Australian Government
Australian Transport Safety Bureau

Runway overrun involving Gippsland Aeronautics GA8, VH-BNX

Cornwell's ALA, Fraser Island, Queensland, on 2 January 2020

ATSB Transport Safety Report
Aviation Occurrence Investigation
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Addendum

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Safety summary

What happened

On 2 January 2020, at about 1415 Eastern Standard Time, the pilot of a Gippsland Aeronautics GA8 aircraft, operated by Air Fraser Island and registered VH-BNX, conducted a local scenic flight at Fraser Island, Queensland, with seven passengers on board. After the 13-minute flight, the aircraft returned to land on the same beach landing area it had taken off from.

During the approach, the pilot saw a vehicle moving close to the runway. To remain clear of the perceived vehicle hazard, the pilot opted to land about a third of the way down the marked runway. Shortly after the first touchdown, the aircraft became airborne again. The pilot reported that he had pulled back on the control column to raise the aircraft nose off the ground, in order to minimise the discomfort to passengers as the aircraft passed over holes in the sand.

After passing the holes, the aircraft landed and the pilot attempted to brake. However, the aircraft was still at speed as it approached the end of the runway, beyond which was a washout. As the aircraft overran the runway, the pilot reported raising the nose to lift the aircraft over the washout, concerned that the aircraft would flip if the nose wheel struck the water. Immediately beyond the washout, the aircraft pitched forwards heavily onto the nose landing gear, which collapsed. The propeller struck the sand and the aircraft came to a halt.

The aircraft sustained substantial damage, but there were no injuries to the pilot or passengers.

What the ATSB found

The pilot did not conduct a go-around despite several cues to do so, including sighting a vehicle near the runway and when becoming airborne again after the first touchdown. The aircraft subsequently landed with insufficient runway remaining to prevent a runway overrun. The overrun was onto a section of beach unsuitable for a landing roll due to a washout.

The pilot did not obtain passenger weights or use standard weights to calculate the aircraft weight and balance prior to the flight from which to assess the required landing distance.

Safety message

This accident is a reminder to pilots to be go-around minded. This is of particular importance when operating at a runway in conditions where the full available runway length is required for a safe landing and no obstacle-free overrun area exists.

The Flight Safety Foundation Approach-and-landing accident reduction tool kit *Briefing note 6.1 – Being prepared to go around*, stated that the importance of being go-around prepared and go-around minded must be emphasised because a go-around is not a frequent occurrence.

The investigation

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of findings that affect safety and possible safety actions.

The occurrence

On 2 January 2020, at about 1415 Eastern Standard Time,[1] the pilot of a Gippsland Aeronautics GA8 aircraft, operated by Air Fraser Island and registered VH-BNX, conducted a local scenic flight at Fraser Island, Queensland, with seven passengers on board. After a 13-minute flight, the aircraft approached Cornwell's beach aeroplane landing area (ALA), from where it had taken off.

Cornwell's ALA was located on the east coast of Fraser Island (Figure 1). The runway, which was on the beach, was 500 m long and marked with traffic cones. The wind was 5-10 kt from the east-north-east and the beach was busy, with vehicles on the beach and campers in the sand dunes. There were also vehicles parked on the edge of the clearway, which extended 100 m either end of the runway.

Figure 1: Fraser Island and Cornwell's aeroplane landing area

Source: Google Earth, annotated by ATSB

[1] Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

As the pilot commenced a straight-in approach from the south, he communicated with ground crew via radio and was advised that all vehicles were stationary. As the aircraft neared the runway, the pilot saw a car moving close to the runway area. A ground crewmember tried to get the driver to stop and the car then changed direction and moved clear of the runway. To ensure the aircraft remained clear of the vehicle hazard, the pilot opted to move his aiming point further along the runway, and the aircraft touched down a third of the way down the marked runway and well beyond the runway threshold markers.

About half way along the runway, there were 10 cm-deep 'melon holes'[2] in the sand. Video footage taken from inside the aircraft indicated that it touched down briefly, then became airborne again. The pilot reported that approaching the holes, he had extended flap and pulled back on the control column in an attempt to lift and hold the aircraft nose wheel off the ground, to minimise the discomfort to passengers. After passing the holes, the pilot reported that he lowered the nose and attempted to brake. The safety manager later paced out the distance from where the aircraft landed after passing the holes, and reported that approximately 100 m of runway remained.

