



*International Civil Aviation Organization*

**NINETEENTH MEETING OF THE METEOROLOGY SUB-GROUP  
(MET SG/19) OF APANPIRG**

Bangkok, Thailand, 3 – 6 August 2015

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**Agenda Item 7: Regional guidance material**

**THE ASIA/PACIFIC REGIONAL GUIDANCE ON AERODROME TSUNAMI WARNINGS**

(Presented by the Rapporteur, MET/H TF, ad-hoc group)

**SUMMARY**

This paper presents the revised tsunami survey results conducted in 2011 and 2014, and the draft regional guidance on aerodrome tsunami warnings prepared by ad-hoc group of MET/H TF comprising Japan and Indonesia.

**1. INTRODUCTION**

1.1 The fourth meeting of the Meteorological Hazards Task Force (MET/H TF/4) reviewed the results of the survey conducted in 2011 and 2014 related to the current capabilities in providing information to aviation on tsunami.

1.2 In relation to the survey results, the meeting agreed to form an ad-hoc group comprising Indonesia and Japan (Rapporteur) to review the Tsunami survey results and develop regional guidance on the provision of tsunami warning information directly from the relevant tsunami warning centres to the 'at-risk' aerodromes that the METWSG proposed in draft Amendment 77 to Annex 3 (Agreed action 4/8 refers).

**2. DISCUSSION**

Review of survey results

2.1 The ad-hoc group reviewed the tsunami survey results and revised results as reported in **Attachment 1A**.

Draft Regional guidance

2.2 The ad-hoc group inquired into the present procedures for dissemination of tsunami warnings to at-risk aerodrome in Indonesia and Japan, and prepared a draft *Asia/Pacific Regional Guidance on Integration of Aerodrome Tsunami Warnings into the National Tsunami Warning Systems for Public* in **Attachment 2B**.

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) review the draft *Asia/Pacific Regional Guidance on Integration of Aerodrome Tsunami Warnings into the National Tsunami Warning Systems for Public* in **Attachment 2B**; and
- b) Provide comment on any additional changes required to the draft guidance; and
- c) discuss any relevant matters as appropriate.

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ATTACHMENT A  
(Revised 28/07/15)

**THE REVIEW OF SURVEY RESULTS FOR AERODROME WARNING  
REGARDING TSUNAMI**

**1. INTRODUCTION**

1.1 The First Meeting of the Asia/Pacific Meteorological Advisories and Warnings Implementation Task Force (METWARN/I TF/1), held in Bangkok, Thailand from 23 to 25 March 2011, agreed to survey States to determine current capabilities in providing information to aviation on tsunami (METWARN/I TF/1 Action Agreed 1/12 refers) to assist the Meteorological Warnings Study Group (METWSG) in its development of guidance on the issuance of tsunami warnings and to enable an assessment of training and guidance requirements to be undertaken and assist in the development of frameworks for regional contingency plans. The survey from METWARN/I TF/1 Action Agreed 1/12 was conducted by State letter issued on 25 April 2011. Eighteen States in the APAC region responded. The findings were presented to the fifteenth meeting of the APAC Meteorology Sub-Group (MET SG/15), held in Bangkok, Thailand, from 25 to 29 July 2011 (CNS/MET SG/15 - WP/50 refers) and forwarded to the METWSG/4, held in Montréal, Canada, from 15 to 18 May 2012 (METWSG/4-SN No. 6 refers), which was tasked with developing guidance material on the issuance of aerodrome warnings for tsunami.

1.2 The third meeting of the Meteorological Hazards Task Force (MET/H TF/3), held in Bangkok, Thailand, from 13 to 15 March 2013, recommended the results of the survey be reviewed at the next meeting (MET/H TF/4) along with results from a new survey to update the status of current capabilities of States in providing information to aviation on tsunami (MET/H TF/3 Action Agreed 3/1 refers). The follow-up survey in accordance with MET/H TF/3 Action Agreed 3/1 was distributed in State letter Ref.: T 4/7.5:AP032/14 (MET) issued on 17 February 2014 (copy provided in **Attachment 1**), and 108 States' responses were available for analysis. The findings are discussed briefly in the paragraphs below, compared with results from the original survey conducted in 2011. The table of all responses to the survey received in 2014 is provided in **Attachment 2**.

## 2. THE REVIEW OF SURVEY RESULTS

2.1 **Question 2:** Does your State have provisions to issue public warnings for a Tsunami that is expected to affect your State's coast?

	Provision to issue public warnings for a tsunami	Yes	No	N/A (no coastline)
2011	Number of States	15	1	2
2014	Number of States	10 <del>8</del>	0	0

If No, why?

