

CIVIL AVIATION SAFETY INVESTIGATION REPORT

PUBLIC VERSION

Runway Excursion During Landing

Boeing 737-400, JY-JAP
Tombouctou Airport, Mali
5 May 2017

PUBLICATION NOTICE

This public version has been prepared for aviation-safety learning and transparency. Personal identifiers, medical information, protected recordings, proprietary extracts, component serial numbers, and material not necessary to understand the safety issues have been removed or generalized. The sole objective is prevention. This report is not intended to apportion blame or liability.

Issued by the Jordan Civil Aviation Regulatory Commission (CARC)
Aircraft Accident Investigation function

Publication Basis and Scope

This document preserves the occurrence sequence, safety-relevant evidence, analysis, conclusions, and recommendations while removing information that is unnecessary for prevention or protected under accident-investigation principles.

Annex 13 principle

The sole objective of an aircraft accident or incident investigation is the prevention of accidents and incidents. It is not the purpose of the activity to apportion blame or liability.

Information removed or generalized

- Ages, licence and medical details, individual experience records, and other personal information concerning flight crew.
- Cockpit voice recorder content and interview details beyond the operational facts necessary for safety analysis.
- Recorder and component serial numbers, internal maintenance references, signatures, and contact details.
- Lengthy proprietary aircraft-manufacturer material, replaced with concise technical summaries.
- Individualized or accusatory descriptions of leadership and assertiveness, replaced with neutral CRM and decision-making findings.
- Appendices and photographs that do not add information necessary for the public understanding of the occurrence.

ICAO framework

The structure follows the Annex 13 final-report framework: factual information, analysis, conclusions, and safety recommendations. Publication decisions were also informed by ICAO Doc 9756, Part IV - Reporting, and the Annex 13 provisions protecting investigation records.

Contents

1. Executive summary
2. Factual information
3. Analysis
4. Conclusions
5. Safety recommendations and action

1. Executive Summary

On 5 May 2017, a Boeing 737-400 operating a passenger flight from Bamako to Tombouctou landed on Runway 07 at Tombouctou Airport. The approach was flown with high descent rate, airspeed above target, and a recorded tailwind component of approximately 16 kt. After touchdown, limited and asymmetric manual braking was applied, followed by maximum braking and reverse thrust. Near the runway end, the aircraft turned toward the taxiway at high ground speed, left the paved surface, and came to rest on soft ground. No injuries were reported.

Occurrence classification	Serious incident - runway excursion
Date and time	5 May 2017 at approximately 08:35 UTC
Location	Runway 07, Tombouctou Airport, Mali
Aircraft	Boeing 737-400, JY-JAP
Flight	JAV 7843, Bamako to Tombouctou
Persons on board	101, comprising 90 passengers and 11 crew
Injuries	None reported
Aircraft damage	Engine No. 1 fan-blade damage from gravel ingestion; wheel, brake, and landing-gear components required inspection

Cause

The occurrence resulted from continuation of a high-energy, unstabilized approach with a tailwind component above the applicable operational limit, followed by inefficient and discontinuous manual braking and an attempted runway exit before the aircraft had decelerated to a safe taxi speed.

Contributing factors

- The approach was not discontinued when stabilized-approach criteria were not met.
- The crew continued despite a recorded tailwind component of approximately 16 kt.

- Manual brake pressure was initially asymmetric and subsequently released or modulated, reducing braking effectiveness.
- Crew monitoring, challenge, and shared decision-making were not sufficiently effective.
- Plan-continuation bias and concern about operational delay influenced reassessment of the landing plan.
- The crew did not review or apply available narrow-runway operational controls for Tombouctou.

2. Factual Information

2.1 History of the flight

The aircraft departed Bamako at 07:36 UTC for the approximately one-hour flight to Tombouctou. The aircraft carried 90 passengers, 11 crew members, approximately 5,000 kg of cargo, and was within the approved centre-of-gravity envelope. The captain was the pilot flying.

The aerodrome reported wind from 250 degrees at 4 kt, visibility 5 km, temperature 34 C, QNH 1011 hPa, and a dry runway. Recorded aircraft data later showed a tailwind component of approximately 16 kt from the final approach through the landing roll.

The crew acquired Runway 07 visually and continued the approach. The aircraft crossed the threshold above target speed and touched down approximately 350 m beyond the threshold. Reverse thrust was selected, but the left reverser lagged the right by several seconds, producing a small right drift. Initial braking was applied asymmetrically, followed later by maximum braking.

At approximately 60 kt groundspeed and with limited runway remaining, steering input was made toward the perpendicular taxiway. The aircraft departed the paved surface and stopped on soft ground near the runway-taxiway intersection. Normal disembarkation was completed through the forward right door.

2.2 Injuries and damage

- No injuries were reported among passengers or crew.
- Engine No. 1 sustained damage to its fan blades after ingesting gravel on the unpaved surface.
- No fire occurred.
- No other external damage was reported in the source report.
- The aircraft was recovered by towing because the airport did not have the normal tow-bar equipment for this aircraft.