The aircraft was still at speed as it approached the end of the runway. As the aircraft overran the runway, the pilot raised the nose to get the aircraft over a washout, concerned that it would flip if the nose wheel struck the water. Immediately beyond the washout, the aircraft pitched forwards heavily onto the nose landing gear, which collapsed. The propeller struck the sand and the aircraft came to a halt (Figure 2). The video footage showed that less than 5 seconds elapsed between the landing and when the aircraft stopped.

The aircraft sustained substantial damage. There were no injuries to the pilot or passengers. The pilot and front passenger were wearing four-point harnesses and rear passengers wore over-shoulder harnesses with lap sash seatbelt. The pilot reported he had verified that everyone was wearing their seatbelts and had headsets on so he could communicate with them before commencing engine start.

Figure 2: VH-BNX at the accident site

Source: Air Fraser Island

[2] Melon holes: holes in the sand the size and shape of melons.

Context

Pilot qualifications and experience

The pilot held a commercial pilot licence (aeroplane) issued in July 2018, a single-engine aeroplane class rating, and a valid Class 1 medical certificate. He commenced training in beach operations at Air Fraser Island on 14 January 2019 and was employed as a pilot on 5 March 2019. Since then, he had accrued 300-350 hours in GA8 aircraft conducting beach operations.

Air Fraser Island pilots underwent beach operations flight checks every 90 days in accordance with their operations manual. The pilot's last beach operations and 6-monthly route check was completed successfully on 18 October 2019. The flight included circuits, soft-field take-offs and landings, and emergency operations.

Aircraft information

The aircraft had 10,844.4 hours total time in service at the start of the accident day. The maintenance release (MR)[3] current on the day was issued on 30 December 2019 following a 100-hourly inspection. The aircraft had subsequently flown 6.7 hours and made 31 landings. No defects were recorded on the MR. The daily inspection certification on the MR had been signed for 2 January.

The chief engineer advised that the operator's aircraft fleet generally made 200-300 landings every 100 hours and the safety manager stated that on a busy day, pilots would conduct 20 to 30 take-offs and landings. The number of landings per hours flown for VH-BNX was normal for Air Fraser Island's operations. Nearly all the landings were soft- and short-field landings on beach runways. This high number of landings and salty, sandy environment had resulted in ongoing unscheduled maintenance of aircraft landing gear, particularly brakes.

Brakes

Unscheduled brake maintenance

Air Fraser Island's chief engineer reported that unscheduled maintenance of the brake system consisted of replacing brake pads, discs, calliper o rings, bearings, master cylinders and undercarriage bushes. They found that when pilots have sand on their shoes and put their feet on the (brake) pedals, the sand drops on top of the master cylinders, eventually works its way down into the cylinders and wears out the o rings.

Sand in the master cylinders wearing the o rings can result in leakage of brake fluid and has the effect of making the brakes feel spongy. Pilots reported that when the brakes felt spongy on landing, they would pump the brake pedals a few times, and the pressure would return and the brakes would stop the aircraft effectively. In response to finding sand in the master cylinders, in November 2019, the aircraft operator commenced a program of replacing all the master cylinder and calliper o rings at every 100-hourly inspection. The chief engineer advised that the master cylinders, calliper o rings and brake pads on VH-BNX had been replaced during the 100-hourly inspection, 3 days before the accident.

Daily inspection

The Air Fraser Island operations manual, stipulated that in the pilots' daily inspection of aircraft, special attention must be given to brakes. Pilots were required to check the brake disc rotor for cracking and corrosion, brake linings for wear and callipers to look for any signs of brake fluid seepage. The pilot of VH-BNX reported that company pilots checked the brake fluid and topped it up when needed, as part of the daily inspection.

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[3] Maintenance release: an official document, issued by an authorised person as described in Regulations, which is required to be carried on an aircraft as an ongoing record of its time in service (TIS) and airworthiness status. Subject to conditions, a maintenance release is valid for a set period, nominally 100 hours TIS or 12 months from issue.

Braking during the occurrence

The pilot reported that he attempted to brake when the aircraft was beyond the melon holes, but that the left brake felt spongy. Before the first flight of the day, he had conducted the daily inspection on the aircraft and had not found any issue with the brakes. He had also checked the brakes when at about 900 ft during the approach, by depressing the pedals, at which stage the brake pressure felt normal.

