Republic of Rwanda

Ministry of Infrastructure

Aviation Accident and Incident Investigation Directorate General

Final Investigation Report for Runway excursion Incident involved RwandAir Flight WB 601, Operated by DHC 8-401 with Registration 9XR-WM, at Kamembe Airport on 22nd October, 2022.

Ref AAID 2022-06

The sole objective of investigations carried out by the AAID is to prevent aircraft accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or determine liability.

LIST OF ABRAVIATION

AAID – Aviation Accident and Incident Investigation Directorate General

AGL – Above Ground Level

AOM – Aircraft Operation Manual

ATC – Air Traffic Control

CVR – Cockpit Voice Recorder

DHC – De Havilland Canada

FDR – Flight Data Recorder

HRZA – Kamembe Airport

ICAO – International Civil Aviation Authority

M – Meter

OM – Operation Manual

PAPI – Precision Approach Path Indicator

RAC – Rwanda Airports Company

RCAA – Rwanda Civil Aviation Authority

RCARs – Rwanda Civil Aviation Regulations.

RESA – Runway End Safety Area

VFR – Visual Flight Rule

SYNOPSIS

On 22nd October, 2022, RwandAir (WB) flight WB 601 conducted a scheduled commercial flight from Kigali International Airport (HRYR) to Kamembe Airport (HRZA) with DHC-8-400 aircraft type, registration number 9XR-WM.

During final approach the Air Traffic Controller cautioned Captain about the bird (eagle) that was beyond the touch down markings. The aircraft had an unstable approach and touched down 601 meters from the beginning of runway 20, overran, reached the end of the runway, turn left and stopped 90 meters away from the end of runway.

The weather condition reported was good with visibility of more than 10km and two-way communication was established with Kamembe Air Traffic Controller. There were no injuries incurred to people due to this incident and the aircraft had minor damages on rear nose landing gear doors.

The aircraft was equipped with the Flight data recorders and Crew Voice Recorders which were availed to the AAID for investigation. During the conduct of investigation, AAID established the findings associated with this incident. The investigation identified the contributing factors and the probable cause of this incident to be the flight crew's decision to continue the approach and landing beyond the touchdown zone while a limited margin between the available and required landing distance existed.

The investigation led to the formulation of seven safety recommendations addressed to the relevant agencies for consideration in order to prevent similar occurrence.

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1. Factual Information

1.1. History of Flight

1.1.1. General

On 22nd October, 2022, RwandAir flight WB 601 conducted a scheduled commercial flight from Kigali International Airport (HRYR) to Kamembe Airport with DHC-8-400 aircraft type, registration number 9XR-WM. The aircraft overran the end of runway 20, turn slightly to the left and stopped 90 meters away from the end of runway. Flight 601 departed from Kigali at 05:05[1], five minutes late according to the schedule and arrived at KAMEMBE at 05: 37 carrying 43 passengers and 7 crew members.

The Cockpit crew consisted of the Captain and First officer. The cabin crew consisted of the Purser, cabin crew member and Maintenance Technician responsible for line maintenance and air marshals.

1.1.2. The operation of flight 601 from Kigali to Kamembe

Based on the interviews conducted with the Captain, the First Officer, and the cabin crew, the operation of flight 601 from Kigali to Kamembe had been uneventful. Kamembe Airport is a category C that requires only Captains to be pilot flying. The aircraft departed Kigali to Kamembe with total fuel 2550 Kgs and climbed to maintain FL180[2]. The weather condition reported was good and two-way communication was established with Kamembe.

1.1.3. Final Approach and Landing at Kamembe

After crossing 1000ft final approach to runway 20, the Air Traffic Controller cautioned Captain about the bird (eagle) that was beyond the touch down markings. During the interview, both pilots said that they saw the bird flying

[1] All times are indicated **in UTC**

[2] FL180 means

from left to right of the aircraft and Captain, who was the Pilot flying decided to flare longer.

The aircraft had an unstable approach and touched down 601 meters from the beginning of runway 20, spoilers were automatically deployed and pilot flying applied brakes, and max reverse thrust with expectation to stop but ended 90 meters after turning left into grass area.

The Flight data indicate a normal approach profile, however the flare and landing phase of flight WB 601 became unstable. As a result of the extended flare the aircraft touched down 601 meters from the beginning of runway 20, whereupon the spoilers deployed automatically. The pilot flying applied brakes and maximum reverse thrust with the expectation to reach a full stop before the runway end, but the aircraft ended up into the grass area beyond the threshold of runway 02.

