



CAA Safety Investigation Brief

Yakovlev Yak 3M ZK-YYY

Collision with ground equipment

Warbirds over Wanaka Air show

31 March 2018

January 30 2019

What happened

The opening sequence of the 2018 Warbirds over Wanaka (WOW) air show was planned to feature aircraft from the Royal New Zealand Air Force (RNZAF) and United States Air Force (USAF).

Weather delays resulted in the USAF aircraft having to cancel, and organisers arranging for two civilian operated Yakovlev Yak-3M (Yak) aircraft to fill in for the USAF aircraft in the opening sequence.

The Yak pilots planned and flew a simple high-speed pass over the airfield, followed by a reversal turn and buzz and break¹ joining procedure to land.

After flying the sequence, Yak 1 (ZK-VVS) landed on sealed runway 29, and Yak 2 (ZK-YYY) landed on the grass area 29 (see figure 1). During the landing roll Yak 2 collided with cherry pickers that had been placed on the grass area north of the sealed runway.



Figure 1. Wanaka aerodrome, showing full width grass, grass runway and disposition of cherry pickers at the time of the accident. (Not to scale.)

¹ Buzz and break is a procedure, designed primarily for military use, which enables an aircraft approaching an aerodrome at high speed to decelerate into the circuit pattern, and land with minimum delay.

Analysis of the circumstances of the flight

Organisational information

WOW organise the biennial air show of the same name. For the duration of the whole weekend of the air show, WOW take control of Wanaka aerodrome, under an agreement with the Queenstown Airport Corporation (QAC).

WOW appoint a number of officers to manage the show. The post of Flying Display Director (FDD) holds several responsibilities which include the safe conduct of the flying display, approving any changes to the flying programme and running the morning mass briefing for all pilots and other participants in the air show.

The FDD, or if military aircraft are involved, a Military Display Director (MDD), will usually be in the Tower during the air show. They coordinate the various display items, approve the commencement of various flight stages such as take-off, display routine, joining and landing, and provide information to pilots to assist them in the safety of their operation².

Last minute change of opening sequence

The late cancellation of the USAF aircraft participation in the opening sequence prompted the last minute change to the programme with the quickly planned Yak display.

Page seven of the New Zealand Air show Association *Guide to Air show Display Director*³ states:

Displays must be carefully planned on the ground and in the air and nothing should be considered without ensuring that it is safe. A risk assessment procedure must be included in this process. The impromptu, ad hoc, unrehearsed or unplanned should never be attempted.

The Flying Display Planner authorised the change to the flying programme, and then advised the FDD just before the briefing. No evidence was found of formal risk assessment of the programme change.

Use of more operational space was agreed

Wanaka aerodrome has two runways available for use; a sealed runway, and a grass runway, parallel to and north of the sealed runway (see figure 1).

WOW reached an agreement with QAC to use the full width of the grass area to the north of sealed runway 29/11 for the take-off and landing of aircraft. The full width of the grass area encompasses the published grass runway.

Use of the full width of the grass facilitates quicker arrival and departure for formations of aircraft.

Cherry picker equipment arrived and was positioned ahead of time

Before the morning briefing it was noticed by the MDD that two cherry pickers, that were not scheduled to be in place until after the opening sequence of the display, were in place on the grass

² Display Director approvals are not Air Traffic Control clearances. The nature of operations at air shows precludes the provision of Air Traffic Control

³ New Zealand Air show Association *Guide to Air show Display Director* is intended as a code of practice and an indicator of best practice to provide guidance to the Flying Display Director, to ensure that the safety of both the participants and the spectators is not compromised.

at the edge of the sealed runway. After being informed of this fact the FDD told the manager responsible they were in the way and thought they should be moved. The manager said to leave it with him.

Based on the discussion with the manager responsible for the cherry pickers, the FDD thought the cherry pickers were going to be removed from the manoeuvring area. He reported at the morning briefing that the full width of the grass was available for take-off and landing.

Mental models differed from reality

Discussion pertaining to operations on the full width grass occurred amongst air show participants, including the question from a pilot "So we could actually land left or right on grass?" to which the answer was "You can, yes."