	Why can't issue public warning for tsunami	System related	Lack of guidance material	Lack of training material	Other
2011	Number of States	1	0	2	0
2014	Number of States	0	0	0	0

2.2 In 2011, whilst only one State (Macao, China) did not have an official tsunami warning service, two States replied that they required more training materials and access to international experts to help improve the services.

2.3 **Question 3:** Does your State have provisions to issue "Aerodrome Warnings" for a tsunami, in accordance with Annex 3 (Appendix 6, 5.1), that is expected to affect one or more of your State's coastal aerodromes?

	Provision to issue aerodrome warning for tsunami	Yes	No	N/A
2011	Number of States	7	8	2
2014	Number of States	6 <del>5</del>	4 <del>3</del>	0

If No, why?

	Why can't issue aerodrome warning for tsunami	System related	Lack of guidance material	Lack of training material	Unable to identify aerodromes at risk	Public warning includes aerodromes	Other
2011	Number of States	0	0	2	0	2	3
2014	Number of States	0	1	1	0	4 <del>3</del>	0

2.4 In 2011, there was a significant difference in the responses to question 2 and 3; almost all States had a public warning system for tsunami, but only 50% of respondents issued aerodrome warnings. Two States highlighted use of the public warning system, as the existing public warning system was an effective and reliable way to ensure warnings were transmitted to the relevant users.

2.5 Lack of authority or of lack necessary agreement between relevant authorities was also identified as a hindrance to the issuance of aerodrome warnings for tsunami in 2011.

2.6 In 2014, four~~three~~ States indicated they didn't have provisions for aerodrome warnings for tsunami, but the public tsunami warning system was used to provide warnings to aerodromes.

2.7 **Question 4:** What is your State's source of tsunami information which is used in the preparation and issuance of a warning for a tsunami?

	Source of tsunami information	JATWC	PTWC (Hawaii)	TWC (Alaska)	LoA	Other	N/A or no answer
2011	Number of States	2	7	1	0	9	5
2014	Number of	3 <del>2</del>	5 <del>4</del>	2 <del>1</del>	0	4 <del>3</del>	0

	States						
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2.8 Responses to the question above in 2011 highlighted a broad range of sources used by States to provide tsunami warning systems. In 2014 the spread of responses was similar to 2011.

2.9 **Question 4a:** How is the information provided from the above source?

	How is information provided	Phone	Fax	Email	WMO product over WMO circuit	Other	N/A or no answer
2011	Number of States	4	9	9	7	6	4
2014	Number of States	10	4	43	2	76	10

2.10 States indicated that the “other” methods for providing tsunami information included AFTN, SMS, GTS and linked applications via the Internet.

2.11 **Question 5:** What criteria are used by your State in the decision to issue a warning for a Tsunami?

2.12 In response to the question above, in 2011 a variety of answers were provided including criteria from: tsunami warning centre(s), agreed by IOTWS/ICG Meetings, other government agencies; and criteria based on the location/time and magnitude/depth of the earthquake. In 2014, the responses indicated that criteria for issuing tsunami warnings were based on the predicted height of tsunami and/or location/time and magnitude/depth of the earthquake.

2.13 **Question 6:** If your State has coastal aerodromes that could be affected by a tsunami, how soon do your emergency response agency or personnel need a warning? In other words, what is required “lead time” of an Aerodrome Warning for a tsunami?

	Required lead time	Immediate or as soon as practicable	Less than 1 hour	Between 1 to 4 hours	Other	Unknown/unable or no answer
2011	Number of States	12	1	1	1 (4hr+)	5
2014	Number of States	54	0	10	2	2E

2.14 **Question 7:** Does your State have an emergency plan for tsunami warning that takes into consideration coastal aerodromes?

	Emergency plan for tsunami	Yes	No	N/A
2011	Number of States	5	10	3
2014	Number of States	76	32	0

2.15 In 2011, it was noted that some countries had (tsunami) emergency plans for the general public in coastal cities, which covered coastal aerodromes, but without separate plans for aerodromes in place. Most responses in 2014 indicated States had emergency plans for tsunami warning that took into consideration coastal aerodromes.

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**SURVEY QUESTIONS**

**TSUNAMI**

1. Name of State: \_\_\_\_\_  
Point of Contact: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Email: \_\_\_\_\_  
Phone: \_\_\_\_\_
  
2. Does your State have provisions to issue public warnings for a Tsunami that is expected to affect your State's coast?
  - a) \_\_\_\_yes
  - b) \_\_\_\_no (Unable to provide public warnings for Tsunami)
  - c) \_\_\_\_not applicable (No coastal areas in our State)If b) why are you unable to provide warnings?
  - a) system related issues
  - b) need more guidance material
  - c) Need more training material
  - d) Other (Please specify): \_\_\_\_\_
  
