# Belize Department of Civil Aviation

## Short Description

This safety assessment is intended to determine the required RESA lenght at both runway ends for Philip Goldson International Airport (MZBZ) in accordance with BCAR regulation 14.209

BDCA AGA UNIT/ACSA. NOVEMBER 2023

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# SAFETY ASSESSMENT

## DISTANCE REQUIRED FOR RUNWAY END SAFETY AREAS PHILIP GOLDSON INTERNATIONAL AIRPORT (MZBZ)

## 1. ORIGIN OF THIS ANALYSIS

In a review of the regulation BAR 14.109 Runway end safety areas, it is possible to identify a contradiction in the dimensions of the RESA, since in the article BCAR 14.209 (b) it is established that the minimum required dimension is 90 m after the strip. However, BCAR 14.209(c) states that for new aerodromes constructed prior to the enactment of the regulation it must be at least 240 m after the strip for aerodromes with code number 3 or 4.

Through an interview with the personnel who developed the regulation, it has been identified that this discrepancy responds to an error in the wording, since the intended spirit of article BCAR 14.209 (c) was to establish that any new key aerodrome 3 or 4 that was built in the future would adopt the 240 of RESA as a standard.

Regardless of the causes, the truth is that the regulation produces a double requirement for the same matter that makes the minimum required distance unclear. Good regulatory practice requires that in a case like this, the most restrictive regulation be taken as applicable, i.e. 240 m, however, due to the fact that the area and quality of the land beyond the current RESA of 90 m do not allow compliance with 240 m requirement. This safety assessment is prepared to identify if the current distances are sufficient to maintain the level of risk in levels as low as reasonably practicable as indicated at the end of BCAR 14.209(c), which also provides that distances may be less if a safety assessment demonstrates that the distances set forth in item (b) are sufficient.

For clarity, the above-quoted article is transcribed below:

**BCAR 14.209 Runway end safety areas**
(See IEM 14.209(a))

**General**

(a) A runway end safety area shall be provided at each end of a runway strip where:

(1) the code number is 3 or 4; and
(2) The code number is 1 or 2 and the runway is an instrument one.

A runway end safety area should be provided at each end of a runway strip where the code number is 1 or 2 and the runway is a non-instrument one.

Appendix 1 to BCAR 14.253 provides guidance on the areas of runway end safety.

**Dimensions of runway end safety areas**

(b) A runway end safety area shall extend from the end of a runway strip to a distance of at least 90 m. If an arresting system is installed, the above length may be reduced, based on the design specification of the system, subject to acceptance by the BDCA.

(c) For new aerodromes constructed before this regulation is in force a runway end safety area shall, extend from the end of a runway strip to a distance of at least:

(1) 240 m where the code number is 3 or 4; Or a reduced length when an arresting system is installed, based on the design specification of the system, subject to acceptance by the BDCA. ;

(2) 120 m where the code number is 1 or 2 and the runway is an instrument one. Or a reduced length when an arresting system is installed based on the design specification of the system, subject to acceptance by the BDCA.

Unless an operational safety assessment accepted by the BDCA demonstrates that it is safe to use the distances indicated in BCAR 14.209.(a)

(d) The width of a runway end safety area shall be at least twice that of the associated runway.

## 2. CHARACTERIZATION OF THE ANALYSIS

### 2.1. Runway physical characteristics

**MZBZ AD 2.12 CARACTERÍSTICAS FÍSICAS DE LAS PISTAS**
***RUNWAY PHYSICAL CHARACTERISTICS***

| **Designador RWY NR** *Designations RWY NR* | **BRG GEO** *True BRG* | **Dimensiones de RWY (M)** *Dimensions of RWY (M)* | **Resistencia (PCN) y superficie de RWY y SWY** *Strength (PCN) and surface of RWY and SWY* | **Coordenadas THR RWY y coordenadas THR de ondulación geoidal** *THR coordinates RWY end coordinates THR geoid undulation* | **Elevación THR y elevación máxima de TDZ de precisión APP RWY** *THR elevation and highest elevation of TDZ of precision APP RWY* |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 07 | 077.05º GEO<br>077.48º MAG | 2950 x 45 | PCN 61/F/C/W/U<br>Hormigón/ *Concrete* | 173212.8422N<br>0881905.2488W<br>------<br>- | THR 4.51M / 15FT<br>TDZ 4.57M / 15FT |
| 25 | 257.06º GEO<br>257.49º MAG | 2950 x 45 | PCN 61/F/C/W/U<br>Hormigón/ *Concrete* | 173234.3386N<br>0881727.7567W<br>------<br>- | THR 4.16M / 14FT |

| **Designador RWY NR** *Designations RWY NR* | **Pendiente de RWY-SWY** *Slope of RWY-SWY* | **Dimensiones SWY** *SWY dimensions* ***(M)*** | **Dimensiones CWY** *CWY dimensions* ***(M)*** | **Dimensiones de franja** *Strip dimensions* ***(M)*** | **Dimensiones RESA** *RESA dimensions* ***(M)*** |
|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 |
| 07 | +0.01% | NIL | 212 | 3070 x 280 | 90 x 90 |
| 25 | +0.01% | NIL | 350 | 3070 x 280 | 90 x 90 |

## 2.2. Types and number of operations in the MZBZ 2022-2023

**2022** **P.S.W.GOLDSON INTERNATIONAL AIRPORT** **CIVIL AVIATION STATISTICS**

**AIRCRAFT MOVEMENT**

| MONTH | JAN | FEB | MARCH | APRIL | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | ACCRUED TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| 1. INTL SCHEDULED | 855 | 752 | 870 | 839 | 733 | 656 | 742 | 668 | 426 | 456 | 577 | 696 | 8270 |
| 2. INTL UNSCHEDULED | | | | | | | | | | | | | |
| INTL TOTAL | 855 | 752 | 870 | 839 | 733 | 656 | 742 | 668 | 426 | 456 | 577 | 696 | 8270 |
| 3. DOMESTIC MVMT | 2302 | 2431 | 3130 | 2745 | 2319 | 2405 | 2493 | 1899 | 1238 | 1447 | 2005 | 2582 | 26996 |
| TOTAL MVMT | 3157 | 3183 | 4000 | 3584 | 3052 | 3061 | 3235 | 2567 | 1664 | 1903 | 2582 | 3278 | 35266 |
| PRIVATE A/C | 60 | 76 | 87 | 79 | 66 | 48 | 51 | 47 | 50 | 44 | 60 | 55 | 723 |
| MILITARY A/C | 23 | 10 | 15 | 14 | 26 | 9 | 7 | 8 | 8 | 1 | 6 | 4 | 131 |
| TOTAL P&M A/C MVMT | 83 | 86 | 102 | 93 | 92 | 57 | 58 | 55 | 58 | 45 | 66 | 59 | 854 |