After the accident, the chief engineer tested the left brake by pushing the pedal with his hand and found that the brake was hard and did not find any defect with the brakes. The safety manager and chief pilot also inspected the tyre tracks in the sand from the accident landing. The left tyre track was different from the right, in which the tyre grooves were distinct. They assessed that the left tyre track was indicative of the left wheel having locked up and skidded across the surface of the sand. The nose wheel track was not very distinct, consistent with the pilot's attempt at raising the aircraft nose.

Aeroplane landing areas

The company operations manual specified that beach runways were to be established in accordance with the Civil Aviation Safety Authority (CASA) Civil Aviation Advisory Publication (CAAP) 92-1(1) *Guidelines for aeroplane landing areas.* The CAAP recommended minimum physical characteristics of landing areas applicable to daytime operation of the GA8.

Runway length

The CAAP stated that 'a runway length equal to or greater than that specified in the aeroplane's flight manual or approved performance charts or certificate of airworthiness, for the prevailing conditions is required (increasing the length by an additional 15% is recommended when unfactored data is used).'

The pilots were required to use soft-field landing technique, as described in the company operations manual:

> The pilot in command shall use sufficient braking to enable the aircraft to slow to a taxi speed as soon as possible after touchdown. Constant back pressure should be maintained on the control column whilst braking to relieve nose wheel pressure.

The landing technique described in the pilot operating handbook for the GA8 aircraft, was consistent with a short-field technique:

> The aircraft approaches with idle power down to the 50 feet height point at the given airspeed appropriate to weight. After touch down maximum wheel braking is used to bring the aircraft to a stop.

From the performance charts in the pilot operating handbook, the take-off distance required was greater than the landing distance. The chief pilot reported that landing distance required was about two thirds of that required for the take-off roll. From the performance charts, the aircraft operator had derived a standard take-off ground roll distance required of 480 m. This was based on 30 ºC temperature, maximum take-off weight, nil wind, a 'short dry grass or gravel' runway surface and the recommended increase of 15 per cent as the data was unfactored. From the calculated distance, the ground crew were to mark out 500 metre-long runways where possible. However, the safety manager commented that if a runway length of 350-500 m was all that was available, the pilots could still operate on the runway but would take fewer passengers and/or less fuel.

The operations manual stipulated that pilots 'must calculate the take-off and landing distance required for a flight considering take-off/landing distance available, aircraft weight, pressure/density height and obstacles.' Additionally, the pilot must ensure that all passenger (and cargo) weights were calculated prior to loading the aircraft, using standard or actual passenger weights, but not a combination of the two.

The passenger manifest was completed after the accident. Standard weights were not used, but passengers later reported that they did not provide their weights to the ground crew when

completing the manifest. The accuracy of the recorded weights was unknown. The aircraft take-off weight on the manifest was 1,767 kg, less than the maximum take-off weight of 1,814 kg.

Based on the power-off landing chart, at 30 °C, the manifest aircraft weight, nil wind and slope, short dry grass or gravel surface and without consideration of 50 ft obstacle clearance, the landing distance required was about 480 m and the landing roll required was 200 m. There was no published data for sand runways.

Runway ends

The CAAP further stated that 'Both ends of a runway…should have approach and take-off areas clear of objects above a 5% slope for day [operations].' The CAAP contained no recommendations or guidance regarding the suitability or nature of the ground under the approach and take-off areas similar to the requirement for obstacle-free areas above. The safety manager reported that the highest obstacle they needed to climb above on the beach were 5 m high tour buses. They used a clearway of at least 100 m at the end of the runways, marked with bollards to distinguish the clearway markers from the runway touchdown cones.

The clearways were used to ensure obstacle clearance and their surfaces were not intended to be used for take-off or landing ground roll. The safety manager advised that soft sand, pooling water, washouts and dips were all suitable in the clearway in accordance with the CAAP.

Comparison with certified aerodromes

Certified aerodromes are intended to accommodate aircraft with more than 30 passenger seats conducting air transport operations. As such, the requirements surrounding certified aerodromes are in excess of those for ALAs.

The International Civil Aviation Organization (ICAO) Annex 14: *Aerodromes*, stated that for non-instrument runways less than 800 m (code 1 runway), there *shall* be a runway strip[4] beyond the runway end of a distance of at least 30 m. It also recommended that a runway end safety area[5] of at least 30 m should be provided at each end of the runway strip.