3. Does your State have provisions to issue "Aerodrome Warnings" for a Tsunami, in accordance with Annex 3 (Appendix 6, 5.1), that is expected to affect one or more of your State's coastal aerodromes?
  - a) \_\_\_\_yes
  - b) \_\_\_\_no (Unable to provide Aerodrome Warnings for Tsunami)
  - c) \_\_\_\_not applicable (No coastal aerodromes in our State)If b) why are you unable to provide aerodrome warnings?
  - a) system related issues
  - b) need more guidance material
  - c) Need more training material
  - d) Unable to identify aerodromes at risk
  - e) Other (Please specify): \_\_\_\_\_
  
4. If "Yes" to questions 2 and 3, what is your State's source of Tsunami information which is used in the preparation and issuance of a warning for a Tsunami?
  - a) The Joint Australian Tsunami Warning Centre \_\_\_\_\_
  - b) The United States Tsunami Warning Center in Hawaii \_\_\_\_\_
  - c) The United States Tsunami Warning Center in Alaska \_\_\_\_\_
  - d) Letter of agreement with \_\_\_\_\_ for the provision of the aerodrome warning.
  - e) Other (Please specify): \_\_\_\_\_
  
- 4a) How is the information provided from the above source? (Please circle all that are relevant):
  - a) phone call
  - b) fax
  - c) e-mail

d) WMO product over WMO circuit

e) Other (Please specify): \_\_\_\_\_

5. What criteria are used by your State in the decision to issue a warning for a Tsunami?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. If your State has coastal aerodromes that could be affected by a Tsunami, how soon do your emergency response agency or personnel need a warning? In other words, what is required "lead time" of an Aerodrome Warning for a Tsunami?

a) Immediately \_\_\_\_\_

b) Less than 1 hour \_\_\_\_\_

c) Between 1 hour and 4 hours \_\_\_\_\_

d) Other \_\_\_\_\_

e) Unknown \_\_\_\_\_

7. Does your State have an emergency plan for Tsunami warning that takes into consideration coastal aerodromes?

a) \_\_\_\_yes

b) \_\_\_\_no

If the response is "Yes" could you please provide a copy of the plan for other States review?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

-END-

Appendix 2 to the review of survey results for aerodrome warning regarding tsunami