2.3 Personnel

Both pilots held the licences, ratings, medical certification, and recent proficiency checks required for the flight. They were adequately rested and complied with flight- and duty-time requirements. Personal data have been removed from this public version.

2.4 Aircraft and maintenance

Type	Boeing 737-400
Registration	JY-JAP
Year of manufacture	1989
Recorded landing weight	Approximately 55,000 kg
Maximum certified landing weight	56,245 kg
Configuration	Flaps 30
Airworthiness status	Valid and airworthy when dispatched
Relevant deferred defects	None identified
Post-occurrence brake inspection	No significant technical defect or performance degradation identified

The braking system included normal and alternate hydraulic braking, antiskid protection, and autobrakes. The crew elected to use manual braking. Ground spoilers and thrust reversers were available as deceleration devices.

2.5 Landing performance

The investigation calculated an approximate landing distance requirement of 4,402 ft using the recorded weight, flaps 30, 16 kt tailwind, elevated approach speed, maximum manual braking, reverse thrust, and manual speedbrake assumptions. Runway 07 had approximately 7,118 ft of landing distance available. Even with a conservative tailwind allowance, the calculated stopping distance remained within the paved runway if recommended techniques were applied promptly and continuously.

2.6 Aerodrome

Runway	07/25
Length	2,170 m
Width	30 m

Surface	Dry
Available approach	Visual approach for the occurrence aircraft; previous ILS procedures had been withdrawn
Special consideration	Narrow runway operation had been risk assessed and briefing controls had been issued

The occurrence crew stated that they had not been made aware of, and did not review, the existing narrow-runway assessment and controls before the flight.

2.7 Flight recorders

Flight data were successfully recovered and used to analyse the approach, touchdown, brake application, reverse thrust, deceleration, and runway departure. The cockpit voice recording for the occurrence period was not available because the relevant content had been erased. The investigation did not determine whether the loss was intentional or unintentional. This limited confirmation of communications and cockpit interaction.

3. Analysis

3.1 Approach stability

The approach did not meet stabilized-approach criteria. At approximately 500 ft above aerodrome level, the descent rate was about 1,540 ft/min, indicated airspeed was about 24 kt above target, and the recorded tailwind component was 16 kt. Although descent rate and speed reduced later, the approach remained outside acceptable limits and should have resulted in a go-around.

The aircraft crossed the threshold at approximately 157 kt indicated airspeed and 182 kt groundspeed, with the tailwind continuing. Touchdown occurred at approximately 148 kt indicated airspeed and 173 kt groundspeed. The landing was not hard, but the aircraft carried excess horizontal energy into the landing roll.

3.2 Tailwind

The recorded tailwind component exceeded the operational limit identified in the report by approximately 6 kt. Tailwind increases groundspeed, runway distance used in the air, and stopping distance. The discrepancy between the tower-reported surface wind and aircraft-indicated tailwind should have prompted an updated wind check, performance reassessment, or discontinuation of the approach.

3.3 Touchdown and deceleration

Touchdown occurred approximately 350 m beyond the threshold. Reverse thrust was selected promptly, but asymmetric deployment produced a small right drift. The nose gear remained airborne for several seconds, delaying full use of nose-wheel steering and reducing weight on the wheels during the earliest part of the landing roll.

The pilot initially applied left brake pressure to counter the drift. Right-side pressure developed later, and both brake pedals were released or reduced for short periods before maximum pressure was applied. Manual brake modulation forced the antiskid system to readjust pressure and reduced overall braking efficiency. Continuous, steadily increasing pressure would have provided better stopping performance.

3.4 Runway departure decision

At about 60 kt groundspeed, with approximately 1,110 ft of runway remaining, the aircraft was steered toward a taxiway perpendicular to the runway. This speed was above a safe taxiing speed for the turn. Continuing straight with continuous maximum braking would probably have kept the aircraft on the paved runway; based on the performance analysis the attempted turn generated the final lateral departure onto soft ground.

3.5 Crew resource management and human factors

The available evidence showed inadequate shared assessment of the excessive tailwind, high descent rate, speed deviation, and stopping plan. The pilot monitoring identified some hazards but did not make sufficiently clear and timely challenge or go-around calls. The pilot flying continued the approach and selected manual braking without a fully shared landing-performance assessment.

Previous successful continuation of unstable approaches may have weakened the perceived need to go around. Concern about refueling logistics, schedule impact, and ground delay at Tombouctou also supported plan-continuation bias. These influences do not assign personal fault, but they identify organizational and human-performance risks that require procedural barriers and monitoring.

3.6 Technical factors

Post-occurrence inspection found no significant brake defect, and the aircraft was airworthy when dispatched. The asymmetric reverser deployment contributed to a small initial drift, but effective directional control and stopping remained available through prompt, continuous braking and standard landing-roll technique. The occurrence was therefore not attributed to a pre-existing aircraft malfunction.

3.7 Narrow-runway risk controls

The runway width increased the importance of centreline control and avoiding a high-speed turn, although the operator had developed narrow-runway guidance; the occurrence crew did not review it. Safety information is effective only when it is incorporated into dispatch, route qualification, briefing packages, and crew verification processes.

