Criticality of Milford Sound Piopiotahi Fixed Wing Aerodrome for Emergency Response Operations

A review undertaken for the Milford Opportunities Project

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EXECUTIVE SUMMARY

Holdfast Projects was engaged by the Milford Opportunities Project to review the criticality of the fixed wing aerodrome at Milford Sound Piopiotahi to emergency response operations.

A review of existing reports and literature was undertaken, followed by interviews with key representatives of six relevant organisations. As part of the analysis, future scenarios requiring an emergency response, including an Alpine Fault Magnitude 8 scenario were considered.

It was assessed that even in future scenarios where the fixed wing aerodrome remained operational, fixed wing evacuation would not be a determining factor in whether death or significant hardship was experienced.

It was assessed that the fixed wing aerodrome at Milford Sound Piopiotahi was not critical to emergency response operations.

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ABBREVIATIONS

MOP	Milford Opportunities Project
AF8	Alpine Fault Magnitude 8

INTRODUCTION

Background and limitations

This report reviews the criticality of the fixed wing aerodrome at Milford Sound Piopiotahi to emergency response operations. The review was undertaken on behalf of the Milford Opportunities Project (MOP).

The author acknowledges the recommendation of the Milford Opportunities Project Governance Group to remove the fixed wing aerodrome. The author also acknowledges (as is specifically commented by the Chair of the Governance Group in the forward to the Masterplan), the objection to this by the then Queenstown Mayor, Jim Boult, and the similar sentiment echoed by the Destination Milford Sound group.

This review concerns itself solely with the *criticality of the fixed wing aerodrome to emergency response operations*. Commentary or discussion on the wider, and significantly more complicated issue of removing or retaining the fixed wing aerodrome is beyond the scope of this report and outside the expertise of the author.

METHODOLOGY

The review was undertaken in April 2024.

Literature review

An initial review of existing reports and plans was undertaken. This included relevant MOP reports, relevant emergency and emergency management plans, and publications and papers of a specific technical nature (e.g., the conduct of evacuation operations and post-earthquake aerodrome inspections). A reference list is provided.

Interviews

Phone interviews with seven individuals representing six organisations were conducted. The aim of these interviews was twofold. First, to ensure that all emergency response related uses of the fixed wing aerodrome had been considered and no potential use or circumstance had been overlooked. Second, to ensure the author understood the risk profile of the Milford Sound Piopiotahi area and the particular challenges of undertaking emergency response air operations in the area.

Analysis

The literature and the interviews, combined with the author's knowledge and understanding of emergency management and large-scale emergency response operations informed the analysis.

The following question drove the investigation and analysis:

What is the criticality of the Milford Sound Piopiotahi fixed wing aerodrome to an emergency response?

Peer review

The report was peer reviewed to ensure no key aspects had been overlooked and the conclusion was sound and justified. The peer review was undertaken by airport industry veteran, Allan MacGibbon. Allan is the Chairman of Chatham Islands Airport Limited, and a safety and compliance consultant to several organisations including the New Zealand International Commercial Pilot Academy and Mid West Helicopters. Allan was previously the Airport Manager at Whanganui Airport, a Civil Defence Emergency Management Controller, and a Regional Emergency Manager for Hawkes Bay.

EXISTING LITERATURE

Masterplan

The Milford Opportunities Masterplan (the Masterplan) proposes to develop a new heliport to allow the current aerodrome runway to be removed and repurposed (Milford Opportunities Project, 2021a).

The plan notes a combination of issues leading to the recommendation. Two are immediately relevant to this review:

1. The operational and safety challenges due to the aerodrome's location in a mountainous area and the highly changeable meteorological conditions. These meteorological conditions limit the number of operating days at the aerodrome.
2. Flooding of the aerodrome at high spring tide. Approximately 300m of the runway is low-lying and occasionally floods and this is forecast to worsen as sea levels rise. Concurrently, groundwater from the Cleddau River undermines the runway tarmac.

Proposed heliport shown as '10'. Repurposed runway shown as '7'.
(Milford Opportunities Project, 2021a, p. 11)

Technical reports and AF8

Three technical reports (all completed in 2021) informed the Masterplan and are relevant to this review:

1. Transport and Access Report,
2. Hazards and Visitor Risk Review Report, and
3. Infrastructure Assessment Report.

The Transport and Access report provides background technical information concerning the airport and its usage. It describes the aerodrome as a "daytime only facility that is used in good weather conditions" (Milford Opportunities Project, 2021b, p. 21) and notes the operational constraints of the surrounding topography and flying conditions.