There were no injuries incurred to Passengers and were deplaned one by one after crew and airport authorities found it to be safe.

The flight crew expressed that a go around was not considered because they expected to make a safe landing.



Figure 1: Passengers leaving the aircraft

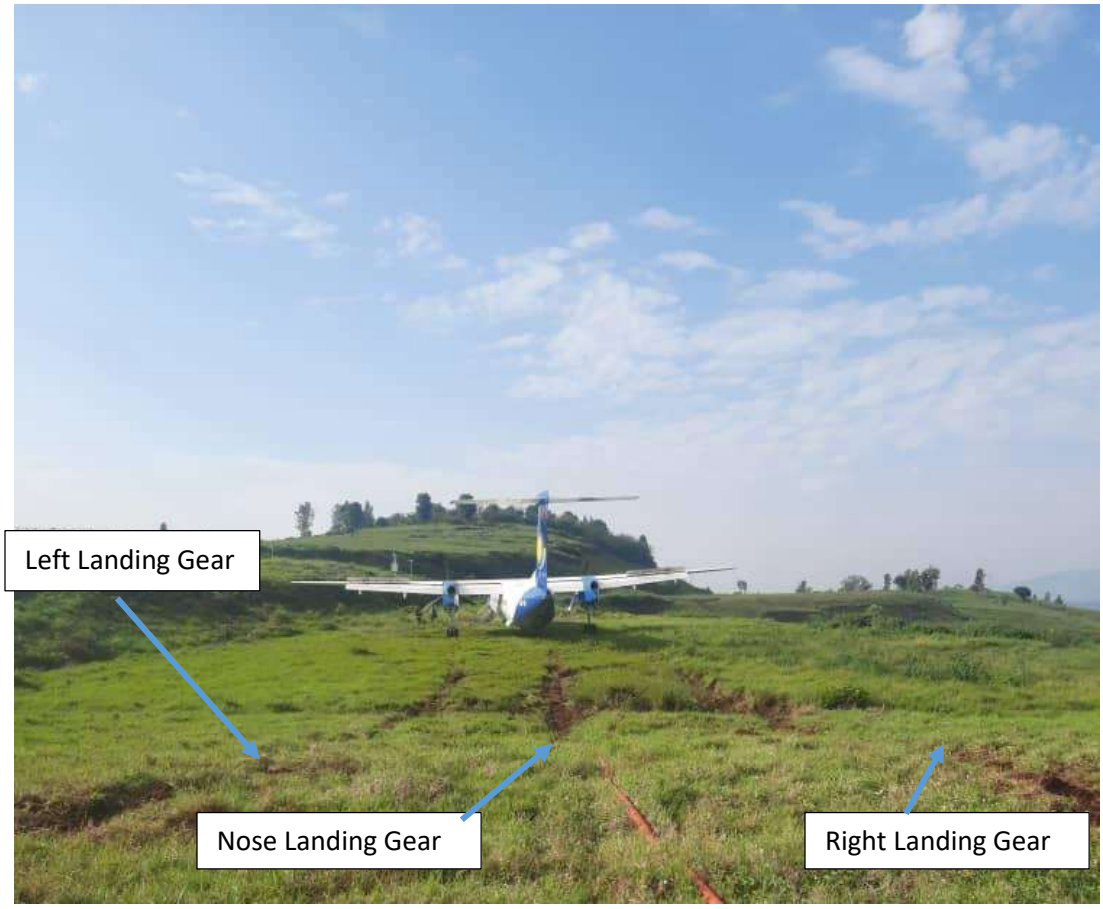


Figure 2:Aircraft landing gears pass-ways

1.2. Injuries to the Persons

There were no injuries incurred to people due to this incident.

1.3. Damages to the Aircraft

Based on the visual inspection at the scene, the aircraft had minor damages on rear nose landing gear doors.

1.4. Other damage

No third party damages identified.

1.5. Personal Information

1.5.1. Captain

Age:	43
Pilot Licence	Type: Airline Transport Pilot Licence
	Date of issue:13 April 2022
	Valid until:30 April 2024
Medical certificate	Type: Class 1
	Issued date:24 June 2022
	Valid until:09 July 2023
Total flying experience	5955 hours
Total flying experience on type	2205 hours
Total flying hours in last 60 days	74hours
Previous rest period	First flight after returning from 12days vacation.