3.8 Recorder preservation

Loss of the relevant cockpit voice recording prevented direct verification of communications, callouts, and cockpit coordination. Operators need a clear and immediate process to preserve recorders after reportable events, including responsibility, technical-log documentation, and confirmation that electrical power or circuit-breaker actions will not overwrite data.

4. Conclusions

4.1 Findings

- 4.1.1 The aircraft was certified, maintained, and airworthy when dispatched.
- 4.1.2 The aircraft mass and centre of gravity were within prescribed limits.
- 4.1.3 Both pilots were licensed, medically fit, qualified, and adequately rested.
- 4.1.4 The runway was dry and 2,170 m long by 30 m wide.
- 4.1.5 The aircraft was not equipped to use the available RNAV GNSS approach and therefore conducted a visual approach.
- 4.1.6 A narrow-runway risk assessment and controls existed, but the occurrence crew did not review them.
- 4.1.7 The approach remained unstable below 500 ft, with excessive descent rate and airspeed.
- 4.1.8 The recorded tailwind component was approximately 16 kt and exceeded the applicable operational limit identified in the report.
- 4.1.9 The aircraft crossed the threshold and touched down with excess groundspeed.
- 4.1.10 The landing was not hard.
- 4.1.11 The left thrust reverser deployed several seconds later than the right, producing a small right drift.
- 4.1.12 Initial manual braking was asymmetric and brake pressure was subsequently modulated or released.
- 4.1.13 Post-occurrence inspection did not identify a significant brake-system defect.
- 4.1.14 The aircraft was turned toward the taxiway at approximately 60 kt groundspeed.
- 4.1.15 The performance analysis indicated that continuous maximum braking would probably have stopped the aircraft on the paved surface.
- 4.1.16 Crew monitoring, challenge, and shared decision-making were not sufficiently effective.
- 4.1.17 Plan-continuation bias and concern about delay influenced reassessment of the approach.
- 4.1.18 The relevant cockpit voice recording was unavailable, limiting confirmation of cockpit communications.
- 4.1.19 No injuries occurred.

4.2 Cause

Cause

Continuation of a high-energy, unstabilized approach with a tailwind component above the applicable operational limit, followed by inefficient and discontinuous manual braking and an attempted runway exit before the aircraft had decelerated to a safe taxi speed.

4.3 Contributing factors

- Ineffective crew challenge, monitoring, and shared decision-making.
- Plan-continuation bias reinforced by concern about operational delay and logistics.
- Failure to apply the operator's stabilized-approach and mandatory go-around policy.
- Use of manual braking without steady, symmetrical brake pressure.
- Failure to review and apply narrow-runway risk controls.
- Loss of the cockpit voice recording, which limited the investigation but did not cause the occurrence.

4.4 Factors not causal

- Aircraft maintenance condition or a pre-existing brake-system malfunction.
- Hard landing.
- Crew fatigue or medical unfitness.

5. Safety Recommendations and Action

The following recommendations retain the preventive intent of the source report while directing action toward systems, procedures, training, and oversight rather than individuals.

Addressee / area	Preventive action
Operator - flight operations	Reinforce the mandatory stabilized-approach and go-around policy, including unambiguous pilot-monitoring callouts and authority for either pilot to require a go-around.
Operator - training	Enhance CRM training in monitoring, assertive challenge, leadership, decision-making, plan-continuation bias, and management of operational pressure.
Operator - training	Provide recurrent simulator scenarios involving excessive tailwind, high-energy visual approaches, short or narrow runways, manual braking, and rejected runway-exit decisions.
Operator - operations	Require documented landing-performance calculation whenever runway length is limited, tailwind exists, the approach speed is elevated, or maximum braking is planned.
Operator - operations	Promote autobrake use when runway length is limited or approach speed is elevated, unless a documented operational reason supports manual braking.
Operator - standards	Emphasize continuous, symmetrical manual brake pressure and prohibit pumping or modulation except where

	approved procedures specifically require it.
Operator - route and aerodrome programme	Ensure aerodrome risk assessments and narrow-runway controls are included in dispatch packages, crew qualification, and pre-flight briefing verification.
Operator - safety management	Use flight-data monitoring to identify unstable approaches, tailwind exceedances, delayed nose lowering, brake modulation, and high-speed runway exits. Track corrective action and recurrence.
Operator - occurrence response	Establish an immediate recorder-preservation procedure with assigned responsibility, technical-log entry, and confirmation that data cannot be overwritten.
CARC oversight	Monitor implementation through en-route inspections, simulator and line-check sampling, FDM review, recorder-preservation audits, and safety-management surveillance.

Recommendation tracking

CARC should maintain the authoritative recommendation register, addressee responses, implementation evidence, effectiveness assessment, and closure status, and update the website when recommendation status changes.

END OF PUBLIC REPORT

This report is issued solely to support aviation-safety learning and prevention. It shall not be used to assign blame or determine liability.