

Report of the Taranaki Maunga Volcanic Activity Exercise

Submitted by New Zealand / NAVAREA XIV

SUMMARY

Executive Summary: Supplementary to the report of the WMO Task Team on Volcanic Activity and Safety of Marine Navigation (TT-VASMN), this document reports on the volcanic activity exercise facilitated by the Civil Aviation Authority (CAA) of New Zealand on Thursday 10 August 2023. While these exercises are typically aviation focused, the IHO WWNWS engagement with CAA NZ on this topic led to the inclusion of a marine environment aspect. This report informs the Sub-Committee on the engagement and learnings identified by NAVAREA XIV.

Action to be taken: 7

Related documents: Report of the Joint WMO/IHO Task Team on Volcanic Activity

1. Background

1.1. METAREA and NAVAREA XIV led a combined METAREA Task Team / NAVAREA Project Team (NCSR 10/10 §14), to audit existing, readily available, resilient, and robust volcanic hazard information with the objective to provide recommendations and options for inclusion in future MSI products and services via an INF document.

1.2. As noted in the report of the TT-VASMN, New Zealand CAA planned a volcanic activity exercise for August 2023. These exercises have been entirely aviation focused, but the IHO WWNWS engagement with CAA NZ on this topic led to the inclusion of a marine environment aspect, so NAVAREA XIV could investigate information sources, access for marine navigational warnings and develop standard warnings for mariners. This exercise occurred after the submission of the TT – VASMN report.

2. Taranaki Maunga (Mount Taranaki) Volcanic Activity Exercise

Scope

2.1. The exercise simulated the unrest and then eruption of Mount Taranaki (39.30S 174.06E), located on the west coast of the North Island of New Zealand. Information on the simulated ash dispersion was detailed in the exercise volcanic ash advisories (VAA) and ashfall graphics, provided on the day of the exercise.



Photo by [Yoann Laheurte](#) on [Unsplash](#)

Taranaki Maunga/Mount Taranaki

Messaging

2.2. Participants received three types of messages, from two sources, during the exercise:

2.2.1. Volcano Activity Bulletins (VAB) from GNS Science:

Volcanic unrest increases at Mt Taranaki.
Volcanic Alert Level raised to Level 2.

VOLCANIC ACTIVITY BULLETIN: TAR – 2023/01

#TARANAKI EXERCISE#

2023-09-09 09:30 NZST, Mt Taranaki

Volcanic Alert Level raised to Level 2

Aviation Colour Code raised to Orange



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Earthquake tremor has increased to historically high levels, large number of earthquakes are becoming shallower over the past week, volcanic gas signatures indicate new magma is beneath the volcano, and snow melt areas are extending. We have also observed minor swelling of the edifice on the southeastern area of the summit. The Volcanic Alert Level has been raised to Level 2 and the Aviation Colour Code changed to Orange.

Since early in July 2023, we have recorded low levels of tremor, along with sporadic earthquakes beneath the summit of Mt Taranaki. Over the past three days, the level of tremor has become strong and the number of shallowing earthquakes has increased significantly.

Analyses of gas and water samples from active fumaroles and springs on the mountain (including the summit area), indicate that the source for these gases and fluids is partially driven by new magma beneath the volcano.

Satellite remote sensing methods have identified a zone of inflation on the southeastern side of the summit area. Such ground movement is most likely caused by magmatic gas and fluid pressurising the summit area.

Our interpretation of the data is that magma is ascending beneath the volcano and an eruption is possible. We continue to monitor the volcano closely and will provide an update when data comes to hand.

The strong levels of volcanic tremor, high number of shallowing earthquakes, presence of magmatic gas, and ground movement are all consistent with a moderate to heightened level of volcanic unrest at Mt Taranaki. As a result, **the Volcanic Alert Level has been raised to Level 2. The Aviation Colour Code has been changed to Orange.**

Mt Taranaki is an active volcano and has the potential to erupt with little or no warning when in a state of moderate to heightened volcanic unrest.

The [Volcanic Alert Level](#) reflects the current level of volcanic unrest. The Volcanic Alert Level should not be used to forecast future activity.

Volcanic Alert Level 2 indicates the primary hazards are those expected during volcanic unrest: steam discharge, volcanic gas, earthquakes, landslides, and hydrothermal activity. While Volcanic Alert Level 2 is mostly associated with environmental hazards, potential for eruption hazards also exists and eruptions

2.2.2. Volcano Observatory Notice for Aviation (VONA) from GNS Science:

Item No	Element	Content
1	Message title	VOLCANO OBSERVATORY NOTICE FOR AVIATION ##TAR EXE (Taranaki Ash Exercise##)
2	Issued:	20230810/1025Z
3	Volcano:	Taranaki
4	Current Aviation Color Code:	Red
5	Previous Aviation Color Code:	Orange
6	Source:	GNS Science, New Zealand
7	Notice Number:	NZ VONA 2023/02
8	Volcano Location:	39 17S 174 03E
9	Area:	Mt Taranaki, North Is, New Zealand
10	Summit Elevation:	8261 FT
11	Volcanic Activity Summary:	Eruption occurring at Mt Taranaki
12	Volcanic Cloud Height:	NIL
13	Other Volcanic Cloud information:	NIL
14	Remarks:	An eruption has begun at Mt Taranaki. We are currently assessing plume height.
15	Contacts:	Duty Volcanologist, +6473748211ph,+6473748199fax
16	Next Notice:	Will be issued when conditions at the volcano warrant changing the aviation color code or when a significant volcanic event occurs within the current color code.