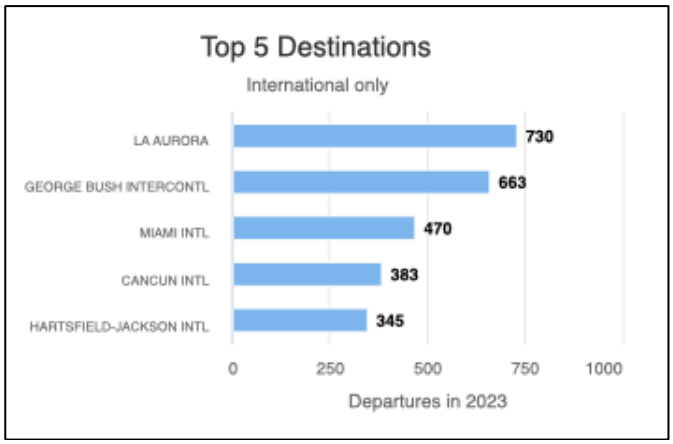
**Total Movements** **36120**

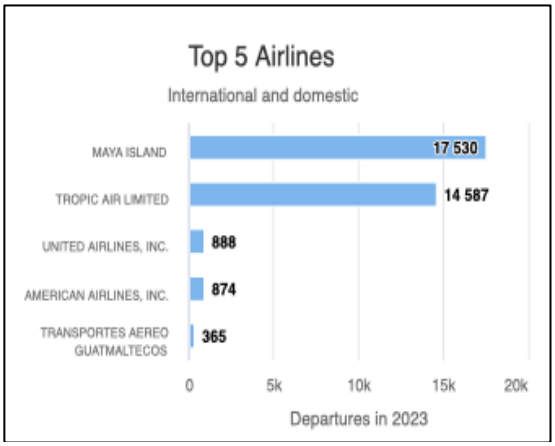
| 2023 | P.S.W.GOLDSON INTERNATIONAL AIRPORT | | | | | | CIVIL AVIATION STATISTICS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AIRCRAFT MOVEMENT** | | | | | | | | | | | | | |
| **MONTH** | **JAN** | **FEB** | **MARCH** | **APRIL** | **MAY** | **JUNE** | **JULY** | **AUG** | **SEPT** | **OCT** | **NOV** | **DEC** | **ACCRUED TOTAL** |
| | | | | | | | | | | | | | |
| **1. INTL SCHEDULED** | 771 | 732 | 872 | 751 | 632 | 683 | | | | | | | 4441 |
| **2. INTL UNSCHEDULED** | | | | | | | | | | | | | |
| **INTL TOTAL** | 771 | 732 | 872 | 751 | 632 | 683 | 0 | 0 | 0 | 0 | 0 | 0 | 4441 |
| **3. DOMESTIC MVMT** | 3195 | 3051 | 2892 | 2574 | 2071 | 1952 | | | | | | | 15735 |
| **TOTAL MVMT** | 3966 | 3783 | 3764 | 3325 | 2703 | 2635 | 0 | 0 | 0 | 0 | 0 | 0 | 20176 |
| **PRIVATE A/C** | 75 | 72 | 95 | 82 | 49 | 53 | | | | | | | 35911 |
| **MILITARY A/C** | 7 | 15 | 7 | 7 | 6 | 4 | | | | | | | 56087 |
| **TOTAL A/C MVMT** | 853 | 819 | 974 | 840 | 687 | 740 | 0 | 0 | 0 | 0 | 0 | 0 | 96439 |
| | | | | | | | | | | | **Total Movements** | | **116615** |

## 2.3. International Operations MZBZ

Philip S W Goldson Intl served 21 international destinations in 2023. The most flow international destination is LA AURORA in Belize with 730 flights per year.

14 airlines operate regularly out of Philip S W Goldson Intl. The first airline is MAYA ISLAND from Belize with 17530 departures per year.

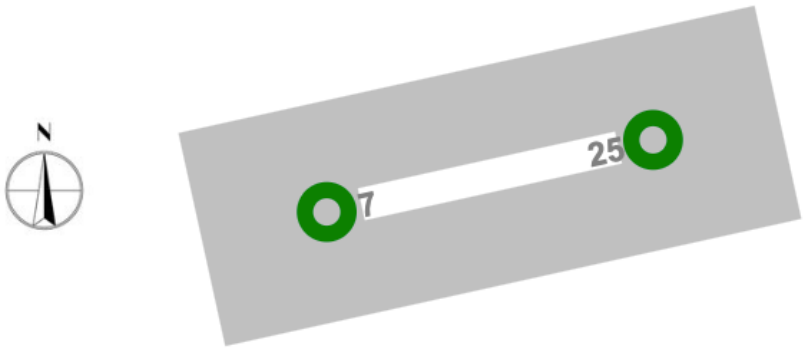


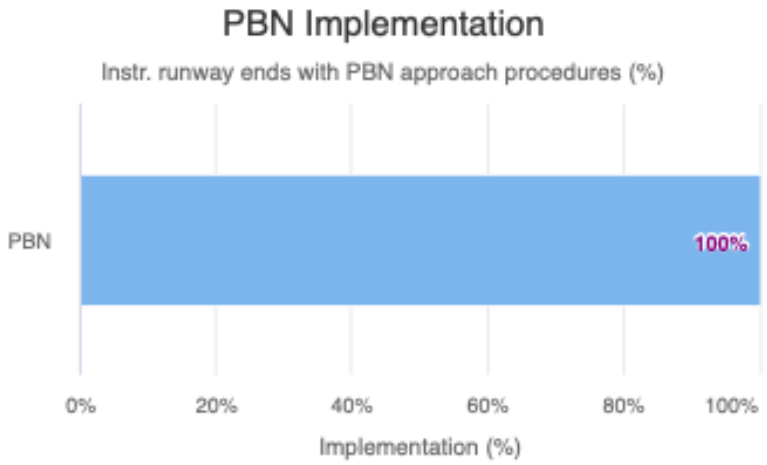

**International Destinations MZBZ**

## 2.4. Runway and PBN approach procedures

Philip S W Goldson Intl has 1 runway with a total of 2 runway ends with instrument approach procedures.




100% of the instrument runway ends have performance based navigation (PBN) approach procedures published.




100% of the instrument runway ends have performance-based navigation (PBN) approach procedures published.

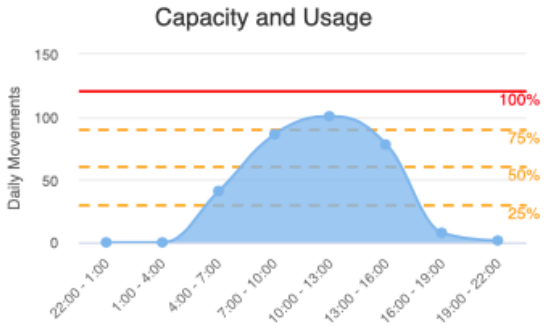
| Runway | Landing Distance Available (m) | Conventional | | Conventional | | | | | SIDs | | STARs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-Precision | Precision | LNAV | LNAV/VNAV | LPV | RNP/AR | UNK | Conv. | RNAV | Conv. | RNAV |
| 25 | 2950 | x | | x | x | | | | x | | | x |
| 7 | 2950 | | x | x | x | | | | x | | | x |

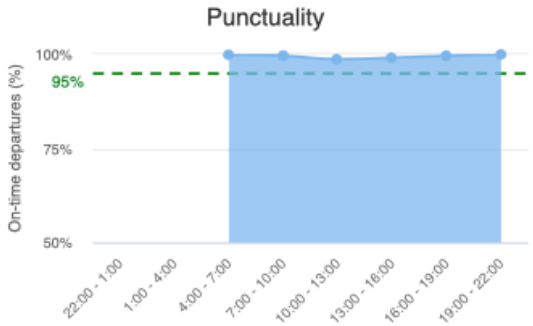
The approach, arrival and departure procedures available on each runway end are listed below. Non-instrument runways are marked in italic, if any.

## 2.5. Capacity and Usage

Philip S W Goldson Intl has an average of 315 daily movements. The peak period is between 10:00 and 13:00 local time and counts in average 101 +- 38 movements in 3 hours. Based on the runway layout of Philip S W Goldson Intl, the total estimated maximum throughput capacity (MTC) in every 3-hour period is approximately 120, based on a theoretical hourly MTC per parallel runway of 40 movements per hour.

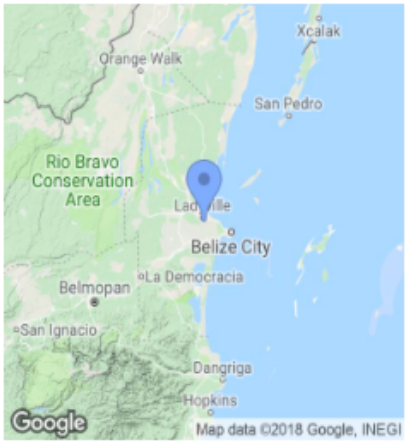
At peak period, Philip S W Goldson Intl is running approximately at 83.91% of its capacity. The on-time departure performance drops to 98.71% between 10:00 and 13:00.