1.5.2. First Officer

Age:	24
Licence	Type: Commercial Pilot Licence
	Date of issue:28 February 2022
	Valid until:29 February 2024
Medical certificate	Type: Class 1
	Date of issue:16 December 2021
	Valid until:13 December 2022
Total flying experience	1574:22
Total flying experience on type	1382:22[hours: minutes]
Total flying hours in last 60 days	117:20 [hours: minutes]
Previous rest period	He was standby a day before the incident.

1.5.3. Air Traffic Controller

Age:	36
Licence [3]	Rating: Kigali International airport Aerodrome Control, Approach procedural Control, Approach Surveillance Control
	Date of issue: 22nd September 2021
	Valid until: 30th September 2023
Function	Approach Radar Controller
Medical certificate:	Valid
Work days before the day of the incident	1 day
Start of duty on the day of incident	04:45 UTC

1.6. Aircraft Information

Manufacturer	De Havilland-Canada
Type	DHC-8-401 (Q400)
Manufacturer's Serial Number	4498
Registration as marked on the exterior	9XR-WM
Registration as marked on identification plate in cockpit	9XR-WM
Engines	Model: PW150A ➢ Left Engine: SN#1: PCE-FA1117, TTL T:13603 Cycles and TTL CYC: 13216:37[hours: minutes] ➢ Right Engine: SN: #2: PCE-FA1118, TTL T:13603 Cycles and TTL CYC: 13216:37[hours: minutes]
Date of Manufacture	18 June 2015
Certificate of airworthiness	Issued by CAA of Rwanda Date of issue: July 28th 2022 Date of expiry: July 31st 2023
Last maintenance check	A Check done on 03rd October 2022
Total Airframe cycles	14895 cycles in 14642:02 Flight hours

[3] The Controller was using a licence only applicable at Kigali International Airport.

1.7. Meteorological Information

The meteorological information supplied to the aircraft was the following:

METAR HRZA 220400Z 05002KT 9999 SCT025 SCT100 17/16 Q1020 NOSIG

It is a weather data dedicated to Kamembe Airport on 22nd October 2022 at 4AM. North easterly wind at 2knots speed, visibility was more than 10km, there were scattered clouds at 2500feet as well as at 10000feet above ground level. The temperature was 17°C and dew point was 16°C.

The incident took place at 05:36. It was morning time conditions with good visibility. The weather is not considered a factor to this incident.

1.8. Aids to Navigation

At Kamembe Airport, there are two PAPIs installed and commissioned by RADIOLA4 but at the time of incident, they were not yet approved by the Regulator.

There are no approved navigation instruments installed at Kamembe Airport.

1.9. Communication

The communication between Pilots and ATC was good and all required information were availed to them.

1.10. Airport Information

Kamembe Airport is a Category C, domestic airport located west of Rwanda, on boarder with Democratic Republic of Congo. It is located at S02°27'34", E028°54'30", 1.5Nm from Kamembe City. It has runway markings, PAPIs, runway and Taxiway lightings. The airport is not yet certified by the Regulator.

Airport: Kamembe

Runway Surface Type: Asphalt Concrete

[4] RADIOLA: it is a company specialized in aeronautical navigation aid, flight inspection, and flight validation.

Airport Elevation: 5192 ft (1,583 m)

Runway Surface Condition: Dry Runway

Runway identification: runway 20/02

Approach/Landing: VFR

Length/Width: 1453m/45m

Visual aids: Kamembe airport is equipped with PAPIs that are not yet approved by the Regulator.

1.10.1. Wildlife Control System

During the time of incident, the runway inspection was conducted according to the checklist available, however, airport had no wildlife management system in place which is designed specifically to repel birds and other animals away from airport and runway to reduce the risk of bird strikes, decrease bird damages costs and ensure the safety of passengers

1.10.2. Runway End Safety Area (RESA)

Kamembe airport runway is a 3C code. According to ICAO Annex 14 standard, a 3C runway must have a Runway End Safety Area. A part from that standard, in view of the elevation, the relatively short runway, the absence of the approved glide path guidance as well as possible wind shifts related to the orography and thunderstorms activity, this would require a well laid-out RESA at the Southern end of the runway.

1.11. Flight Recorder Information

The DHC-8-402 is equipped with FDR and CVR. At the time of incident, the aircraft was equipped with the recorders and their raw data were availed to the AAID for investigation.

FDR and CVR raw data were decompressed and interpreted by Blackbox[5] company based in Kenya. These interpreted data were used in the analysis part of this report.