The report notes that the aerodrome "provides for the ability to evacuate people in the event of a natural disaster leading to the closure of the Milford Road, assuming that the aerodrome itself is not impacted by a natural disaster or meteorological conditions that render it inoperable" (p. 25).

The two other relevant reports, the Hazards and Visitor Risk Review Report and the Infrastructure Assessment Report both reference the "AF8" scenario. AF8 is shorthand for the Alpine Fault

Magnitude 8 earthquake, and it has formed the basis of a significant amount of recent emergency management planning work. The work involved large scale collaboration between scientists and emergency managers and was led by Emergency Management Southland. The capstone document was the South Island Alpine Fault Emergency Response (SAFER) Framework.

The AF8 scenario was developed as a maximum credible event. It is a robust, scientifically modelled scenario that presents credible impacts from a magnitude 8.0 rupture of the Alpine Fault. For locations near the fault, the scenario describes injuries and fatalities due to building failures, landslides and rockfalls, and road and bridge damage. Whether created by rockfall or submarine landslide, the framework observes that tsunami in lakes and fiords near the Alpine Fault are likely, potentially causing significant damage or loss of life (Emergency Management Southland, 2018, p. 6).

Separate, but complementary, the risk assessment of a landslide generated tsunami in Fiordland has been declared a hazard of national significance (Southland Civil Defence Emergency Management, 2017-2022).

The Hazards and Visitor Risk Review Report notes the probability of a major AF8 event in the next 50 years (or less) is very high at around 50 percent. More recently, a Te Herenga Waka – Victoria University of Wellington study has indicated a 75% chance of an Alpine Fault earthquake within the next 50 years, with an 80% chance it will be greater than magnitude 8 (Otago Regional Council, 2023). With respect to Milford Sound, if an AF8 event occurred during peak occupancy, in the order of 3,000 visitors and staff would be exposed to substantial risk (Milford Opportunities Project, 2021c).

The Infrastructure Assessment Report notes that the western portion of the runway is subject to inundation during King Tide events, has occasional instances of water rising up thorough the pavement seal, and that there is a medium risk of liquefaction damage in an AF8 scenario (Milford Opportunities Project, 2021d). The most recent climate change risk assessment report presents the current risk of coastal inundation and flooding for transport infrastructure as “moderate”, moving to “high” by mid-century, and “extreme” by late century (WSP, 2024).

In their development of a high-level pavement design to overcome the risks of the site, Stantec raised approximately 300m of the pavement at the flood-prone end and allowed for subgrade preparations to minimise the risk of pavement damage due to poor foundations/materials (Stantec, 2022). Most concisely, the SAFER Framework assesses the Milford Sound aerodrome

will be "likely not operational" following an AF8 event (Emergency Management Southland, 2018, p. 59).

Fixed wing operations in emergency response

The advantage proffered by fixed wing aircraft (over helicopters) is their substantially greater payload capacity. Cessna Caravans are a common visitor to the Milford Sound Piopiotahi aerodrome. These aircraft can carry 13 passengers at a time. In contrast, the AS350 Squirrel helicopter, also a frequent visitor, is capable of carrying five or six passengers.

Larger rotary wing aircraft such as the BK117 (operated by a number of local companies) can seat nine passengers, while at the extreme end, the NH90 helicopter operated by the Royal New Zealand Air Force can seat 18 passengers.

For planning and comparison purposes relevant to this review, a reasonable planning statement would be that fixed wing aircraft operating in and out of Milford Sound Piopiotahi aerodrome have roughly twice the passenger capacity of rotary wing aircraft.

With their ability to move more people more quickly, fixed wing aircraft become an important consideration in any emergency response operation that requires the evacuation of large numbers of people.

There is limited existing guidance for the conduct of large-scale evacuation operations from a location and environment as restrictive as Milford Sound Piopiotahi. The National Emergency Management Agency's prime evacuation guidance (titled Mass Evacuation Planning) provides no guidance for air evacuation (Ministry of Civil Defence & Emergency Management, 2008). Open-source military publications concerning evacuations offer little planning guidance relevant to the Milford Sound context. (United Kingdom Ministry of Defence, 2023), (United States Joint Chiefs of Staff, 2022).

