Rural Training Center – Thailand (RTC-TH)

F CUS

Community-based Environmental Education for the Self-sufficiency and Sustainability of Small Rural Family Farms

© 2010, rev 2012 RTC-TH. All rights reserved.

Advanced MEWS Weather Observing Lesson A5:

Reporting Severe Weather

2012 Ed

MEWS Lesson A5

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

A Mobile Emergency Weather Station (MEWS) Training Series presentation

Rural Training Center-Thailand
Emergency Communications Program

Ready to serve and sustain our community

For other lessons in the series e-mail hsØzhm@gmail.com
www.neighborhoodlink.com/RTC-TH_Tech/pages

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

A part of the RTC-TH EmComm Program

The Rural Training Center-Thailand Emergency Communications program is a volunteer effort to provide emergency amateur radio communications for local community self-sufficiency and sustainability in times of need.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

The Rural Training Center-Thailand (RTC-TH)

is an all volunteer organization providing community-based environmental education for self-sufficiency and sustainability of small rural family farms

www.neighborhoodlink.com/org/rtcth

E-mail: rtc2k5@gmail.com

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

MEWS adapts weather lessons from two existing RTC-TH programs

Unless otherwise indicated, photos in this presentation are the exclusive property of the RTC-TH. Use of RTC-TH copyrighted materials are available for private / non-commercial educational use without written permission if no changes are made, no fee is charged, and proper attribution is made to the RTC-TH.

Commercial use of the materials is prohibited without written permission.

E-mail: rtc2k5@gmail.com
www.neighborhoodlink.com/RTCTH_Tech/pages

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

The Rural Training Center-Thailand was created to honor the life and memory of Mr. Tang Suttisan, a father, farmer and former custodian of Ban Na Fa Elementary School who appreciated and valued education.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Warnings

Image from the internet: educational fair use clause

Thunderstorms often have severe turbulence, heavy rain, and lightning. These are extreme hazards for flight crews.

It is vital that MEWS Observers to immediately report cumulonimbus clouds, thunderstorms, and lightning to warn air crews of possible hazardous flight conditions.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

When do severe storms occur in Nan?

From North Thailand Climate Data During 54 years (1951 - 2004)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Tropical Cyclones	-	-	-	-	5	2	9	17	23	15	1	-	72
Thawangpha Rainfall (mm)	11.0	12.6	29.2	108.0	206.2	202.4	244.1	302.3	175.6	80.4	22.7	5.9	1400.04
Seasons	Winter		Summer		Rainy (SW Monsoon)						Winter (NE Monsoon)		
Ave Temp	23.1°C		28.0°C		27.3°C						23.1°C		
Temp Range	17.1-30.8°C		21.4-35.8°C		23.7-32.2°C						17.1-30.8°C		
Ext Temp	0.8°C		44.5°C								0.8°C		
Rainfall (mm)	105.5		182.5		952.1						105.5		1240.10

Tropical Cyclones associated with the SW monsoon season.