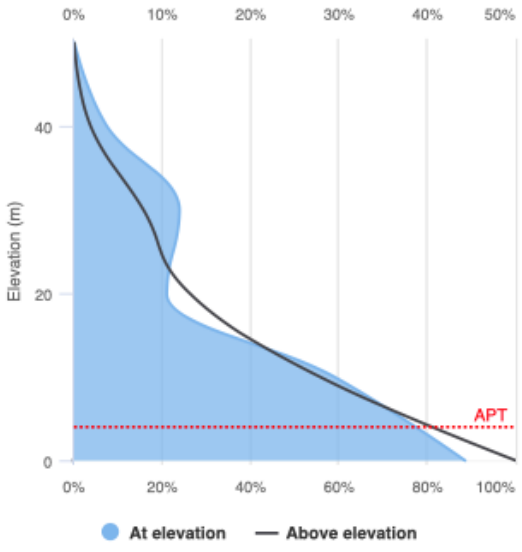



## 2.6. Terrain Challenge

Philip S W Goldson Intl is located at 4m ASL (above sea level). 0% of the terrain surrounding the airport in 20NM is higher than 300 m above the airport height.

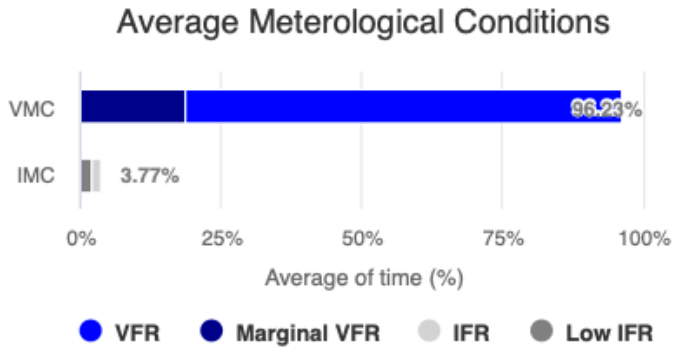


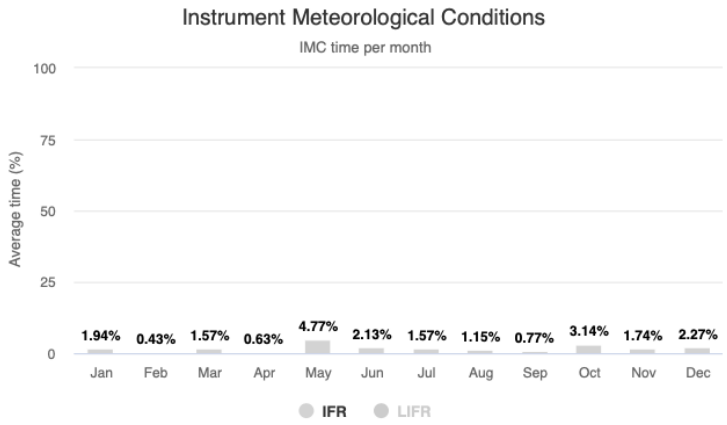



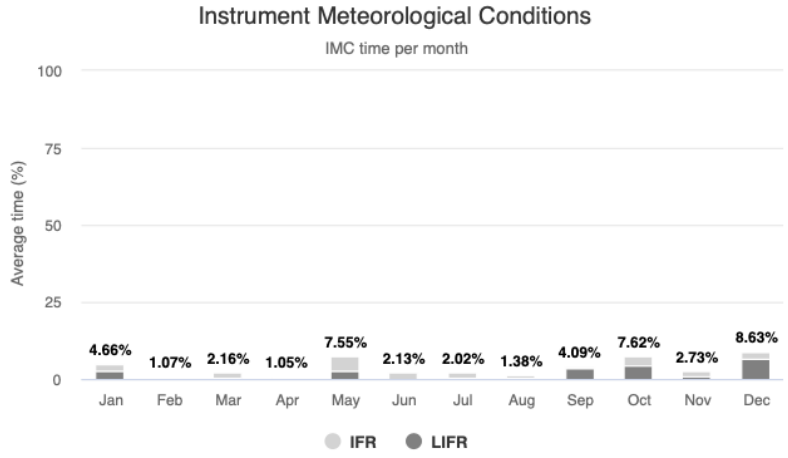
## 2.7. Meteorological conditions

### 2.7.1. Average

Philip S W Goldson Intl is 96.23% of the time per year in visual meteorological conditions (VMC) and 3.77% in instrument meteorological conditions (IMC). IMC conditions exist when the outside view from an aircraft is restricted in such a way that aircraft control and navigation can only be carried out using special flight instruments. The airport has a new primary and secondary radar system that allows surveillance-based air traffic control procedures which are implemented by the ATS service provider.



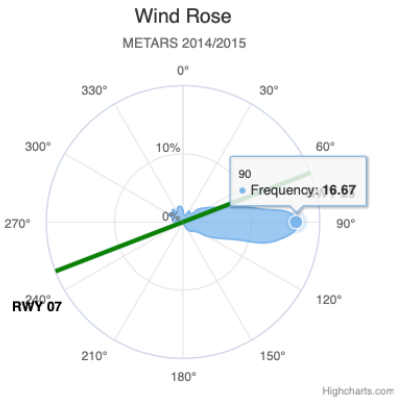



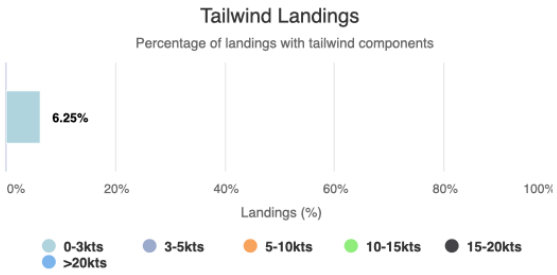
### 2.7.2. Wind Conditions

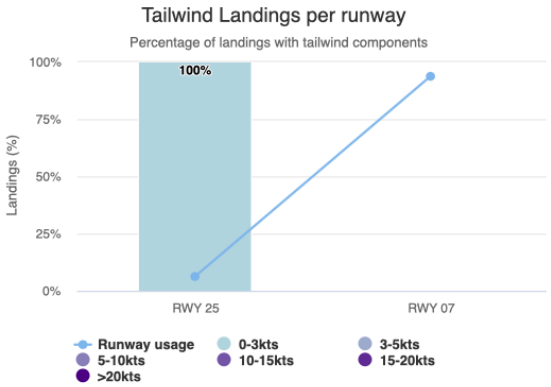
The diagram shows the frequency of prevailing winds at Philip S W Goldson Intl airport from each directions per month in relation to instrument landing runways. Wind directions are in True North and the magnetic runway direction are compensated for -1.17126 magnetic declination at Philip S W Goldson Intl airport to be true in reference to wind directions. Philip S W Goldson Intl airport has a 90.7% chance for prevailing wind conditions.

The lines indicate approach paths to the airport in the center.Only instrument approaches are shown.The colors inducate the level of service provided(see runways and PBN section for more details).




### 2.7.3. Tailwind landings



## 3. ACCIDENTS AND INCIDENTS

### 3.1. Overruns and undershoots occurred

1- According to the AIG unit of Belize there are no records of overruns or undershoots at the MZBZ
2- According to the Aviation Safety Network there are no occurrences of accidents or incidents at the MZBZ since 1962
3- No accidents or mayor incidents has been reported at MZBZ in the las 10 years records in the ICAO accidents portal.