Similarly, the CASA Manual of Standards for Part 139 - *Aerodromes* indicated that, for certified aerodromes, a runway strip shall extend at least 30 m from the end of the runway. However, the standards did not require a non-instrument code 1 runway to have a runway end safety area. The runway strip requirement was to ensure, in the case of a runway excursion (overrun and veer-off), the aircraft had enough room to stop, reducing the risk of damage to an aircraft and injury to occupants.

Although these standards were not applicable for ALAs, in this occurrence, the pooling water at the end of the runway increased risk of aircraft damage and occupant injury in the event of a runway excursion.

In an investigation into an accident in 2018, where an aircraft overran the runway of an ALA and collided with a watercourse (AO-2018-025), the ATSB identified a safety issue that CAAP 92-1(1) did not have guidance for the inclusion of a safe runway overrun area at ALAs. The ATSB issued a safety recommendation to CASA in October 2019 to include guidance for the inclusion of runway end safety areas at ALAs in CAAP 92-1(1).

Cornwell's aeroplane landing area

Cornwell's runway used on the accident flight was 500 m long and 15 m wide, marked with touchdown cones, and 100 m clearways beyond either end, marked by bollards and a sign. It was a 'high beach' landing area, set towards the dunes and either side of the runway was hard sand.

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[4] Runway strip: A defined area including the runway and stopway, if provided, intended: a) to reduce the risk of damage to aircraft running off a runway; and b) to protect aircraft flying over it during take-off or landing operations.

[5] Runway end safety area: An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aircraft undershooting or overrunning the runway.

There was a length of about 50 m with melon holes mid-strip and an ankle-deep freshwater soak, or washout, at the northern end of the runway.

Earlier in the day, ground crew had driven up and down the strip, assessing that the melon holes did not pose undue risk. Other company pilots had also inspected the strip and landed there with no issues. Prior to the accident flight, the pilot had landed VH-BNX on the Cornwell's runway with no passengers on board. On that landing, the aircraft stopped before the melon holes, using less than half the available runway distance.

The safety manager assessed that on the accident flight, the aircraft landed with less than 100 m runway remaining beyond the melon holes, which was insufficient distance to stop with the aircraft fully loaded, and the conditions on the day.

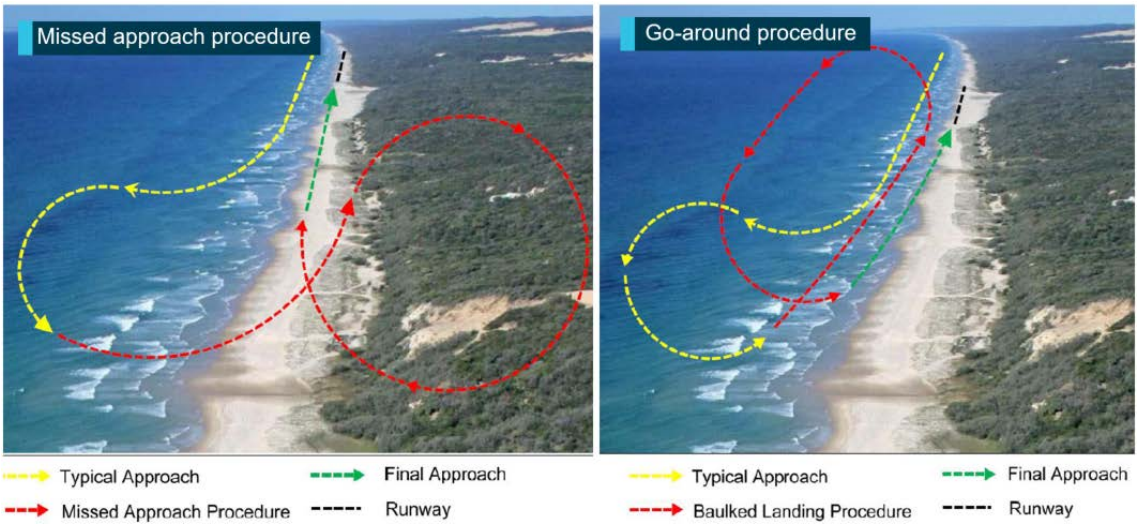
The pilot subsequently reported that he may have misidentified the end of the runway, mistaking the end-of-clearway bollards beyond the landing strip to be the end-of-runway cones. He further commented that at the time, he had thought there was ample distance remaining to stop, until he saw the washout.