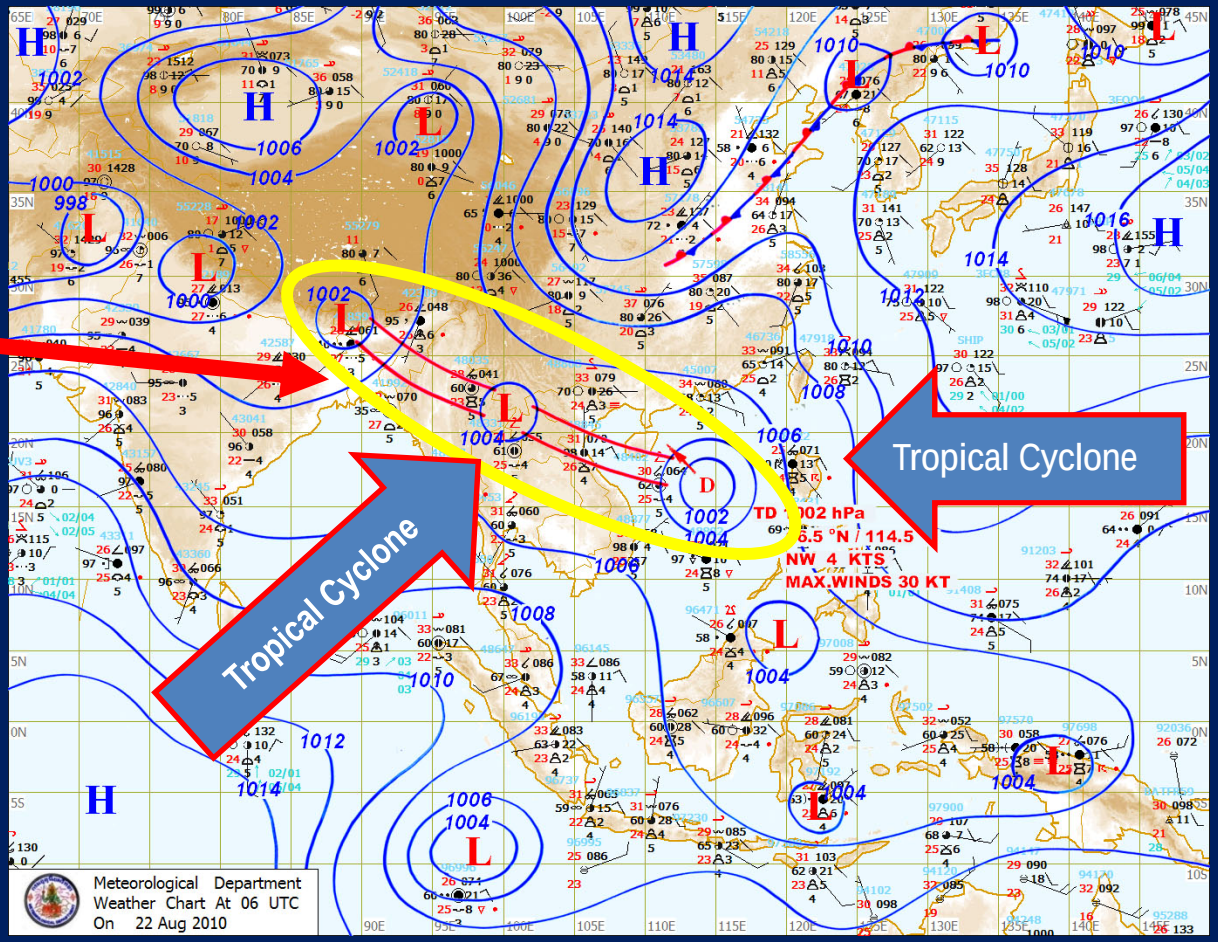
Convective thunderstorms associated with the summer season.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

SW Monsoon & Northern Thailand

A series of Low pressure cells form a “low pressure trough” over northern Thailand

Some tropical cyclones from the Andaman Sea flow toward the low pressure trough



Some tropical cyclones from the South China sea flow into low pressure trough

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Photo from the Internet; educational use clause

Summer in Northern Thailand

The high pressure systems create clear skies that can make convective thunderstorms.