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**Belize City-Philip S.W. Goldson International Airport profile**

**General data**

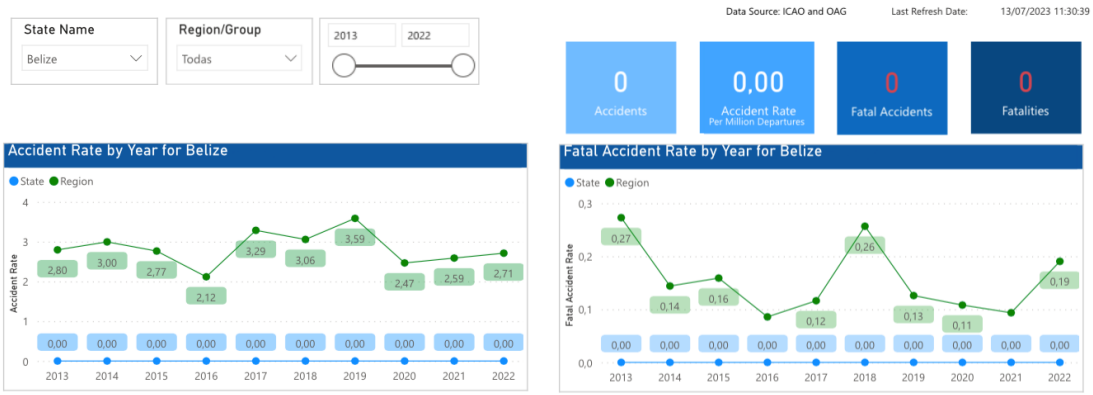
**Belize City-Philip S.W. Goldson International Airport**
Belize
**IATA code:** BZE
**ICAO code:**MZBZ
**Elevation:** 15 feet / 5 m

**Aircraft accidents at or near Belize City-Philip S.W. Goldson International Airport (BZE)**

no occurrences in the database

**Aircraft that departed Belize City-Philip S.W. Goldson International Airport**

| date | type | registration | operator | fat. | location | pic | cat |
|---|---|---|---|---|---|---|---|
| 18-NOV-2005 | BN-2A-21 Islander | V3-HFO | Blancaneaux Lodge | 3 | near Privacion Airstrip | | A1 |
| 27-DEC-2002 | Cessna 208B Grand Caravan | V3-HGH | Tropic Air | 0 | near San Pedro Airpor... | | A2 |
| 24-MAY-1988 | Boeing 737-3T0 | N75356 | TACA | 0 | near New Orleans Inte... | | I2 |
| 06-JAN-1962 | Curtiss C-46A | HR-TNB | TAN | 1 | Belize City-Phil... | | A1 |



## 4. AIRPORT BRIEFING SUMMARY

**PHYSICAL CHARACTERISTICS**

| Subject | Characteristics |
|---|---|
| RWY 07 TORA | 2,950m |
| RWY 25 TORA | 2,950m |
| RWY 07 LDA | 2,950m |
| RWY 25 LDA | 2,950m |
| RWY 07 ASDA | 2,950m |
| RWY 25 ASDA | 2,950m |
| RESA 07 | 90 x 90 m |
| RESA 25 | 90 x 90 m |

**Departures**

| Type | Quantity | A/C Reference code |
|---|---|---|
| International 2022 | 8,270 | 4C |
| Domestic 2022 | 26,996 | 1A |
| International 2023 | 7,960 | 4C |
| Domestic 2023 | 25,123 | 1A |

**Meteorological conditions**

The analysis of the data shows that 96.23% of the operations can be carried out with VFR procedures and that 3.77% of the operations can be carried out with IFR procedures. Likewise, the MZBZ does not present significant crosswind conditions during any month of the year and only 6.25% of the operations were carried out with tailwinds of less than 3 knots.

**Terrain challenge**

Negligible. There are no obstacles within a 20 NM radius of more than 300 feet. There are no obstacles on any of the approaches and clearways are declared on both sides of the runway.

**Overruns or undershoots.**

There are no reports of these occurrences in the last 40 years.

## 5. THEATS

According to the information obtained for the MZBZ, this airport has optimal location conditions, it does not have traffic congestion conditions and its meteorological conditions can be considered optimal in terms of wind direction, runway drainage and visibility.

## 6. SAFETY ASSESSMENT

Three safety assessments were carried out related to landing and takeoff operations in both directions.

Two safety events are identified as possible main causes of specific top events with overruns beyond 90 m of the LDA and the ASDA, depending on whether the operation is landing or takeoff.

- Contaminated Runway; or
- Aircraft failure

The proactive defenses to avoid the inability to brake in the LDA in case of landing or in the ASDA in case of aborted takeoff are many, all of which are strong defenses since they are fully implemented.

These proactive defenses involve different areas of air navigation: Operations, Airworthiness, Air Navigation Services, NAVAIDS electronic equipment, primary and secondary radar control that allows surveillance approach control procedures, redundant braking systems, permanent meteorological information, conditions of adequate macrotexture and microtexture runway and friction coefficient measurements on a continuous basis and good runway drainage conditions.

On the other hand, even if any of the top events occurred, there are reactive barriers implemented that could recover control of the top event or mitigate the probability of the consequences of the aircraft exceeding the 90 m length of the RESA on an overrun or suffering excessive damage.

### 6.1. Other mitigating factors

#### 6.1.1. Runway length.

As can be seen in the traffic statistics, only 23% of traffic requires runway T-O lengths (TOR) of more than 2,200 m. The rest of the traffic is conformed of aircraft, mostly Cessna 208, which in standard atmosphere conditions at 15 m above sea level and 32º C temperature, standard flaps, does not exceed 800 m TOR Therefore this traffic does not require RESA to avoid an overrun.

#### 6.1.2. Terrain Challenge.

Philip S W Goldson Intl is located at 4m ASL (above sea level). 0% of the terrain surrounding the airport in 20NM is higher than 300 m above the airport height.

#### 6.1.3. Visibility

Philip S W Goldson Intl is 96.23% of the time per year in visual meteorological conditions (VMC) and 3.77% in instrument meteorological conditions (IMC).

#### 6.1.4. Wind Direction

Philip S W Goldson Intl airport to be true in reference to wind directions. Philip S W Goldson Intl airport has a 90.7% chance for prevailing wind conditions.

#### 6.1.5. Tailwinds landings

Only 6.25% of operations with tailwind between 0-3 Kts

#### 6.1.6. Overrun Statistics

Any Overrun occurrence where found in the PGIA in the last 60 years. As matter of fact the likelihood in terms of probability is negligible.

## 7. RISK LEVELS

**Landing operation 07 and 25**

- For the event of inability to brake in the LDA in both runways considering the strength and quantity of redundances and the likelihood of occurrence: both Inherent and residual risk: B1
- For the consequence Overrrun beyond 150 m from de LDA: B1
- For the consequence Damage to Aircraft C1

**Take-off operation 07 and 25**

- For the event of inability to brake in the ASDA in both runways considering the strength quantity of redundances and the likelihood of occurrence: both Inherent and residual risk: B1
- For the consequence Overrrun beyond 150 m from de LDA: B1
- For the consequence Damage to Aircraft C1

## 8. Conclusion

Taking into account what is indicated in article BCAR 14,209 in relation to the Dimensions of the Runway end safety area point (c), last paragraph, after analyzing the threats, mitigating factors, and risk levels found in a safety assessment, this report concludes that 90x90 m RESAS at both ends of the runway are sufficient and that it is not necessary to implement 240 m RESAS at the MZBZ.