Go-around procedures

The chief pilot and safety manager emphasised that because of the short-field (minimum length) landing areas and dynamic beach conditions, pilots were trained to conduct a go-around if safety could not be assured at any stage during approach or landing. The company operations manual specified both missed approach and go-around procedures (Figure 3). The chief pilot reported that pilots must conduct an orbit (missed approach procedure), if, during the approach, they saw anything that could encroach on the runway. In this case, he advised that the pilot should have conducted a 2-minute orbit and communicated with ground crew via radio to clear vehicles from the area.

The manual stated that the go-around procedure was to be flown 'if the go-around is initiated during the final approach or landing phase.'

Figure 3: Extract from operations manual depicting missed approach and go-around procedures



Source: AIAC annotated by ATSB

Safety analysis

Fraser Island beaches posed a very dynamic aircraft operating environment. Potential hazards included vehicles, people, animals and changing tides and sand conditions. To mitigate and manage the hazards, the operator used runway markers, ground crew and reinforced the importance of, and pilot skills in, conducting go-arounds when safe landing could not be assured. Additionally, to enable better control of landing areas, the operator used runways of the minimum

safe length for take-off and landing, which necessitated that pilots use short-field and soft-field techniques. This meant that both landing beyond the runway threshold and becoming airborne again during the landing phase, increased the risk of a runway overrun.

Furthermore, because there were few high obstacles on the beaches, going around was less likely to result in a collision than encountering unsuitable surfaces beyond the designated landing area. The pilot was proficient at conducting go-arounds and the reason he omitted to do so in this occurrence, could not be determined.

Although the aircraft was still on the beach during the runway overrun, the area beyond the runway contained a washout unsuitable for a landing roll. The pilot's action in raising the aircraft nose prior to the washout likely prevented a more serious outcome.

The pilot reported that the left brake was spongy and that this had affected his ability to stop the aircraft. The aircraft operator also reported that there had been a history of brake issues due to the operating environment. However, the maintainer inspected the brakes after the accident and other than accident damage, could not reproduce a fault with the brakes. While the ATSB could not determine whether the brakes had been functioning correctly at the time of the accident, in any event, there was almost certainly insufficient runway remaining to stop given the aircraft weight and conditions.

The pilot subsequently reported that he may have mistaken the clearway bollards for the runway marker cones, thereby assessing that he had more stopping distance than actually remained. However, the bollards were deliberately different from the marker cones to mitigate against this misidentification. Additionally, the pilot had previously overflown the runway, which was the normal length used by the operator, and then landed on it, prior to the accident flight. Whether this misidentification contributed to the accident could not be determined.

The passenger manifest was completed after the accident. However, this was required to be completed prior to flight, as it included passenger weights from which to calculate aircraft take-off weight and assess take-off and landing distances.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The pilot did not conduct a go-around including when faced with a vehicle hazard, landing well beyond the runway threshold and becoming airborne again during the landing. This resulted in the aircraft landing with insufficient runway remaining and a runway overrun onto an area of the beach unsuitable for the landing roll.
- The pilot did not obtain passenger weights or use standard weights to calculate the aircraft weight and balance prior to the flight from which to assess the required landing distance.

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- pilot
- ground crew
- aircraft operator
- aircraft maintainer
- Civil Aviation Safety Authority.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the pilot, ground crewmember, aircraft operator, aircraft maintainer, aircraft manufacturer and the Civil Aviation Safety Authority.

Submissions were received from the aircraft manufacturer and pilot. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

General details

Occurrence details

Date and time:	2 January 2020 – 1430 EST	
Occurrence category:	Incident	
Primary occurrence type:	Runway excursion	
Location:	Cornwell's ALA, Fraser Island, Queensland	
	Latitude: 25º 20.18' S	Longitude: 153º 12.12' E

Aircraft details

Manufacturer and model:	Gippsland Aeronautics GA8	
Registration:	VH-BNX	
Operator:	Air Fraser Island	
Serial number:	GA8-03-032	
Type of operation:	Charter – Passenger	
Departure:	Cornwell's ALA, Fraser Island, Queensland	
Destination:	Cornwell's ALA, Fraser Island, Queensland	
Persons on board:	Crew – 1	Passengers – 7
Injuries:	Crew – 0	Passengers – 0

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within the ATSB's jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Terminology used in this report

Occurrence: accident or incident.