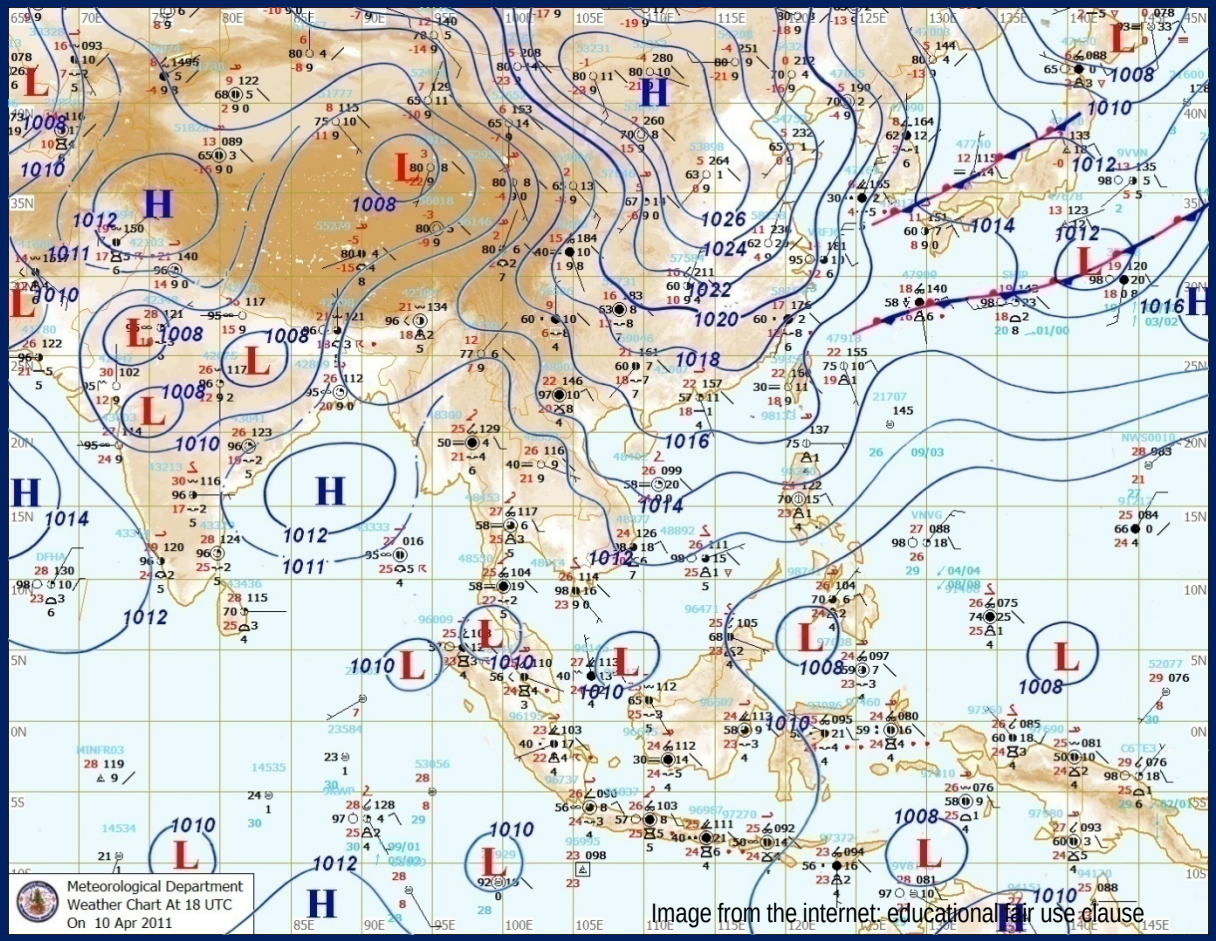


Image from the internet: educational fair use clause

The rains can be intense, short (1-2 hours) but heavy producing flash floods and landslides.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

May be dangerous to survivors. Severe weather affects emergency relief planning.

Severe Weather	Survivors
Strong / Gusting Winds	Damage to shelters; increases need for food and clothing for warmth.
Heavy Rain	Flooding and flash flooding; closed roads; water damage to supplies; landslides; damage to shelters.
Low Cloud Base	Possible rain; overcast (gloomy) affecting flight operations
Lightning	Personal injury and death; Electrical damage to equipment, vehicles, and aircraft.
Hail	Personal injury; damage to shelters, vehicles, and aircraft.

MEWS observers should use local knowledge and judgment to provide relief planners any information needed for aiding survivors.

See Basic MEWS Lesson B8 to learn more about severe weather.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

May be dangerous to flight crews and EmComm operators. Be alert to severe weather conditions.

Severe Weather	Flight Ops	EmComm Ops
Strong / Gusting Winds; Turbulence	Strong winds / turbulence = dangerous flight conditions	Danger for radio operator; Can damage to mast / antenna systems
Heavy Rain	Reduced visibility; can flood LZ	Station flooding; water damage
Low Cloud Base	Limits flight altitude; reduces visibility	-Not Applicable-
Lightning	Electrical damage to aircraft	Operator danger; electrical damage
Hail	Aircraft damage	Personal injury; Station and mast / antenna damage