# ANNEX 1

## BOW TIE RISK ASSESSMENT REPORT

# BowTie Report

## Contents

## Barrier register

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| **OPS SOP** | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) OPS SOP | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Standard operation procedures in place |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS SOP | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Standard operation procedures in place |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) OPS SOP | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Standard operation procedures in place |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS SOP | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Standard operation procedures in place |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Emergency operation procedures in place |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| ASDA / (S.E) Contaminated Runway / (Br.) OPS SOP | | | | | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) OPS SOP | ST Socio technical | ++ Very Good | High Critical | AOC7 Pilot | Emergency operation procedures in place |
| BRAKING Antiskid System | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) BRAKING Antiskid System | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) BRAKING Antiskid System | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) BRAKING Antiskid System | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| / (Br.) BRAKING Antiskid System | | | | | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) BRAKING Antiskid System | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) BRAKING Antiskid System | A-HW Active hardware | ++ Very Good | Std Standard | ADR2 Maintenance staff | A system to mitigate skid improoving rolling resistance |
| Braking systems: 2 main, 1 emergency | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Braking systems: 2 main, 1 emergency | A-HW Active hardware | ++ Very Good | High Critical | ADR2 Maintenance staff | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Braking systems: 2 main, 1 emergency | A-HW Active hardware | ++ Very Good | High Critical | ADR2 Maintenance staff | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to | A-HW Active | ++ Very Good | High Critical | ADR2 Mainten | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) Braking systems: 2 main, 1 emergency | hardware | | | ance staff | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) Braking systems: 2 main, 1 emergency | A-HW Active hardware | ++ Very Good | High Critical | ADR2 Maintenance staff | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Braking systems: 2 main, 1 emergency | A-HW Active hardware | ++ Very Good | High Critical | ADR2 Maintenance staff | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Braking systems: 2 main, 1 emergency | A-HW Active hardware | ++ Very Good | High Critical | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) | A-HW Active hardware | ++ Very Good | Std Standard | AOC7 Pilot | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| BRAKING Spoilers speed brakes | | | | | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) BRAKING Spoilers speed brakes | A-HW Active hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) BRAKING Spoilers speed brakes | A-HW Active hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) BRAKING Spoilers speed brakes | A-HW Active hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) BRAKING Spoilers speed brakes | A-HW Active hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing | A-HW Active | ++ Very Good | Std Standard | AOC7 Pilot | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| Distance Available / (S.E) Equipment failure / (Br.) BRAKING Spoilers speed brakes | hardware | | | | |
| BRAKING Engine reverse | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) BRAKING Engine reverse | A-HW Active hardware | ++ Very Good | High Critical | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) BRAKING Engine reverse | A-HW Active hardware | ++ Very Good | High Critical | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) BRAKING Engine reverse | A-HW Active hardware | ++ Very Good | High Critical | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) BRAKING Engine reverse | A-HW Active hardware | ++ Very Good | High Critical | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de | A-HW Active | ++ Very Good | High Critical | AOC7 Pilot | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) BRAKING Engine reverse | hardware | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) BRAKING Engine reverse | A-HW Active hardware | ++ Very Good | High Critical | AOC7 Pilot | |
| Visual Aids. | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings (THR, TDZ, RWYcentreline, RWY edge stripes, PAPI lights,RWY edge lights, RWY end lights) |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings (THR, TDZ, RWYcentreline, RWY edge stripes, PAPI lights, RWY edge lights, RWY end lights) |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings (THR, TDZ, RWYcentreline, RWY edge stripes, PAPI lights, RWY edge lights, RWY end lights) |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings (THR, TDZ, RWYcentreline, RWY edge stripes, PAPI lights, RWY edge lights, RWY end lights) |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings ( RWY edge lights, RWY end lights) |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) Visual Aids. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | Runway Markings (RWY edge lights, RWY end lights) |
| Pilot monitoring an resolution | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Damage to the aircraft / (Br.) Pilot monitoring an resolution | BEH Behavioural | ? Unassessed | Std Standard | AOC7 Pilot | |
| Runway Strip | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) | C-HW Continuous | + Good | High Critical | AOC1 Operator | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| Overrrun beyond 150 m from the LDA / (Br.) Runway Strip | hardware | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Runway Strip | C-HW Continuous hardware | + Good | High Critical | AOC1 Operator | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) Runway Strip | C-HW Continuous hardware | + Good | High Critical | AOC1 Operator | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Runway Strip | C-HW Continuous hardware | + Good | High Critical | AOC1 Operator | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) Runway Strip | C-HW Continuous hardware | + Good | High Critical | AOC1 Operator | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Damage to the aircraft / (Br.) Runway Strip | C-HW Continuous hardware | + Good | High Critical | AOC1 Operator | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| **RESA 90x90 m** | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Damage to the aircraft / (Br.) RESA 90x90 m | C-HW Continuous hardware | ++ Very Good | High Critical | AOC1 Operator | |
| RFF Service | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Overrrun beyond 150 m from the LDA / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Damage to the aircraft / (Br.) RFF Service | ST Socio technical | ? Unassessed | High Critical | ERP1 Emergency service organization | |
| OPS On flight landing distance required calculation | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) OPS On flight landing distance required calculation | C-HW Continuous hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS On flight landing distance required calculation | C-HW Continuous hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) | C-HW Continuous | ++ Very Good | Std Standard | AOC7 Pilot | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| Contaminated Runway / (Br.) OPS On flight landing distance required calculation | hardware | | | | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS On flight landing distance required calculation | C-HW Continuous hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| ANS-MET METAR information | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) ANS-MET METAR information | ST Socio technical | ++ Very Good | Std Standard | ANS1 ATS organization | Continous METARS, ATIS, and SPECI |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) ANS-MET METAR information | ST Socio technical | ++ Very Good | Std Standard | ANS1 ATS organization | Continous METARS, ATIS, and SPECI |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) ANS-MET METAR information | ST Socio technical | ++ Very Good | Std Standard | ANS1 ATS organization | Continous METARS, ATIS, and SPECI |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) ANS-MET METAR information | ST Socio technical | ++ Very Good | Std Standard | ANS1 ATS organization | Continous METARS, ATIS, and SPECI |
| Grooved ridgid pavement. | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Grooved ridgid pavement. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Grooved ridgid pavement. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) Grooved ridgid pavement. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) Grooved ridgid pavement. | C-HW Continuous hardware | + Good | Std Standard | ADR2 Maintenance staff | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| **Glideslope and overspeed warning systems** | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Glideslope and overspeed warning systems | C-HW Continuous hardware | + Good | Std Standard | ANS7 Other | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Glideslope and overspeed warning systems | C-HW Continuous hardware | + Good | Std Standard | ANS7 Other | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Glideslope and overspeed warning systems | C-HW Continuous hardware | + Good | Std Standard | ANS7 Other | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) Glideslope and overspeed warning systems | C-HW Continuous hardware | + Good | Std Standard | ANS7 Other | |
| **OPS Go arround procedures** | | | | | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) OPS Go arround procedures | BEH Behavioural | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS Go arround procedures | BEH Behavioural | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) OPS Go arround procedures | BEH Behavioural | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) OPS Go arround procedures | BEH Behavioural | ++ Very Good | Std Standard | AOC7 Pilot | |
| ANS ATC RWY conditions information | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) | ST Socio technical | + Good | Std Standard | ANS2 ATCOs and FIS staff | Standard ATC procedures for RWY condition notification |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| ANS ATC RWY conditions information | | | | | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) ANS ATC RWY conditions information | ST Socio technical | + Good | Std Standard | ANS2 ATCOs and FIS staff | Standard ATC procedures for RWY condition notification |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) ANS ATC RWY conditions information | ST Socio technical | + Good | Std Standard | ANS2 ATCOs and FIS staff | Standard ATC procedures for RWY condition notification |
| Friction measurment procedures and rubber removal procedures | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Friction measurment procedures and rubber removal procedures | ST Socio technical | + Good | Std Standard | AOC1 Operator | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) Friction measurment | ST Socio technical | + Good | Std Standard | AOC1 Operator | |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| procedures and rubber removal procedures | | | | | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) Friction measurment procedures and rubber removal procedures | ST Socio technical | + Good | Std Standard | AOC1 Operator | |
| Insurance | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Insurance | ST Socio technical | ++ Very Good | Std Standard | ATO5 Other | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (Cons.) Damage to the aircraft / (Br.) Insurance | ST Socio technical | ++ Very Good | Std Standard | ATO5 Other | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (Cons.) Damage to the aircraft / (Br.) Insurance | ST Socio technical | ++ Very Good | Std Standard | ATO5 Other | |
| NAVAIDS Electronic Aids | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing | C-HW Continuous | ++ Very Good | High Critical | MET2 Mainten | ILS CAT I, DME, VOR |