More than one pilot, including the pilot of Yak 2 left the briefing with the very clear impression that the full width of the grass was available for landing. After the accident the pilot described the visibility limitations in the Yak, particularly when landing, and said he never saw the cherry pickers.

Even if the cherry pickers entered the pilot's visual field before the landing phase, as unexpected obstacles they may not have been detected due to the focus on flying the aircraft in formation. Failure to detect unexpected objects in a visual field is an extensively studied and well-documented subject, and a normal aspect of human sensory perception known as inattention blindness.⁴

The MDD on duty at the time of the accident said his mental model was that the Yaks would be landing on the sealed runway. The MDD missed the discussion concerning availability of the grass during the brief while attending to other duties concerning military aircraft. His understanding was that the seal and designated grass runway were still the only surfaces to be used for take-off and landing, but that the entire grass area was available for manoeuvre. He was aware of the cherry pickers on the grass, the possibility that Yak 2 could be landing on the grass adjacent to the seal runway was not an option he had considered.

The MDD did a visual gear check of the approaching aircraft, and watched Yak 1 land. Yak 2 appeared to be behind Yak 1, and he turned his attention to scanning for an approaching RNZAF helicopter. While looking for the helicopter, he heard a bang and looked round to see Yak 2 coming to a halt.

From any typically positioned Tower, visually identifying of which of a pair of close parallel runways an aircraft on final is lined up for is almost impossible.

The pilot of Yak 2 had made a radio call reporting he was on base leg for the grass. but the content of this transmission was not heard in the Tower. The MDD expectation of both Yak aircraft landing on the sealed runway and not hearing the position and intentions report from the pilot of Yak 2 resulted in no information about the cherry pickers being passed to the pilot.

⁴ See as an example <https://www2.psych.ubc.ca/~rensink/publications/download/EncycConsc-CB-IB-rr.pdf>

Safety actions

WOW have a series of documented risk mitigation strategies in place for the organisation and running of the air show. The CAA is working with WOW on ways to further develop and improve the effectiveness of these mitigations.

These actions will also assist in safety management of other air shows in New Zealand.

Pilots have been reminded that the nature of air show operations includes unusual hazards. The approvals issued by an FDD or MDD may not mitigate all risks arising from those hazards.

As such, a heightened level of vigilance by the pilot is required at all times when operating at air shows. Within the limits imposed by visibility and operational requirements, runways should be actively scanned for unexpected obstacles prior to landing.

Accident Data Summary

Aircraft make and model, registration:	Yakovlev Yak-3M, serial number 1701231
Year of manufacture:	Unknown
Accident Date and time:	31 March 2018, 1006 hours NZDT
Location:	Latitude: S44° 43' 19.85" Longitude: E169° 14' 50.35"
Altitude:	1123 feet above mean sea level
Type of flight:	Private
Persons on board:	Crew: 1
Injuries:	Crew: 0
Nature of damage:	Extensively damaged
Pilot's licence:	ATPL
Pilot's age:	73 years
Information sources:	Civil Aviation Authority safety investigation

About the CAA

New Zealand's legislative mandate to investigate an accident or incident are prescribed in the Transport Accident Investigation Commission Act 1990 (the TAIC Act) and Civil Aviation Act 1990 (the CA Act).

Following notification of an accident or incident, TAIC may conduct an investigation. CAA may also investigate subject to Section 72B(2)(d) of the CAA Act which prescribes the following:

72B Functions of Authority

(2) The Authority has the following functions:

- (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in [section 14\(3\)](#) of the [Transport Accident Investigation Commission Act 1990](#)

The purpose of a CAA safety investigation is to determine the circumstances and identify contributory factors of an accident or incident with the purpose of minimising or reducing the risk to an acceptable level of a similar occurrence arising in the future. The safety investigation does not seek to ascribe responsibility to any person but to establish the contributory factors of the accident or incident based on the balance of probability.

A CAA safety investigation seeks to provide the Director of the CAA with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

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