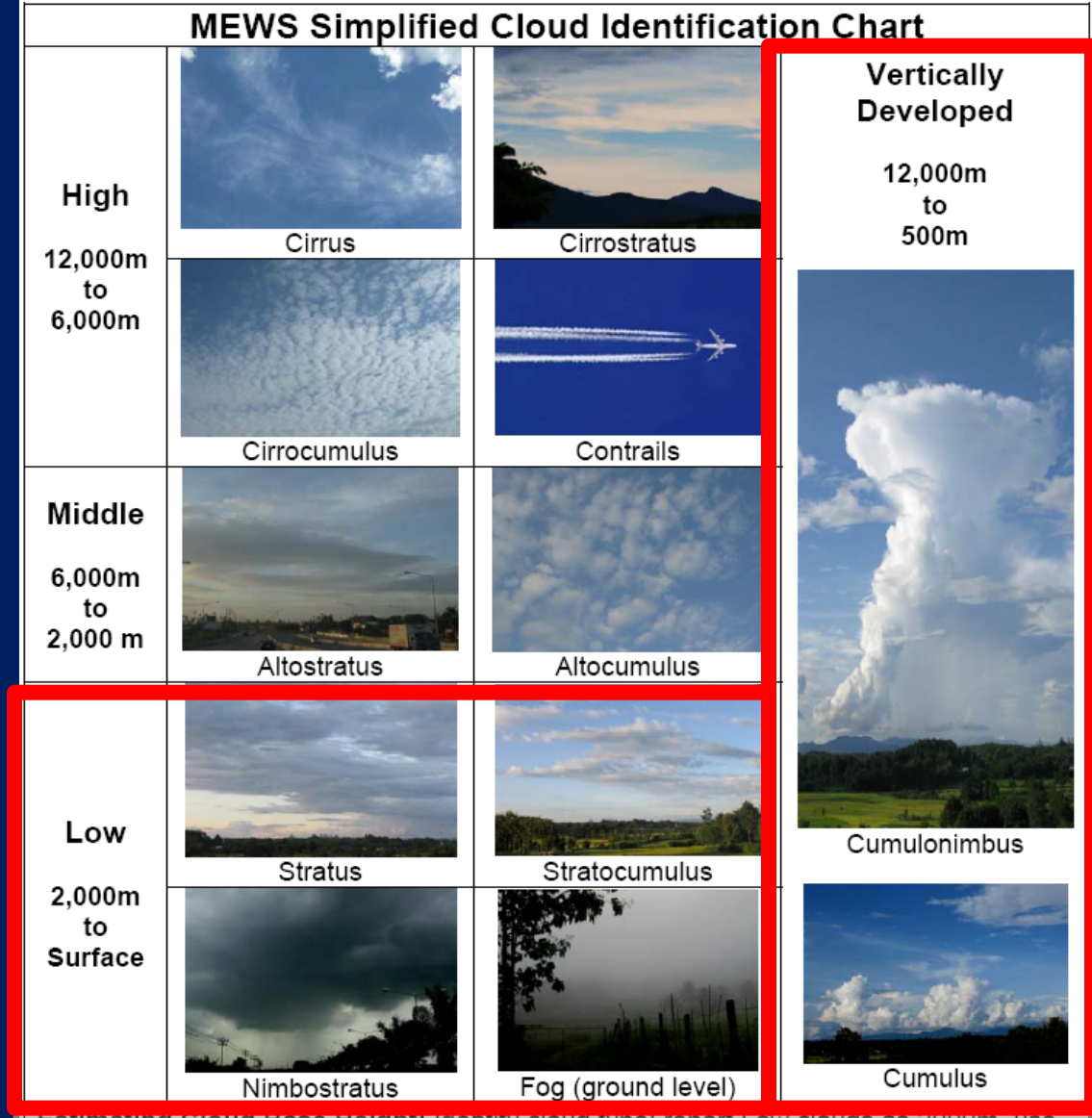
MEWS observers should use local knowledge and judgment to provide flight crews with any information needed for safe flight operations.

See Basic MEWS Lesson B8 to learn more about severe weather.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

The main concern are storm clouds and related weather affecting helicopter flight operations

Severe weather is often associated with Cumulonimbus cloud formations.



Estimating Cloud Base Height: Identify cloud type; report Low clouds as 2000m, use lower limit for other cloud types.

Flight Advisories: Report flight advisory to air crews for the following conditions.

Low Clouds near or at l60m AGL (day); 500m AGL (Night). No flights if below these minimum limits.