2.2.3. Volcanic Ash Advisory (VAA) messages from MetService New Zealand:

FVPS01 NZKL 092300~
 VA ADVISORY
 STATUS: EXER
 DTG: 20230809/2300Z
 VAAC: WELLINGTON
 VOLCANO: TARANAKI 241030
 PSN: S3918 E17404
 AREA: NEW ZEALAND
 SUMMIT ELEV: 2518M
 ADVISORY NR: 2023/2
 INFO SOURCE: VA EXERCISE
 AVIATION COLOUR CODE: RED
 ERUPTION DETAILS: ERUPTION AT 20230809/2210Z TEST EXAMPLE
 FOR VOLCEX SCENARIO TEST
 OBS VA DTG: 09/2300Z
 OBS VA CLD: SFC/FL160 S3915 E17400 - S3915 E17415 - S3930
 E17415 MOV NE 10KT
 FCST VA CLD +6 HR: 10/0500Z SFC/FL160 S3915 E17400 - S3900
 E17400 - S3900 E17430 - S3930 E17430 FCST VA CLD +12 HR: 10/1100Z SFC/FL160 S3930 E17400 - S3900
 E17345 - S3900 E17430 - S3930 E17430 FCST VA CLD +18 HR: 10/1700Z SFC/FL160 S3930 E17400 - S3815
 E17330 - S3815 E17415 - S3930 E17430
 RMK: TEST EXAMPLE FOR VOLCEX SCENARIO TEST NXT ADVISORY: NO LATER THAN 20230810/0409Z=

Messaging most relevant to marine navigational warnings

2.3. The information provided in the VAA messages provided the information most relevant for broadcast as navigational warnings, with the provision of DTGs, lower level altitude (SFC=surface) and polygons for the hazard areas delimited by latitude/longitude.

Challenges for assessment and translation of text to marine navigational warnings

2.4. Assessing when the activity becomes a hazard to marine navigation – A number of messages preceded the VAA at 2.2.3 above. Without expert guidance, it was difficult to determine if any preceding advisories warranted a navigational warning.

2.5. Decoding aviation-specific format for translation to navigational warnings – The VAA messages are aviation focused for an audience that is well versed in these message formats. Deciphering the abbreviations as well as reformatting the DTGs and position information took time.

2.6. Accuracy of surface level observations – The sensors used to provide observations of ashfall cannot provide accurate information on the lower-level extent. As a precaution, all VAA will typically note the lower level as “surface”. As this may be the only information available to MSI providers, navigational warnings may be issued for volcanic activity that does not impact the surface.

3. Navigational Warnings Issued

3.1. As the impact of the activity was limited to the coastal areas of the New Zealand North Island, Coastal Warnings were issued.

3.2. The initial Coastal Warning was triggered by the VAA at 2.2.3:

"EXERCISE EXERCISE EXERCISE

NEW ZEALAND COASTAL NAVIGATION WARNING 183/23

AREA RAGLAN

1. VOLCANIC ASH ADVISORY ISSUED BY METSERVICE AT 092300 UTC AUG 2023. VOLCANO TARANAKI ERUPTION.

2. ASH OBSERVED AT SURFACE LEVEL IN AREA BOUND BY 39-15S 174-00E 39-15S 174-15E 39-30S 174-15E AT 092300 UTC AUG 2023.

3. ASH FORECAST AT SURFACE LEVEL IN AREAS BOUND BY:

A. 39-15S 174-00E 39-00S 174-00E 39-00S 174-30E 39-30S 174-30E AT 100500 UTC AUG 2023

B. 39-30S 174-00E 39-00S 173-45E 39-00S 174-30E 39-30S 174-30E AT 101000 UTC AUG 2023

C. 39-30S 174-00E 38-15S 173-30E 38-15S 174-15E 39-30S 174-30E AT 101700 UTC AUG 2023

4. ASH CAN BE CORROSIVE, EFFECT STABILITY, NAVIGATIONAL SYSTEMS AND BE HAZARDOUS TO PEOPLE.

NNNN"

3.3. Following further assessment, it was determined that two GMDSS Coast Radio Station VHF sites, one on the north side and one on the south side of Mount Taranaki, would likely have been destroyed or significantly damaged in the eruption. A second coastal warning was issued, cancelling the initial:

"EXERCISE EXERCISE EXERCISE
NEW ZEALAND COASTAL NAVIGATION WARNING 184/23
AREA RAGLAN AND STEPHENS
1. VOLCANIC ASH ADVISORY ISSUED BY METSERVICE AT 092300 UTC AUG 2023. VOLCANO TARANAKI ERUPTION.
2. ASH OBSERVED AT SURFACE LEVEL IN AREA BOUND BY 39-15S 174-00E 39-15S 174-15E 39-30S 174-15E AT 092300 UTC AUG 2023.
3. ASH FORECAST AT SURFACE LEVEL IN AREAS BOUND BY:
A. 39-15S 174-00E 39-00S 174-00E 39-00S 174-30E 39-30S 174-30E AT 100500 UTC AUG 2023
B. 39-30S 174-00E 39-00S 173-45E 39-00S 174-30E 39-30S 174-30E AT 101000 UTC AUG 2023
C. 39-30S 174-00E 38-15S 173-30E 38-15S 174-15E 39-30S 174-30E AT 101700 UTC AUG 2023
4. ASH CAN BE CORROSIVE, EFFECT STABILITY, NAVIGATIONAL SYSTEMS AND BE HAZARDOUS TO PEOPLE.
5. TARANAKI AND EGMONT MARITIME RADIO VHF CHANNEL 16 UNAVAILABLE. VESSELS TRANSITING AREAS RAGLAN AND STEPHENS ARE REQUESTED TO MAINTAIN A LISTENING WATCH ON VHF 16. LIMITED COVERAGE MAY BE AVAILABLE VIA AUCKLAND, PLENTY AND WANGANUI OR TAUPO MARITIME RADIO/ZLM VIA SSB.
6. CANCEL NEW ZEALAND COASTAL NAVIGATION WARNING 183/23
NNNN"

4. Cancellation of Navigational Warnings

4.1. The VAA below was the trigger for cancellation of navigational warnings:

FVPS01 NZKL 100204~
VA ADVISORY
STATUS: EXER
DTG: 20230810/0204Z
VAAC: WELLINGTON
VOLCANO: TARANAKI 241030
PSN: S3918 E17404
AREA: NEW ZEALAND
SUMMIT ELEV: 2518M
ADVISORY NR: 2023/3
INFO SOURCE: VA EXERCISE
AVIATION COLOUR CODE: UNKNOWN
ERUPTION DETAILS: ERUPTION AT 20230809/2210Z VOLCEX SCENARIO
TEST NOW CONCLUDED
OBS VA DTG: 10/0204Z
OBS VA CLD: VA NOT IDENTIFIABLE FM SATELLITE DATA WIND
FL010/020 VRB00KT
FCST VA CLD +6 HR: 10/0804Z NO VA EXP
FCST VA CLD +12 HR: 10/1404Z NO VA EXP
FCST VA CLD +18 HR: 10/2004Z NO VA EXP
RMK: VOLCEX SCENARIO TEST NOW CONCLUDED
NXT ADVISORY: NO FURTHER ADVISORIES=

4.2. The cancellation warning below was issued:

"EXERCISE EXERCISE EXERCISE
NEW ZEALAND COASTAL NAVIGATION WARNING 185/23
AREA RAGLAN AND STEPHENS
1. VOLCANIC ASH ADVISORY ISSUED BY METSERVICE AT 100204 UTC AUG
2023. VOLCANO TARANAKI ERUPTION.
2. NO FURTHER VOLCANIC ASH EXPECTED.
3. CANCEL NEW ZEALAND COASTAL NAVIGATION WARNING 184/23 AND THIS
MESSAGE.
NNNN"

5. Future Development

5.1. NAVAREA XIV will discuss with New Zealand MetService and GNS Science, options regarding future volcanic activity messaging that allows for simpler translation to marine navigational warnings, and any guidance available to develop preformatted navigational warning templates.

6. Guidance and Examples for the Joint IMO/IHO/WMO Manual on MSI

6.1. The Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI), Section 7 paragraph 16 provides guidance and sample text for navigational warnings related to "Tsunamis and other natural phenomena, such abnormal changes to sea level".

6.2. Recommend the Sub-Committee consider including the sample warnings at paragraphs 3.2, 3.3 and 4.2 above as sample text for volcanic activity in the Joint Manual.

7. Action requested of the Sub-Committee:

7.1. The WVNWS-SC is invited to:

7.1.1. Note the challenges for assessment and translation of volcanic activity text to marine navigational warnings (paragraphs 2.4 to 2.6);

7.1.2. Consider including the sample warnings at paragraphs 3.2, 3.3 and 4.2 above as sample text for volcanic activity in Section 7 paragraph 16 of the Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI), and

7.1.3. Note the report in general.