What is apparent is that for emergency response fixed wing operations to occur – the aerodrome must be in adequate condition to receive aircraft. The aerodrome's emergency response plan notes that a "full inspection of the aerodrome, particularly the runway and taxiways" will need to occur before the aerodrome can be declared operational (Ministry of Transport, 2015). In an emergency response, the Milford Sound Volunteer Fire Brigade will likely be asked to undertake this inspection. (Referred to as Milford Sound Emergency Response Team (MERT) in the Aerodrome Emergency Plan, the team has been subsumed into Fire and Emergency (Fire and Emergency New Zealand, 2024).

Some events may necessitate a more detailed, specialist inspection is undertaken before fixed wing aircraft can land. Wellington Airport have developed a three-level approach to post-earthquake runway inspections. These are based on the severity of the ground acceleration experienced at the airport and range through a quick driven assessment undertaken by operational staff, an on-foot inspection of the entire runway, to an inspection undertaken by a consultant engineer (Eban, Hira, & Sharpe, 2014).

INTERVIEWS

Phone interviews were conducted with local representatives from the following organisations:

- Emergency Management Southland,
- Fire and Emergency New Zealand,
- New Zealand Police,
- St John,
- Southern Lakes Helicopters (as the contracted aeromedical/search and rescue provider), and
- Destination Milford Sound.

Interviewees provided experience-rooted insight into emergency response operations undertaken in and around the aerodrome. The interviews ensured that all relevant aspects of the fixed wing aerodrome's relationship to emergency response operations had been considered.

Interviewees were asked about their involvement in emergency responses and the use of aircraft (both fixed wing and helicopter) as part of response operations they were involved with. They were asked explicitly if the lack of fixed wing capability at Milford Sound aerodrome would have any impact on their extant or likely emergency response operations. The average interview length was twenty minutes.

Three themes became apparent.

Theme 1 – Helicopters are the default

Helicopters are the default, go-to platform for emergency response operations. Most interviewees highlighted the 2020 evacuations (where approximately 400 people were evacuated from Milford Sound and wider Fiordland over a two-day period), as an example of their usefulness in a large-scale emergency response.

For inserting staff into Milford Sound, the first responders (Police, Fire and Emergency, St John) said again, the default go-to was helicopters. As one response agency stated, if more staff than could fit into one helicopter were needed – they'd just send two helicopters.

Interviewees could not conceive of a situation where fixed wing aircraft operating in and out of Milford Sound would be specifically needed – i.e., there was no situation where fixed wing aircraft operating in and out of Milford Sound were essential to task or mission completion.

Theme 2 – Helicopters provide versatility

All interviewees noted the increased versatility offered by helicopters. Much of this versatility related to the ability of helicopters to get the job done in conditions that might prevent fixed wing aircraft from operating. The ability of helicopters to fly in lower weather minima, the larger number of ingress and egress routes available to helicopters, and the ability of helicopters to land near a pass and wait to exploit a passing weather window were all mentioned.

Interviewees also cited the versatility of being able to carry underslung loads (including dangerous goods) and not requiring a dedicated and serviceable airstrip.

Theme 3 – Fixed wing aircraft provide payload

Interviewees noted the significant increase in payload offered by fixed wing aircraft. When interviewed, Destination Milford Sound concurred with the planning figure that each fixed wing aircraft could take approximately twice as many passengers as a rotary wing aircraft.

When questioned about an evacuation scenario, interviewees agreed that fixed wing assets would be useful to evacuate large numbers out of the Sound should the road network be blocked.

Destination Milford Sound noted another component of the 2020 evacuations – pointing out that people evacuated from Fiordland and Milford Sound ended up in Te Anau, and still needed to be transported to Queenstown. Destination Milford Sound highlighted that in one day of flying, using approximately 20 separate fixed wing aircraft, local operators moved over 1000 of these evacuees from Te Anau Airport Manapouri to Queenstown Airport.

ANALYSIS

Historical precedence

The issue being explored is the criticality of Milford Sound's fixed wing aerodrome to support emergency response operations.

No interviewee presented a historical case where the fixed wing capability at Milford Sound was critical to the emergency response. There was simply no situation or event that needed fixed wing assets to operate from Milford Sound.

If historical precedence was the sole driver of the analysis the conclusion would be straightforward - the fixed wing aerodrome is not critical to emergency response.

However, historical precedence is not the only consideration. Future emergency response scenarios must be considered. To this end, consideration of likely emergency response actions following an AF8 earthquake scenario is appropriate.

Criticality in an AF8 scenario

The AF8 earthquake scenario and the resulting impacts described in the SAFER Framework are well considered and scientifically robust. Given the high likelihood of a major AF8 event within the next 50 years, and the clarity with which its potential impacts on Milford Sound are articulated, it is an appropriate event to use as a vignette.