1.17. Organizational and management information.

1.17.1. Trainings for Cockpit Crews

Remedial trainings for both pilots should include Crew Resource Management and Safety Management System Trainings to improve team work and safety awareness to reduce frequency of incidents. At the time of incident, the SMS training certificate for first officer, was expired.

[5] BLACKBOX Flight Data Systems Limited is company established in Kenya that is specialized in Flight data recorders readout and cockpit voice recorder transcription. It is also an approved maintenance organization in Kenya, Uganda and Tanzania

2. Analysis

2.1. General

The captain and first officer were properly licensed and qualified under Rwanda Civil Aviation regulations to act in their respective roles during incident.

The aircraft was properly certified, equipped and maintained in accordance with RCARs. It was dispatched in accordance with industry practices and within weight and cg limits.

2.2. Aircraft Braking and Thrust Reverse Systems

DHC-8-402 is equipped with Hydraulic braking systems installed in its both landing gears, flaps and spoilers as well as engine thrust reversers.

Based on the information obtained from the FDR, AAID found that flaps were set to 35 degrees (fully extended). After touchdown, spoilers were automatically deployed and maximum brake pressure, left and right, was applied 10s and 11s respectively. Both engine power levers were set disc[6], then to maximum reverse 10 seconds later.

2.3. Go -Around Requirement

According to the AOM, the Pilot flying is required to execute a go-around when the pilot determines that landing in the touchdown zone cannot be safely achieved.

The go around was not initiated after the flight crew received a caution from tower controller about the eagle beyond touch down zone.

Based on DHC-8-Q400 aircraft performance data, the minimum required landing distance under the prevailing circumstances was 950m, while after touchdown of flight WB601 only 852m of landing remained available.

The crew relied on flaps, spoilers, maximum reversers and brakes whereas the only possibility for safe operation, was to go around.

[6] Disc: it is the position on the center console

2.4. Communication

The communication between Pilots and ATC was good and all required information were availed to them as required.

Based on the CVR recording, 8 seconds after 1000ft AGL call out, ATC informed the Pilots that there is an eagle beyond aiming point. There was no decision taken at the reference point (500ft AGL) by the Pilot flying whether they were going around or landing. Pilot-flying instructed the pilot monitoring to set missed approach altitude and continued approach for landing. Pilot monitoring didn't initiate a go around as it is required in RwandAir OM.

3. Conclusion

3.1. Findings

1. The captain and first officer were properly licenced and qualified under Rwanda Civil Aviation regulations
2. The Air Traffic controller had no licence to operate at Kamembe airport
3. Kamembe Airport does not have Wildlife Management System in place
4. The airport does not have aerodrome manual to provide pertinent information concerning Kamembe airport
5. The aircraft was properly certified equipped and maintained in accordance with RCARs,
6. At the time of incident, SMS and CRM trainings for first officer had expired
7. Fatigue was not considered as a factor.
8. While on final, there was a bird beyond touchdown zone.
9. Aircraft landed 601m beyond touchdown zone.
10. The runway length remaining after touchdown was 852m.
11. Fire fighters were standby and reacted according to the command from ATC.
12. Aircraft sustained minor damages to the rear nose landing gear door.
13. The pilots did not execute a go around
14. Kamembe airport has no a well laid down Runway End Safety Area (RESA)

3.2. Probable Cause

The AAID determines that the probable cause of this incident was the flight crew's decision to continue the approach and landing beyond the touchdown zone while a limited margin between the available and required landing distance existed.

3.3. Contributing Factors

- Pilots distracted due to the presence of a bird on runway beyond touchdown zone
- Unstable approach
- Failure to go around

4. Safety Recommendations

As a result of this incident investigation, AAID issued the safety recommendations as follows:

To: RAC

1. To ensure that Kamembe airport is certified for operation in accordance with RCAR Part 26.
2. To ensure that the wildlife Management System and bird control policy at Kamembe airport in place to safeguard the flight operations safety
3. To ensure that a well laid out Runway End Safety Area (RESA) is installed for the case of any ground emergency

To: RwandAir

4. To ensure that First Officers are trained to be more assertive for safe flight operations and be encouraged to intervene when safety is being compromised.
5. To ensure that go around is executed after realizing an unsafe landing conditions
6. To ensure that all flight safety trainings are timely conducted as required by Regulations.

To: RCAA

7. To ensure that operational aerodromes are certified in accordance with RCARs Part 26.

8. To ensure that all flight safety trainings are timely conducted as per RCARs