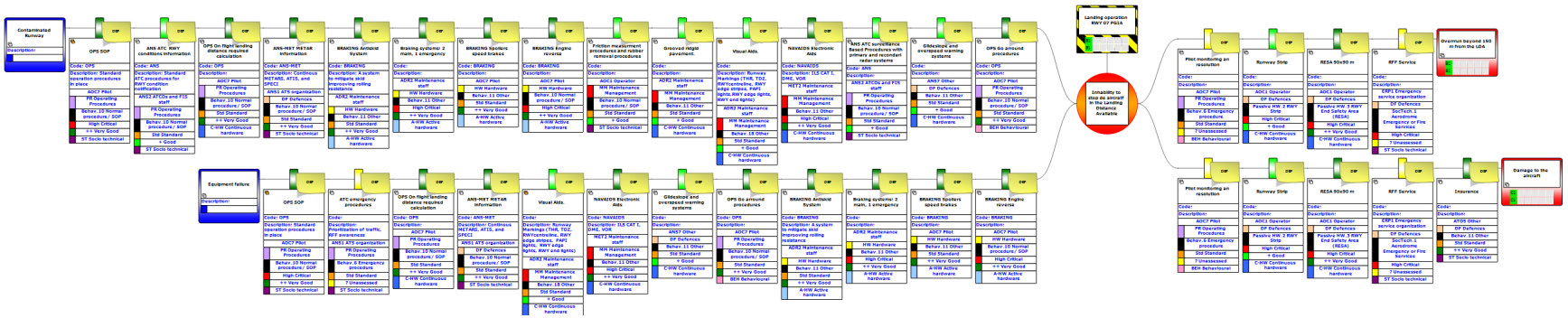
| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| Distance Available / (S.E) Contaminated Runway / (Br.) NAVAIDS Electronic Aids | hardware | | | ance staff | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) NAVAIDS Electronic Aids | C-HW Continuous hardware | ++ Very Good | High Critical | MET2 Maintenance staff | ILS CAT I, DME, VOR |
| ANS ATC surveillance Based Procedures with primary and recondari radar systems | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) ANS ATC surveillance Based Procedures with primary and recondari radar systems | ST Socio technical | + Good | Std Standard | ANS2 ATCOs and FIS staff | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Contaminated Runway / (Br.) ANS ATC surveillance Based Procedures with primary and recondari radar systems | ST Socio technical | + Good | Std Standard | ANS2 ATCOs and FIS staff | |
| ATC emergency procedures | | | | | |
| (Haz.) Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) | ST Socio technical | ? Unassessed | Std Standard | ANS1 ATS organization | Prioritization of traffic, RFF awareness |

| Barrier | Barrier type | Effectiveness | Criticality | Accountable | Description |
|---|---|---|---|---|---|
| Equipment failure / (Br.) ATC emergency procedures | | | | | |
| (Haz.) Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available / (S.E) Equipment failure / (Br.) ATC emergency procedures | ST Socio technical | ? Unassessed | Std Standard | ANS1 ATS organization | Prioritization of traffic, RFF awareness |
| OPS Take-off distance required calculation | | | | | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Equipment failure / (Br.) OPS Take-off distance required calculation | C-HW Continuous hardware | ++ Very Good | Std Standard | AOC7 Pilot | |
| (Haz.) Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA / (S.E) Contaminated Runway / (Br.) OPS Take-off distance required calculation | C-HW Continuous hardware | ++ Very Good | Std Standard | AOC7 Pilot | |

## BowTie diagrams

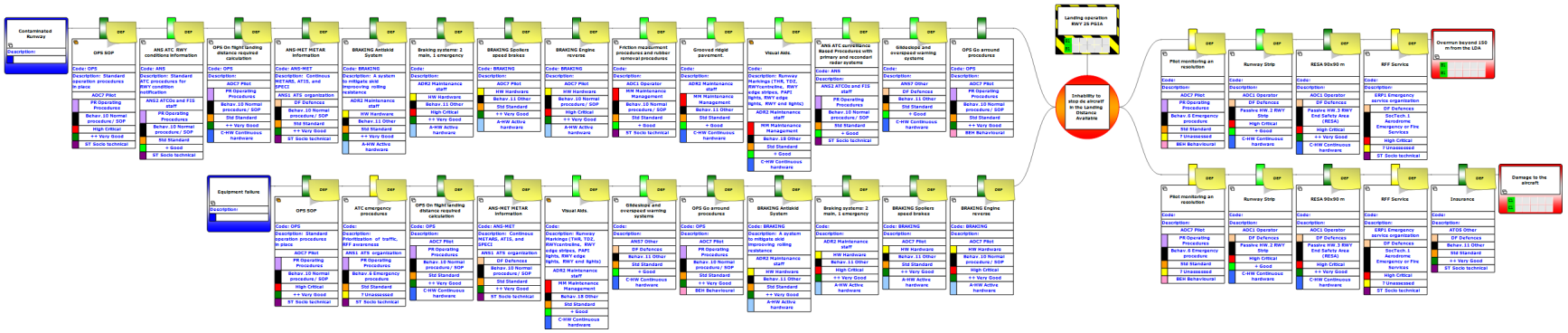
## Landing and T-O operations at PGIA

| Hazard | Top event |
|---|---|
| **Landing operation RWY 07 PGIA** | **Inhability to stop de aircratf in the Landing Distance Available** |



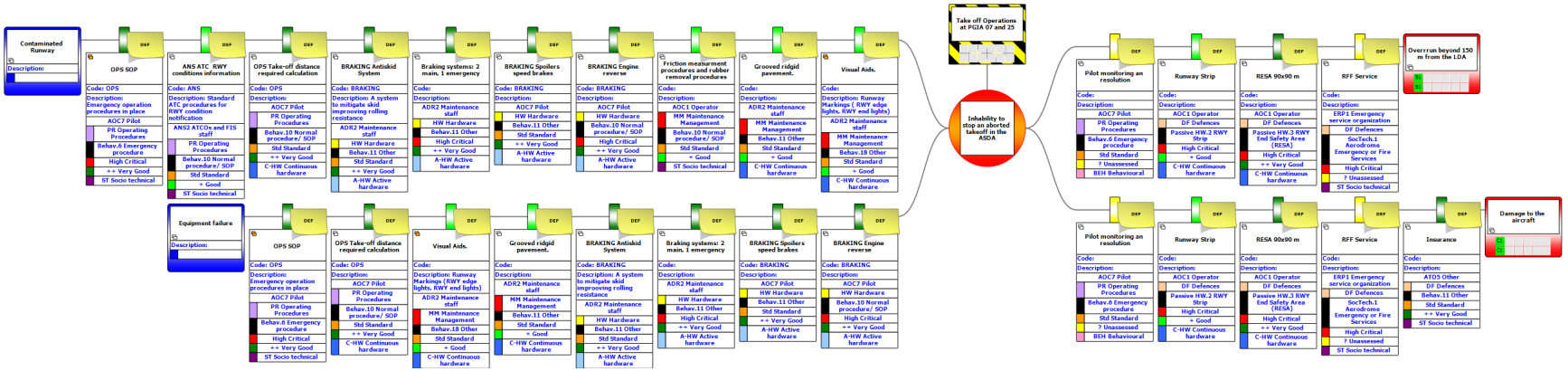
# Landing at PGIA 25

| Hazard | Top event |
|---|---|
| Landing operation RWY 25 PGIA | Inhability to stop de aircratf in the Landing Distance Available |



# Take off operations at PGIA 07 and 25

| Hazard | Top event |
|---|---|
| **Take off Operations at PGIA 07 and 25** | **Inhability to stop an aborted takeoff in the ASDA** |



## Threats and consequences

### Landing and T-O operations at PGIA

| BowTie Group | Description |
|---|---|
| Landing and T-O operations at PGIA | |

| Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available | | |
|---|---|---|
| Safety Events | Contaminated Runway | |
| | Equipment failure | |
| Consequences | Overrrun beyond 150 m from the LDA | |
| | Damage to the aircraft | |

### Landing at PGIA 25

| BowTie Group | Description |
|---|---|
| Landing at PGIA 25 | |

| Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available | | |
|---|---|---|
| Safety Events | Contaminated Runway | |
| | Equipment failure | |
| Consequences | Overrrun beyond 150 m from the LDA | |
| | Damage to the aircraft | |