Reduced Visibility: Smoke, dust, haze, fog reducing visual range to 3.2 km (Day) or 5 km (Night); No flights if below these minimum limits.

Severe Weather: Thunderstorms, lightning, heavy rain, excessive winds, or other weather extremes.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Heavy rains obscure vision

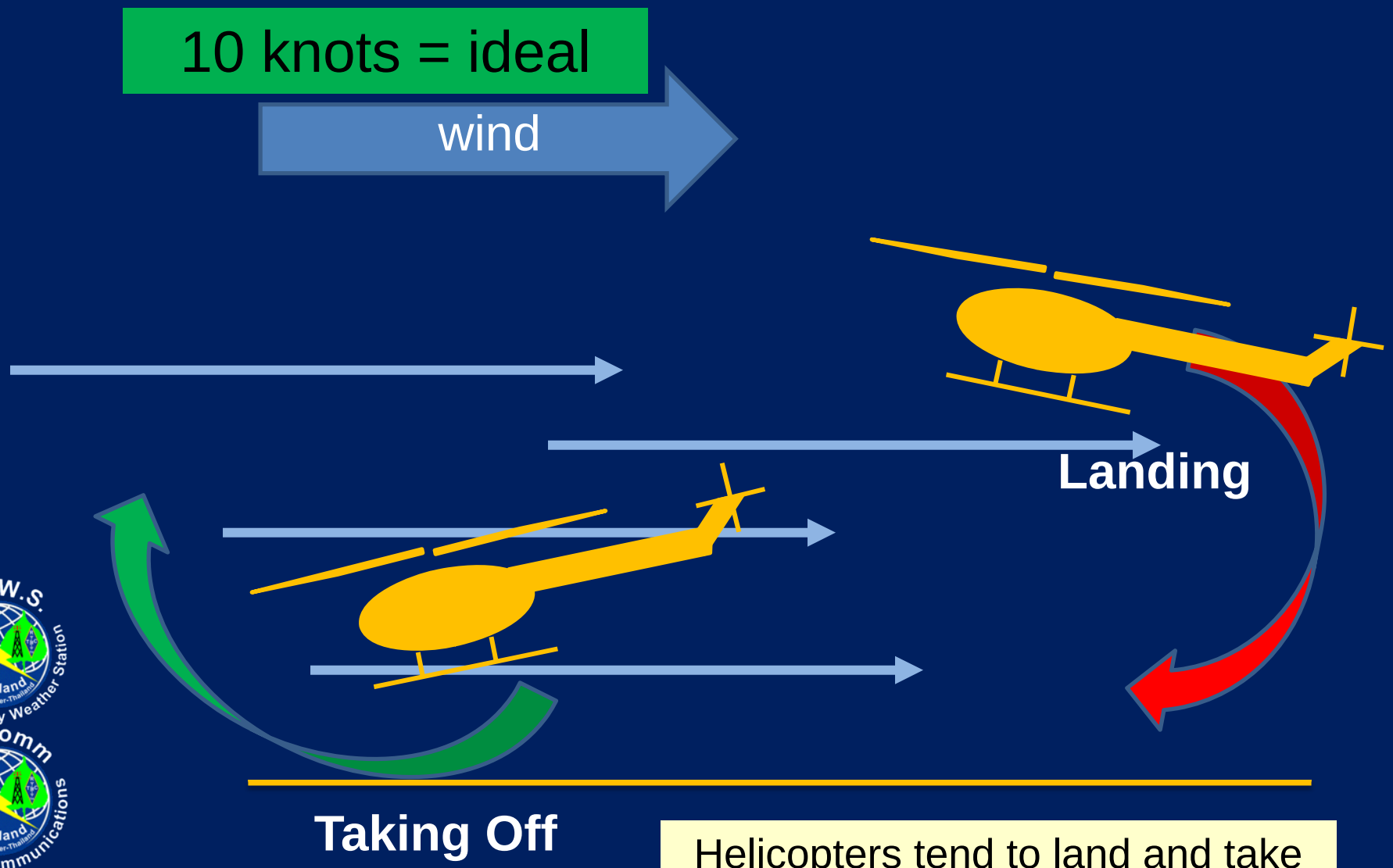
Most helicopters operate VFR (visual flight rules). They must see where they are going.