Responses to survey (in 2014) on APAC States/Territories' capabilities in providing information to aviation on tsunami (Ref.: T 4/7.5:AP032/14 (MET))																
No.	Q1	Q2	If no	Q3	If no	Q4	Q4a	Q5	Q6	Q7	If yes	Agency/Organisation	Name	Title	Email	Phone
1	Japan	Yes		No	E: Tsunami warning for the public is used at aerodromes as well.	Information on earthquakes and tsunamis created and issued by JMA itself.	E: Via the online system in JMA	Tsunami warnings for the public are issued by JMA when necessary for tsunami forecast regions expected to be affected. Specific criteria are: a major tsunami warning is issued when the tsunami height is expected to exceed three meters; a tsunami warning is issued when the tsunami height is expected to be up to three meters; and a tsunami advisory is issued when the tsunami height is expected to be from twenty centimeters up to one meter.	A	Yes	Although possible, the plan is prepared in Japanese only.	Japan Meteorological Agency	Mr. Takeshi Koizumi	Senior Coordinator for International Earthquake and Tsunami Information	t-koizumi@met.kishou.go.jp	+81 3 3284 1743
2	Samoa	Yes		Yes		B	E: AFTN		A	Yes		Ministry of Works, Transport and Infrastructure	Nanai Junior Saaga	DCA	njsaga@mwti.gov.ws	685-23565
3	Singapore	Yes		Yes		A and B	E and D	Based on a study conducted by Singapore, the time taken for a tsunami (generated from the nearest earthquake zones) to reach Singapore is about 10 hours. Information of a possible tsunami will be made known to government agencies when a major earthquake in the tsunamigenic zones. (which has the potential to affect Singapore) is detected. There will be subsequent alerts / warnings based on the time the tsunami is expected to affect Singapore.	E	No		Meteorological Service Singapore	Patricia Eel Gek May	Director (Weather Services Department)	Ee_gek_mav@nea.gov.sg	+6565422863
4	Hong Kong, China	Yes		Yes		B and C	B, C, D and E: SMS, Applications via Internet links	A tsunami warning will be issued by the HK-Observatory if a tsunami with a height of 0.5 metres or more above the normal tide level is expected to affect the coast of HK within the next 3 hours.	D: As soon as practicable when the warning criterion is met. Noting that the warning criterion has already included a forecast element.	Yes	Contingency Plan for National Disasters issued by the Government of HK SAR (www.an.gov.hk/eng/emergency/cp.html)	HK Observatory	Dr. Ping Wah Li	Senior Scientific Officer	pwli@hko.gov.hk	+852-2926-8437
5	Indonesia	Yes		No	E: National regulation concerning Aerodrome Warnings** for a Tsunami, in accordance with Annex 3 Is still developed by BMKG	E: Indonesia Tsunami Early Warning System	E: local governments, interface Institutions, and the media, using various communication channels (SMS, Email, Fax, Warning Receiver System, Website and GTS)	Tsunami warning will be issued if an earthquake matches following criteria: Large magnitude earthquake, usually of M > 7 RS Undersea earthquake with a shallow depth (< 100 km) Deformation or uplift of the sea floor, which is evident from a nominal fault or thrust fault earthquake mechanism Distance from the earthquake epicenter to the shore sufficient to allow a tsunami wave to form.	A	Yes		Meteorological Climatological and Geophysical Agency	Drs Syamsul Huda, M.Si.	Head of Aviation and Marine Meteorological Centre	hsyamsul1116@gmail.com	+62 21 6544689
6	Thailand	Yes		No	B, C and E: Public warning includes aerodrome	PTWC	B and C	Aerodrome side: Warning when earthquake mag more than 6.5 with depth less than 100 km. Gulf of Thailand side: Warning when earthquake mag more than 7.7 with depth less than 100 Km.	D: Thailand has coastal aerodromes but unable to provide aerodrome warning for tsunami.	No		Thai Meteorological Department	Mr. Charoon Laohaletchai MR. Phuwienng Prakhammintara	Director, Bureau of Aeronautical Meteorology	Charoon-lao@hotmail.com phuwienng@hotmail.com	+66(2) 234 0011 Ext. 216
7	Bangladesh	Yes		Yes		A and E: INCOIS, InaTEWS	B, C and E: SMS, GTS	As indicated in tsunami message	A	Yes		BANGLADESH METEOROLOGICAL DEPARTMENT	SYED ABUL HASANAT	METEOROLOGIST	hasanat2001@yahoo.com, info@bmd.gov.bd	+880 29135742, +880 1714202486
8	Republic of Korea	Yes		Yes		E: Earthquake and tsunami information of KMA	B	The criteria are decided by KMA	E	Yes	It is impossible to provide a copy of emergency plan because the plans of each airport is managed by Airports Corporation and is in the closed document.	Korea Aviation Meteorological Agency of KMA	Lee Hoyong	Assistant Director	Lhy2502@korea.kr	+82 32 740 2820
9*	United States (There is no change in the information previously provided by the United States in 2011)	yes		no	e) State uses public warning system. Many emergency managers today take advantage of cell phones technology etc. where the warnings are transmitted directly to their phones. This ensures that the warning is reaching the intended supervisors in a fast a reliable manner			USA uses the guidance from either the Tsunami Warning Center in Hawaii or Alaska	A	no		FAA	Mr. Steven R. Albersheim	Aviation Weather Planning & Requirements	Steven.Albersheim@faa.gov	+1 (202) 385 7185
10*	Australia	Yes		Yes		a) The Joint Australian Tsunami Warning Centre	a) phone call b) e-mail c) Other (Please specify): Internal alert on forecast preparation system	Aerodrome Warnings for Tsunami are issued for specific international airports that are located within 1km of the coast and below an elevation of 10m above Mean Sea Level and are within threat area indicated by a Tsunami Warning (Land Inundation Threat) issued by the Joint Australian Tsunami Warning Centre (http://www.bom.gov.au/tsunami/index.shtml)	e) Between 1 hour and 4 hours (but this may be less depending on the lead-time to the coast)	yes	The major international airports that are close to the coast and assessed as being at threat during a tsunami event have disaster management plans in this regard.	Meteorological Authority, Australian Bureau of Meteorology	Mrs Sue O'Rourke	Section Head, Meteorological Authority	metauthority@bom.gov.au	+61 3 9669 4662 Mobile: +61 4 1823 4138