### Take off operations at PGIA 07 and 25

| BowTie Group | Description |
|---|---|

| | |
|---|---|
| **Take off operations at PGIA 07 and 25** | |

| **Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA** | | |
|---|---|---|
| **Safety Events** | **Contaminated Runway** | |
| | **Equipment failure** | |
| **Consequences** | **Overrrun beyond 150 m from the LDA** | |
| | **Damage to the aircraft** | |

## Barrier summaries

### OPS SOP

| Code | Name | Effectiveness |
|---|---|---|
| OPS | SOP | ++ Very Good |

### ANS ATC  RWY conditions information

| Code | Name | Effectiveness |
|---|---|---|
| ANS | ATC  RWY conditions information | + Good |

### OPS On flight landing distance required calculation

| Code | Name | Effectiveness |
|---|---|---|
| OPS | On flight landing distance required calculation | ++ Very Good |

### ANS-MET METAR information

| Code | Name | Effectiveness |
|---|---|---|
| ANS-MET | METAR information | ++ Very Good |

### BRAKING Antiskid System

| Code | Name | Effectiveness |
|---|---|---|
| BRAKING | Antiskid System | ++ Very Good |

### Braking systems: 2 main, 1 emergency

| Code | Name | Effectiveness |
|---|---|---|
| | Braking systems: 2 main, 1 emergency | ++ Very Good |

### BRAKING Spoilers speed brakes

| Code | Name | Effectiveness |
|---|---|---|
| BRAKING | Spoilers speed brakes | ++ Very Good |

### BRAKING Engine reverse

| Code | Name | Effectiveness |
|---|---|---|
| BRAKING | Engine reverse | ++ Very Good |

Friction measurment procedures and rubber removal procedures

| Code | Name | Effectiveness |
|---|---|---|
| | Friction measurment procedures and rubber removal procedures | + Good |

Grooved ridgid pavement.

| Code | Name | Effectiveness |
|---|---|---|
| | Grooved ridgid pavement. | + Good |

Visual Aids.

| Code | Name | Effectiveness |
|---|---|---|
| | Visual Aids. | + Good |

NAVAIDS Electronic Aids

| Code | Name | Effectiveness |
|---|---|---|
| NAVAIDS | Electronic Aids | ++ Very Good |

ANS ATC surveillance Based Procedures with primary and recondari radar systems

| Code | Name | Effectiveness |
|---|---|---|
| ANS | ATC surveillance Based Procedures with primary and recondari radar systems | + Good |

Glideslope and overspeed warning systems

| Code | Name | Effectiveness |
|---|---|---|
| | Glideslope and overspeed warning systems | + Good |

OPS Go arround procedures

| Code | Name | Effectiveness |
|---|---|---|
| OPS | Go arround procedures | ++ Very Good |

ATC emergency procedures

| Code | Name | Effectiveness |
|---|---|---|
| | ATC emergency procedures | ? Unassessed |

Pilot monitoring an resolution

| Code | Name | Effectiveness |
|---|---|---|
| | Pilot monitoring an resolution | ? Unassessed |

### Runway Strip

| Code | Name | Effectiveness |
|---|---|---|
| | Runway Strip | + Good |

### RESA 90x90 m

| Code | Name | Effectiveness |
|---|---|---|
| | RESA 90x90 m | ++ Very Good |

### RFF Service

| Code | Name | Effectiveness |
|---|---|---|
| | RFF Service | ? Unassessed |

### Insurance

| Code | Name | Effectiveness |
|---|---|---|
| | Insurance | ++ Very Good |

### OPS Take-off distance required calculation

| Code | Name | Effectiveness |
|---|---|---|
| OPS | Take-off distance required calculation | ++ Very Good |

## Actions overview

### All actions

| Code | Name | Action party | Target |
|---|---|---|---|
| **DEF** | **Addtional actions**<br><br>**No additional action required** | | |

## Job titles

### Maintenance staff

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ADR2 Maintenance staff | 22 | 0 | 0 |

| Barriers |
|---|
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |
| Grooved ridgid pavement. |
| Visual Aids. |
| Visual Aids. |
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |
| Grooved ridgid pavement. |
| Visual Aids. |
| Visual Aids. |
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |
| Grooved ridgid pavement. |
| Visual Aids. |
| Visual Aids. |
| Grooved ridgid pavement. |
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |
| BRAKING Antiskid System |
| Braking systems: 2 main, 1 emergency |

## ATS organization

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ANS1 ATS organization | 6 | 0 | 0 |

| Barriers |
|---|
| ANS-MET METAR information |
| ANS-MET METAR information |
| ANS-MET METAR information |
| ANS-MET METAR information |
| ATC emergency procedures |
| ATC emergency procedures |

## ATCOs and FIS staff

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ANS2 ATCOs and FIS staff | 5 | 0 | 0 |

| Barriers |
|---|
| ANS ATC  RWY conditions information |
| ANS ATC surveillance Based Procedures with primary and recondari radar systems |
| ANS ATC  RWY conditions information |
| ANS ATC surveillance Based Procedures with primary and recondari radar systems |
| ANS ATC  RWY conditions information |

## Other

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ANS7 Other | 4 | 0 | 0 |

| Barriers |
|---|
| Glideslope and overspeed warning systems |
| Glideslope and overspeed warning systems |
| Glideslope and overspeed warning systems |
| Glideslope and overspeed warning systems |

Operator

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| AOC1 Operator | 15 | 0 | 0 |

| Barriers |
|---|
| Friction measurment procedures and rubber removal procedures |
| Runway Strip |
| RESA 90x90 m |
| Runway Strip |
| RESA 90x90 m |
| Friction measurment procedures and rubber removal procedures |
| Runway Strip |
| RESA 90x90 m |
| Runway Strip |
| RESA 90x90 m |
| Friction measurment procedures and rubber removal procedures |
| Runway Strip |
| RESA 90x90 m |
| Runway Strip |
| RESA 90x90 m |

## Pilot

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| AOC7 Pilot | 34 | 0 | 0 |

| Barriers |
|---|
| OPS SOP |
| OPS On flight landing distance required calculation |
| BRAKING Spoilers speed brakes |
| BRAKING Engine reverse |
| OPS Go arround procedures |
| OPS SOP |
| OPS On flight landing distance required calculation |
| OPS Go arround procedures |
| Pilot monitoring an resolution |
| Pilot monitoring an resolution |
| OPS SOP |
| OPS On flight landing distance required calculation |
| BRAKING Spoilers speed brakes |
| BRAKING Engine reverse |
| OPS Go arround procedures |
| OPS SOP |
| OPS On flight landing distance required calculation |
| OPS Go arround procedures |
| Pilot monitoring an resolution |
| Pilot monitoring an resolution |
| OPS SOP |
| OPS Take-off distance required calculation |
| BRAKING Spoilers speed brakes |
| BRAKING Engine reverse |
| OPS SOP |

| |
|---|
| **Barriers** |
| **OPS Take-off distance required calculation** |
| **Pilot monitoring an resolution** |
| **Pilot monitoring an resolution** |
| **BRAKING Spoilers speed brakes** |
| **BRAKING Engine reverse** |
| **BRAKING Spoilers speed brakes** |
| **BRAKING Engine reverse** |
| **BRAKING Spoilers speed brakes** |
| **BRAKING Engine reverse** |

## Other

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ATO5 Other | 3 | 0 | 0 |

| Barriers |
|---|
| Insurance |
| Insurance |
| Insurance |

## Emergency service organization

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| ERP1 Emergency service organization | 6 | 0 | 0 |

| Barriers |
|---|
| RFF Service |
| RFF Service |
| RFF Service |
| RFF Service |
| RFF Service |
| RFF Service |

