnog prometa, u slučaju kada je predloženim alternativnim mjerama i/ili postupcima osigurana najveća sigurnost operacija zrakoplova. Odobrenje za izuzeće od važećih propisa BHDCA može izdati:

- Na određeno vremensko razdoblje, s ograničenim rokom trajanja, ili
- Trajno.

Na temelju izdatog odobrenja kojim operatoru aerodroma BHDCA dopušta odstupanje od važećih zakonskih propisa, operator aerodroma je obvezan u Zborniku zrakoplovnih informacija (AIP) objaviti sljedeće:

- Sažet opis odstupanja od propisa za koje je izdano odobrenje,
- Vremenski rok u kojem je odstupanje od zakonskih propisa odobreno,
- Mjere i postupke čija je primjena obvezna u cilju otklanjanja posljedica koje po sigurnost operacija zrakoplova može imati odobreno odstupanje,
- Sve moguće opasnosti po sigurnost operacija zrakoplova koje mogu nastati primjenom odobrenih alternativnih mjera i postupaka, odobrenih u cilju otklanjanja opasnosti, prouzročene odobrenim odstupanjem od važećih zakonskih propisa.

7 Privitak

7.1 Primjer: "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.

----- KRAJ DOKUMENTA ----