\*indicates responses received after the MET/H TF/4 meeting

Responses to survey (in 2011) on APAC States/Territories' capabilities in providing information to aviation on tsunami (Ref.: T 4/7.5:AP065/11(MET))																
No.	Q1	Q2	If no	Q3	If no	Q4	Q4a	Q5	Q6	Q7	If yes	Agency/Organisation	Name	Title	Email	Phone
1	Australia			yes		The JATWC	c), d), and e e-mail WMO product over WMO circuit other: internal alert on forecast system	The Bureau's guidelines for issuing Aerodrome Warnings for Tsunami state that "an Aerodrome Warning should be issued whenever the aerodrome lies within a threatened area as indicated in any Tsunami Warning issued by the Joint Australian Tsunami Warning Centre". Specifically, Aerodrome Warnings would be issued for aerodromes located within a coastal zone for which the JATWC issues a land inundation threat tsunami warning. (http://www.bom.gov.au/tsunami/index.shtml)  Upon receipt of a Tsunami Warning which includes the threat of land inundation from the JATWC, an Aerodrome Warning will be issued for aerodromes identified as lying within the coastal region defined in the Tsunami Warning, stating that a tsunami warning has been issued and that land inundation may occur. The estimated commencement time is included and reference to the associated public Tsunami Warning is provided.  For example: YBCS AD WRNG 1 VALID 032200/041000 AERODROME WARNING NUMBER 1 FOR CAIRNS VALID 040800/042000 LOCAL ISSUED 031830Z (040430 LOCAL) TSUNAMI WARNING HAS BEEN ISSUED. MAJOR LAND INUNDATION IS POSSIBLE FROM 0800 LOCAL. ALSO REFER http://www.bom.gov.au/tsunami/  Once the threat has passed, or if the Tsunami has not eventuated, the	Typically greater than 4 hrs. notice is provided		The Bureau of Meteorology is unaware if at risk aerodromes have emergency plans in place.		Shona Rosengren	National Aviation Weather Service Manager	sra@bom.gov.au	+61 (3) 9669 4586

Appendix 2 to the review of survey results for aerodrome warning regarding tsunami