## Maintenance staff

| Job Title | # Barriers | # Activities | # Document Links |
|---|---|---|---|
| MET2 Maintenance staff | 2 | 0 | 0 |

| Barriers |
|---|
| NAVAIDS Electronic Aids |
| NAVAIDS Electronic Aids |

## Document links

## Hazard register

### Landing operation RWY 07 PGIA / Inhability to stop de aircratf in the Landing Distance Available

| Contaminated Runway | | | | | |
|---|---|---|---|---|---|
| ***Barriers & Escalation Factors*** | ***Criticality*** | ***Barrier type*** | ***Effectiveness*** | ***Accountable*** | ***Activities*** |
| **OPS SOP** | **High Critical** | **ST Socio technical** | **++ Very Good** | **AOC7 Pilot** | |
| **ANS ATC RWY conditions information** | **Std Standard** | **ST Socio technical** | **+ Good** | **ANS2 ATCOs and FIS staff** | |
| **OPS On flight landing distance required calculation** | **Std Standard** | **C-HW Continuous hardware** | **++ Very Good** | **AOC7 Pilot** | |
| **ANS-MET METAR information** | **Std Standard** | **ST Socio technical** | **++ Very Good** | **ANS1 ATS organization** | |
| **BRAKING Antiskid System** | **Std Standard** | **A-HW Active hardware** | **++ Very Good** | **ADR2 Maintenance staff** | |
| **Braking systems: 2 main, 1 emergency** | **High Critical** | **A-HW Active hardware** | **++ Very Good** | **ADR2 Maintenance staff** | |
| **BRAKING Spoilers speed brakes** | **Std Standard** | **A-HW Active hardware** | **++ Very Good** | **AOC7 Pilot** | |

| | | | | | |
|---|---|---|---|---|---|
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| Friction measurment procedures and rubber removal procedures | Std Standard | ST Socio technical | + Good | AOC1 Operator | |
| Grooved ridgid pavement. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| NAVAIDS Electronic Aids | High Critical | C-HW Continuous hardware | ++ Very Good | MET2 Maintenance staff | |
| ANS ATC surveillance Based Procedures with primary and recondari radar systems | Std Standard | ST Socio technical | + Good | ANS2 ATCOs and FIS staff | |
| Glideslope and overspeed warning systems | Std Standard | C-HW Continuous hardware | + Good | ANS7 Other | |
| OPS Go arround procedures | Std Standard | BEH Behavioural | ++ Very Good | AOC7 Pilot | |

| Equipment failure | | | | | |
|---|---|---|---|---|---|
| ***Barriers & Escalation Factors*** | ***Criticality*** | ***Barrier type*** | ***Effectiveness*** | ***Accountable*** | ***Activities*** |
| OPS SOP | High Critical | ST Socio technical | ++ Very Good | AOC7 Pilot | |
| ATC emergency procedures | Std Standard | ST Socio technical | ? Unassessed | ANS1 ATS organization | |
| OPS On flight landing distance required calculation | Std Standard | C-HW Continuous hardware | ++ Very Good | AOC7 Pilot | |
| ANS-MET METAR information | Std Standard | ST Socio technical | ++ Very Good | ANS1 ATS organization | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| NAVAIDS Electronic Aids | High Critical | C-HW Continuous hardware | ++ Very Good | MET2 Maintenance staff | |
| Glideslope and overspeed warning systems | Std Standard | C-HW Continuous hardware | + Good | ANS7 Other | |
| OPS Go arround procedures | Std Standard | BEH Behavioural | ++ Very Good | AOC7 Pilot | |

| | | | | | |
|---|---|---|---|---|---|
| BRAKING Antiskid System | Std Standard | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| Braking systems: 2 main, 1 emergency | High Critical | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | Std Standard | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |

Landing operation RWY 25 PGIA / Inhability to stop de aircratf in the Landing Distance Available

| Contaminated Runway | | | | | |
|---|---|---|---|---|---|
| *Barriers & Escalation Factors* | *Criticality* | *Barrier type* | *Effectiveness* | *Accountable* | *Activities* |
| OPS SOP | High Critical | ST Socio technical | ++ Very Good | AOC7 Pilot | |
| ANS ATC RWY conditions information | Std Standard | ST Socio technical | + Good | ANS2 ATCOs and FIS staff | |
| OPS On flight landing distance required calculation | Std Standard | C-HW Continuous hardware | ++ Very Good | AOC7 Pilot | |
| ANS-MET METAR information | Std Standard | ST Socio technical | ++ Very Good | ANS1 ATS organization | |

| | | | | | |
|---|---|---|---|---|---|
| BRAKING Antiskid System | Std Standard | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| Braking systems: 2 main, 1 emergency | High Critical | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | Std Standard | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| Friction measurment procedures and rubber removal procedures | Std Standard | ST Socio technical | + Good | AOC1 Operator | |
| Grooved ridgid pavement. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| ANS ATC surveillance Based Procedures with primary and recondari radar systems | Std Standard | ST Socio technical | + Good | ANS2 ATCOs and FIS staff | |

| | | | | | |
|---|---|---|---|---|---|
| Glideslope and overspeed warning systems | Std Standard | C-HW Continuous hardware | + Good | ANS7 Other | |
| OPS Go arround procedures | Std Standard | BEH Behavioural | ++ Very Good | AOC7 Pilot | |
| Equipment failure | | | | | |
| *Barriers & Escalation Factors* | *Criticality* | *Barrier type* | *Effectiveness* | *Accountable* | *Activities* |
| OPS SOP | High Critical | ST Socio technical | ++ Very Good | AOC7 Pilot | |
| ATC emergency procedures | Std Standard | ST Socio technical | ? Unassessed | ANS1 ATS organization | |
| OPS On flight landing distance required calculation | Std Standard | C-HW Continuous hardware | ++ Very Good | AOC7 Pilot | |
| ANS-MET METAR information | Std Standard | ST Socio technical | ++ Very Good | ANS1 ATS organization | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Glideslope and overspeed warning systems | Std Standard | C-HW Continuous hardware | + Good | ANS7 Other | |

| | | | | | |
|---|---|---|---|---|---|
| OPS Go arround procedures | Std Standard | BEH Behavioural | ++ Very Good | AOC7 Pilot | |
| BRAKING Antiskid System | Std Standard | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| Braking systems: 2 main, 1 emergency | High Critical | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | Std Standard | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |

Take off Operations at PGIA 07 and 25 / Inhability to stop an aborted takeoff in the ASDA

| Contaminated Runway | | | | | |
|---|---|---|---|---|---|
| *Barriers & Escalation Factors* | *Criticality* | *Barrier type* | *Effectiveness* | *Accountable* | *Activities* |
| OPS SOP | High Critical | ST Socio technical | ++ Very Good | AOC7 Pilot | |
| ANS ATC RWY conditions information | Std Standard | ST Socio technical | + Good | ANS2 ATCOs and FIS staff | |
| OPS Take-off distance required calculation | Std Standard | C-HW Continuous hardware | ++ Very Good | AOC7 Pilot | |

| | | | | | |
|---|---|---|---|---|---|
| BRAKING Antiskid System | Std Standard | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| Braking systems: 2 main, 1 emergency | High Critical | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | Std Standard | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| Friction measurment procedures and rubber removal procedures | Std Standard | ST Socio technical | + Good | AOC1 Operator | |
| Grooved ridgid pavement. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Equipment failure | | | | | |
| *Barriers & Escalation Factors* | *Criticality* | *Barrier type* | *Effectiveness* | *Accountable* | *Activities* |
| OPS SOP | High Critical | ST Socio technical | ++ Very Good | AOC7 Pilot | |

| | | | | | |
|---|---|---|---|---|---|
| OPS Take-off distance required calculation | Std Standard | C-HW Continuous hardware | ++ Very Good | AOC7 Pilot | |
| Visual Aids. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| Grooved ridgid pavement. | Std Standard | C-HW Continuous hardware | + Good | ADR2 Maintenance staff | |
| BRAKING Antiskid System | Std Standard | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| Braking systems: 2 main, 1 emergency | High Critical | A-HW Active hardware | ++ Very Good | ADR2 Maintenance staff | |
| BRAKING Spoilers speed brakes | Std Standard | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |
| BRAKING Engine reverse | High Critical | A-HW Active hardware | ++ Very Good | AOC7 Pilot | |