An AF8 event will likely see the road from Te Anau to Lake Gunn partially blocked, and the road from Lake Gunn to Milford Sound impassable (Emergency Management Southland, 2018, p. 56). People in Milford Sound at the time will be trapped and will need to be evacuated.

Whether from liquefaction, tsunami damage or tsunami debris, landslide debris, remnant flooding, or pavement cracking, the fixed wing aerodrome will likely not be operational following an AF8 event (Emergency Management Southland, 2018, p. 59). The air evacuation of people from Milford Sound will therefore need to occur via helicopter.

The likelihood that the aerodrome will be non-operational renders the use of fixed wing aircraft moot. An appropriate statement, therefore, is that the fixed wing aerodrome is not critical to an emergency response associated with an AF8 scenario.

(Evacuating people by sea is an option, albeit one with significant challenges. Potential evacuation by sea does not change the analysis presented here.)

Criticality where the aerodrome remains operational

Scenarios where large numbers of people need evacuating, and the aerodrome remains operational are feasible. A cruise ship that is required to abandon ship in the Sound is one example, a large rockfall, infrastructure failure, or traffic incident that closes the Homer Tunnel for an extended period is another.

In these cases, where the aerodrome is operational and weather conditions allow, fixed wing aircraft may play a significant role in evacuating people from Milford Sound. As has been discussed, airframe for airframe, fixed wing aircraft will evacuate twice as many people as a helicopter.

The issue then, is whether those fixed wing assets are *critical* to the successful evacuation of thousands of potentially trapped people.

Defining "criticality" is a challenge and becomes subjective. Using the concept of critical medical care as guide, the fixed wing aerodrome could be considered critical if its absence resulted in the evacuation of people with life threatening injuries being delayed.

Alternatively, critical infrastructure definitions can be used as a guide. Here, the fixed wing aerodrome could be considered critical if its absence resulted in serious hardship for those awaiting evacuation (New Zealand Lifelines Council, 2023, p. B15).

The use of fixed wing aircraft, where the aerodrome remains operational, would significantly speed up any evacuation. This means that the Milford Sound facilities would need to support stranded people for no longer than absolutely necessary.

However, the absence of fixed wing aircraft is unlikely to influence the evacuation of people with life threatening injuries requiring critical care. Helicopters, most likely specialised aeromedical evacuation helicopters would undertake these evacuations.

Similarly, the absence of fixed wing aircraft is unlikely to cause serious hardship for those awaiting evacuation. While the evacuation may take longer using helicopters only, people waiting for evacuation will still have access to shelter, water, and food. They will be inconvenienced and perhaps uncomfortable but are unlikely to endure serious hardship.

Thus, while fixed wing aircraft (and hence an operational fixed wing aerodrome) could significantly speed up evacuation from Milford Sound, neither the aircraft nor the aerodrome are critical to the emergency response.

Criticality summarised

In the interview, Emergency Management Southland stated that from a purely emergency management perspective and ignoring all other angles, they would rather have the fixed wing aerodrome than not have it. This is a logical emergency management perspective.

With respect to criticality however, there is no credible emergency response situation where fixed wing access into Milford Sound would be the deciding factor in whether people live or die,

whether they are delayed in receiving medical care, or whether they endure significant hardship. In layman's terms, from an emergency management perspective, the fixed wing aerodrome is a nice to have.

It is an accurate statement to say that the fixed wing aerodrome is not critical to the conduct of emergency response operations affecting the Milford Sound.

CONCLUSION

To date, the fixed wing aerodrome at Milford Sound Piopiotahi has not been critical to an emergency response.

Future scenarios where the fixed wing aerodrome may prove beneficial concern the evacuation of large numbers (thousands) of people. These future scenarios are viable and realistic, and in the case of AF8, likely to occur within the next 50 years.

Utilising the increased capacity of fixed wing aircraft to evacuate people from Milford Sound Piopiotahi necessitates that weather conditions are acceptable for fixed wing aircraft, and that the fixed wing aerodrome is operational. In the case of an AF8-like event, the aerodrome is unlikely to be operational.

Other evacuation scenarios, where the aerodrome is operational, may see fixed wing aircraft play a significant role in evacuation efforts. The used of fixed wing aircraft could significantly expedite the evacuation operations, but they would not be *critical* to the evacuation operation. Without fixed wing aircraft, the evacuation operation would still continue, albeit at a slower pace.

From an emergency response perspective, the fixed wing aerodrome at Milford Sound Piopiotahi is not critical.

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