Responses to survey (in 2011) on APAC States/Territories' capabilities in providing information to aviation on tsunami (Ref.: T 4/7.5:AP065/11(MET))																	
No.	Q1	Q2	If no	Q3	If no	Q4	Q4a	Q5	Q6	Q7	If yes	Agency/Organisation	Name	Title	Email	Phone	
								Bureau of Meteorology will issue a Tsunami Warning Cancellation, whereupon the Aerodrome Warning will be cancelled if it is still in force. YBCS AD WRNG 2 VALID 032300/041000Z CNL AD WRNG 1 032200/041000Z									
2	Bhutan	N/A	Bhutan is land locked country	N/A	N/A	N/A	N/A	N/A	N/A	N/A		Department of Civil Aviation	Mr. Tashi Dukpa	Deputy Chief of Aviation Meteorology	<a href="mailto:aeromet@druknet.bt">aeromet@druknet.bt</a>	+975 271404	
3	Hong Kong, China	Yes		Yes		b), c) and e) Nation Tsunami Experts, National Earthquake Detection System, the State Oceanic Administration of China, Northwest Pacific Tsunami Advisory Centre in Japan	b), c), d), e) SMS, Applications via Internet links.	A Tsunami Warning will be issued by the Hong Kong Observatory if a tsunami with a height of 0.5 metre or more above the normal tide level is expected to affect the coast of Hong Kong within the next 3 hours.	d) As soon as practicable when the warning criterion is met noting that warning criterion has already included a forecast element.	yes	Contingency Plan for Natural Disasters issued by the Security Bureau of the Government of the Hong Kong Special Administrative Region ( <a href="http://www.sb.gov.hk/eng/emergency/cp.html">http://www.sb.gov.hk/eng/emergency/cp.html</a> )	Hong Kong Observatory	Queenie CC Lam	Senior Scientific Officer	<a href="mailto:cclam@hko.gov.hk">cclam@hko.gov.hk</a>	+8852 2926 8437	
4	Macao, China	No	no official tsunami warning	No	no official tsunami warning			not designed	e)	No		Meteorological and Geophysical Bureau	Mr. Ku Chi Ming	Chief of Aeronautical Meteorological Centre	<a href="mailto:cmku@smg.gov.mo">cmku@smg.gov.mo</a>	+853 88986243	
5	India	Yes		No	Unable to provide public warnings for Tsunami because a), b) and c	e) Indian Ocean Tsunami early warning center (IOTWC) functioning INCOIS - Hyderabad, India	e) Short messages on Mobile phones	As criteria available at <a href="http://www.incois.gov.in/Incois/tsunami/eqevents.jsp">http://www.incois.gov.in/Incois/tsunami/eqevents.jsp</a> . For Indian Ocean Earthquakes, the bulletin - I that contains preliminary earthquake information & qualitative statement on it tsunamigenic potential based on following criteria (See original hard copy)	immediately	no		Central Aviation Meteorology Division	Mr. R.R. Mali	Scientist "E"	<a href="mailto:rajesh132002@yahoo.com">rajesh132002@yahoo.com</a> , <a href="mailto:aviationsection@yahoo.com">aviationsection@yahoo.com</a>	+94 (11) 24619196	
6	Japan	yes		b. no	other	other	other		immediately	no					-		
7	Lao PDR	N/A	need more training material	N/A		N/A	N/A	N/A	N/A	No		MWO	Mr. Vandhy Douangmala	Deputy Head of Division of Weather Forecast & Aeronautical Meteorology	<a href="mailto:vandhy_d@yahoo.com">vandhy_d@yahoo.com</a>	+856 (21) 263657, 520 038 Mobile: +856 (20) 22402743	
8	Malaysia	Yes		-		Malaysia Tsunami Early Warning Centre	a), b), and c)	When there is Tsunami threat based on tsunami data base	a) within 12 months	yes	under responsibility of National Security Council	KLIA Meteorological Office	Mr. Ab Liah Che Cob	Director	<a href="mailto:ablah@met.gov.my">ablah@met.gov.my</a>	+603 8787 2388	
9	New Zealand	yes		No	e) MCDEM is the only authorized entity to issue Tsunami warnings for NZ.	b) MetService and MCDEM receive the necessary information	b) and c) RSMC Wellington receive initial advice	The criteria are decided by MCDEM	e) Lead times advise by MCDEM. Those aerodromes at risk form part of the coastal areas.	a) yes	NZ has attached a copy of plan for other State review (see original message)	New Zealand Ministry of Civil Defence & Emergency Management (MCDEM)	N/A	Duty Manager (24/7 operation)	<a href="mailto:mcdemduy_mgr@dia.govt.nz">mcdemduy_mgr@dia.govt.nz</a>	+61 (21) 226 3997	
10	Pakistan	yes	The department need more international training, international experts may be deputed to impart training(s) in hardware/software etc.	No	Tsunami warnings issue for general public are also applicable for coastal aerodromes. 1) PTWC, 2) KTSP, India, Indonesia, Australia, PMD (NSM & TBWC), Karachi Pakistan Bulletins		b), c) & d)	(i) Location (Makran subduction zone (ii) Magnitude (iii) Dept. of Earthquake	a) after earthquake	no	The Emergency plan for general public in coastal cities is also applicable for coastal aerodromes. However, there is no separate emergency plan for coastal aerodromes in place.	National Scientific Monitoring & Tsunami Early Warning Centre	Mr. Naeem Shah	Chief Meteorologist, Karachi	<a href="mailto:naeemshah1956@yahoo.com">naeemshah1956@yahoo.com</a>	+92 (21) 9926 1404	
11	Palau	yes		yes		b) Pacific Tsunami Warning Centre (PTWC)	a), b), c) and d)	Pacific Tsunami Warning Center Criteria	a)	yes		Palau National Aviation Administration	Peter Polloi	Administrator	<a href="mailto:pnaa@palaunet.com">pnaa@palaunet.com</a>	+680 5874369, 2944 Cell phone: 7751828	
12	Philippines	Yes		No	not included in the letter of agreement (PHIVOLCS, PAGASA & CAAP)	b) Pacific Tsunami Warning Centre (PTWC)	a), b), and c)	Strong trench-related earthquake, data from PTWC, tide gauge of NAMRIA, Tsunami sensors	a)			Philippines Institute of Volcanology & Seismology	Ishmael Narag	OIC, Seismology	<a href="mailto:ishma01@yahoo.com">ishma01@yahoo.com</a>	+63 (2) 4261468 to 79	
13	Republic of Korea	yes		yes		c) Earthquake Monitoring division in KMA (Korea Meteorological Administration	b)	The Earthquake and Tsunami Information of KMA	a)	yes	Whether provided by the airport, according to the airport operating manual	KAMA (Korea Aviation Meteorological Agency)	Oh Hyung-Gun	International Coordinator	<a href="mailto:ohg47@korea.kr">ohg47@korea.kr</a>	+82 (32) 740 2803	
14	Samoa	Yes		Yes		b)	a), b), d) and e) e) Aeronautical Fixed Telecommunication Network	Depends on the level of Tsunami "Warning" or "Watch" from Hawaii Office	a)	No		Ministry of Works, Transport/Infrastructure (MWTI)	Mr. Vaaelua Nofu Vaaelua	Chief Executive Officer	<a href="mailto:nvaaelua.mwti@samoa.ws">nvaaelua.mwti@samoa.ws</a>	21611 Ext. 11	
15	Singapore	yes		yes		a), b), and e) e) Japan Meteorological Agency. Singapore's National Tsunami Early Warning System	c), d)	Based on a study conducted by Singapore, the time taken for tsunami (generated from the nearest earthquake zones) to reach Singapore is about 10 hours. Information of a possible tsunami will be made to government agencies when a major earthquake in the tsunami zones (which have the potential to affect Singapore) is detected. There will be subsequent alerts/warnings based on the time the tsunami is expected to affect Singapore.	c)	No		Meteorological Service Singapore, NEA	Ms. Lim Lay Eng	Director, Business and Corporate Affairs	<a href="mailto:Lim_Lay_Eng@nea.gov.sg">Lim_Lay_Eng@nea.gov.sg</a>	+65 6545 7196	
16	Sri Lanka	yes		yes		b), e) Indian Ocean Tsunami Warning System (IOTWS) and Japan Meteorological Agency (JMA)	b), c) and d)	Criteria agreed by IOTWS/ICG Meetings	b)			Department of Meteorology, Meteorological Office, Bandaranaike Airport, Katunayake, Sri Lanka	A.K. Karunanayake	Meteorologist in Charge, Katunayake Airport	<a href="mailto:athu1970@yahoo.com">athu1970@yahoo.com</a>	+94 (11) 2252721, 2252319	
17	Thailand	yes		no	c)	e) by every website linked	e) website	Our state has no criteria but we use the reference from the tsunami warning center near the earthquake source	d) Thailand has coastal aerodromes but are unable to provide Aerodrome warning	No		Thai Meteorological Department	Mrs. Yaovapa Tanadchangeang	Director, Bureau of Aeronautical Meteorology	<a href="mailto:yaovapa@tmd.go.th">yaovapa@tmd.go.th</a>	+66 (2) 1340007	
18	USA	yes		no	e) State uses public warning system. Many emergency managers today take advantage of cell phones technology etc. where the warnings are transmitted directly to their phones. This ensures that the warning is reaching the intended supervisors in a fast a reliable manner			USA uses the guidance from either the Tsunami Warning Center in Hawaii or Alaska	a)	no		FAA	Mr. Steven R. Albersheim	Aviation Weather Planning & Requirements	<a href="mailto:Steven.Albersheim@faa.gov">Steven.Albersheim@faa.gov</a>	+1 (202) 385 7185	

ATTACHMENT B

**ASIA/PACIFIC REGIONAL GUIDANCE**  
**on**  
**Integration of Aerodrome Tsunami Warnings**  
**into the National Tsunami Warning Systems for Public**

**10 July 2015**  
**Draft Version 0.3**

<i>Revision</i>	<i>Date</i>	<i>Description</i>
0.1	15/12/2014	Initial Draft of Guidance
0.2	13/01/2015	Reviewed by ad-hoc members
0.3	10/07/2015	Reviewed by MET/H TF members

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## 1. Introduction

### 1.1 Background

1.1.1 The ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG), at its twentieth Meeting held in Bangkok, Thailand, 7 to 11 September 2009 had formulated its Conclusion 20/69 b). This conclusion had requested that ICAO consider developing Annex 3 provisions and guidance material, as necessary, related to the issuance of aerodrome warnings on tsunami, as the implementation of the existing provisions had been considered to be problematic.

#### **Conclusion 20/69 — Implementation of SIGMET on Radioactive Clouds and Aerodrome Warnings on Tsunami**

That, in view of clarifying existing Annex 3 provisions,

a) (Omitted)

b) ICAO consider developing Annex 3 provisions and guidance material as necessary related to the issuance of aerodrome warnings on Tsunami.

1.1.2 The Meteorological Warning Study Group (METWSG), at its third Meeting held in Montréal, Canada, 15 to 18 November 2010, agreed that the intent of the inclusion of tsunami in the list of phenomena in aerodrome warnings was simply to relay any notification of an impending impact from a State emergency response structure to those concerned at an aerodrome, so that emergency measures could take place. It was noted that tsunami was not a meteorological phenomenon, but also recognized that the aerodrome warning was a convenient pre-existing means to get such information to the authorities concerned. With this in mind, the group agreed that an ad hoc group could consider the form of any appropriate guidance that could be provided to assist States in this respect. Furthermore, the group agreed that in order to prepare appropriate guidance, a better understanding of the existing capabilities of the States involved would be necessary.

1.1.3 The Meteorological Warning Study Group (METWSG), at its fourth Meeting held in Montréal, Canada, 15 to 18 May 2011, received a report from the ad hoc group that the aerodrome warning for tsunami be replaced by either an element of a national system or by information stemming from an international warning centre whose area of responsibility covers the State concerned. The group agreed that it would be difficult to place requirements in ICAO provisions for national public safety systems or indeed for the International Tsunami Warning Centres. However, the group agreed that in cases where a national public safety plan was in place concerning the incidence of tsunami, and that the aerodrome in consideration was a full and active part of that plan, then the issuance of a separate aviation-related tsunami warning would be redundant and could even cause confusion. As a result the group agreed the following action:

## **Action Agreed 4/7 — Tsunami warnings where national public safety plans incorporating the aerodrome exist**

That the Secretary develop a draft amendment proposal to Annex 3, Appendix 6, 5.1.3 to add a note stating that tsunami warnings are not required in cases where a national public safety plan for tsunami was fully integrated with the “at risk” aerodrome concerned.

### Draft Amendment 77 to Annex 3 related to aerodrome warnings for tsunami

1.2 The Meteorological Warning Study Group (METWSG), at its fifth Meeting held in Montréal, Canada, 20 to 21 June 2013, agreed a draft amendment proposal to Annex 3, Appendix 6, 5.1.3 to add the following note and submitted the draft amendment to Meteorology Divisional Meeting held in Montréal, Canada, 7 to 18 July 2014:

*Note. — Aerodrome warnings related to the occurrence or expected occurrence of tsunami are not required where a national public safety plan for tsunami is integrated with the ‘at risk’ aerodrome concerned.*

### Overview of the concept on aerodrome warnings for tsunami

1.3 The ‘at risk’ aerodrome which is a full and active part of a national public safety plan for tsunami receives warnings from national public safety systems for tsunami or the International Tsunami Warning Centres according to that plan. On the other hand, the ‘at risk’ aerodrome which is not a part of a national public safety plan for tsunami receives aerodromes warnings for tsunami from the meteorological office designated by the meteorological authority concerned.

## **2. Integration of aerodromes into the national tsunami warnings**

### Aerodrome warnings for tsunami

2.1 The provisions for aerodrome warnings are provided in Annex 3, 7.3, and tsunami is included in the list of phenomena in aerodrome warnings in Appendix 6, 5.1.3. The aerodrome warnings for tsunami are issued where required by operators or aerodrome services, and shall be disseminated in accordance with local arrangements to those concerned.

### National tsunami warning system for public

2.2 A large number of States which have a risk of tsunami develop national public safety plans for tsunami and disseminate warnings from national tsunami warning centres or the International Tsunami Warning Centres to public.

### Integration of aerodromes into the national tsunami warning systems for public

2.3 Warnings from national tsunami warning centres or the International Tsunami Warning Centres are relayed to the ‘at risk’ aerodrome according to a national public safety plan for tsunami and are treated as aerodrome warnings for tsunami.

### **3. Responsibilities**

#### Tsunami warning centre

3.1 Each tsunami warning center including national tsunami warning centres or the International Tsunami Warning Centres issues information or warnings for tsunami and disseminates them to organizations concerned.

#### Meteorological Watch Office

3.2 Meteorological Watch Office which is designated to a part of a national tsunami warning system should play the role that defined in the national public safety plan.

#### Aerodrome Meteorological Office

3.3 Aerodrome Meteorological Office which is designated to a part of a national tsunami warning system also should play the role that defined in the national public safety plan and provide appropriate information to aviation users concerning the aerodrome. In case, in ‘at risk’ aerodrome, aviation users is not receive tsunami warning directly from tsunami warning centre, Aerodrome Meteorological Office should issue aerodrome warning for tsunami. In preparing aerodrome warning for tsunami the format determined in Annex 3 (detailed format description is provided in Appendix 6, Table A6-2 of Annex 3)

#### Aviation users

3.4 Aviation users who receive tsunami warnings by measures established in a national tsunami warning system should take the appropriate action based on the evacuation plan developed in each organization.

#### Coordination between units

3.5 Not to mention the coordination between units based on a national public safety plan, it is desirable to coordinate between each unit concerning the ‘at risk’ aerodrome and to develop each appropriate tsunami evacuation plan regardless of a national public safety plan.

### **4. Procedures for dissemination of tsunami warnings to at-risk aerodrome**

#### Dissemination of tsunami warnings to aviation users

4.1 Tsunami warnings are disseminated using appropriate measures established in national tsunami warning systems. In some States, tsunami warnings are disseminated directly from national tsunami warning centres to aviation users, and in other States, aerodrome meteorological

offices which receive tsunami warning as a part of a national tsunami warning system may provide them to aviation users concerning the aerodrome.

Examples in States

4.2 Appendix A and Appendix B shows the examples of procedures for dissemination of tsunami warnings to at-risk aerodrome in Japan and Indonesia.

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## **Appendix A**

### **The use of public tsunami warnings in aerodromes in Japan**

1.1 Japan Meteorological Agency (JMA) issues tsunami warnings as a national tsunami warning centre. JMA disseminates tsunami warnings using public measures such as community wireless systems and public broadcast services. Aviation users concerning 'at risk' aerodrome receive tsunami warning from public measures described above and via aerodrome meteorological office.

1.2 Aviation users concerning 'at risk' aerodrome coordinate with each other and have developed tsunami evacuation plan in the aerodrome. Aviation users receiving tsunami warning will take the appropriate action based on the evacuation plan.

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## **Appendix B**

### **The use of public tsunami warnings in aerodromes in Indonesia**

1.1. Indonesian Meteorological Climatological and Geophysical Agency (BMKG) is responsible for providing tsunami warning in Indonesia. BMKG disseminates tsunami warning through various communication media including SMS, email, website, Warning Receiver System and Global Telecommunication System.

1.2. Aviation users receiving tsunami warning through dissemination media described above will take the appropriate action based on the evacuation plan

— END —