View from the cockpit with overcast sky but no rain.

View from the cockpit with clouds and rain.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

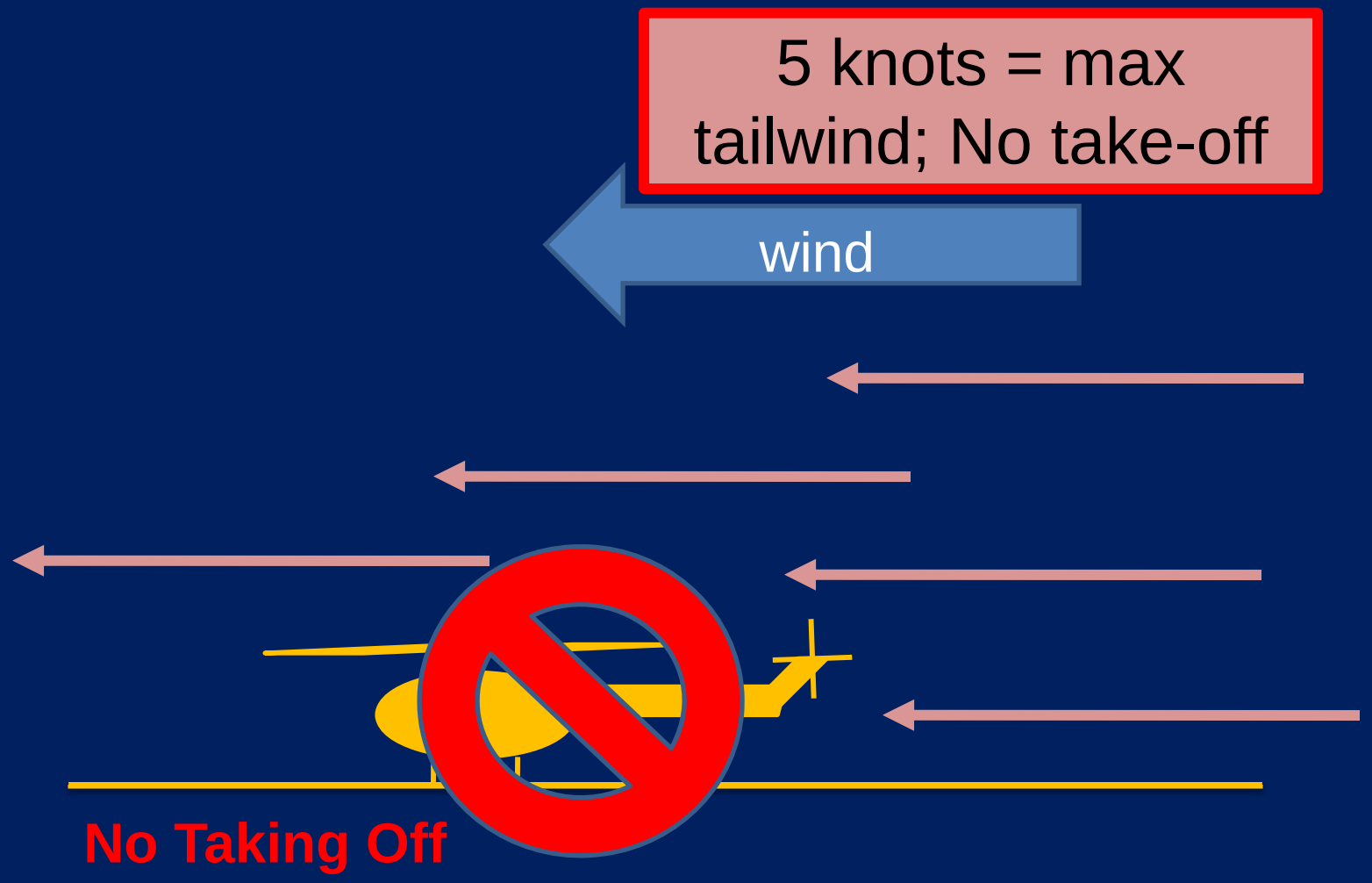
How wind affects flight operations



Helicopters tend to land and take off by flying into the wind.

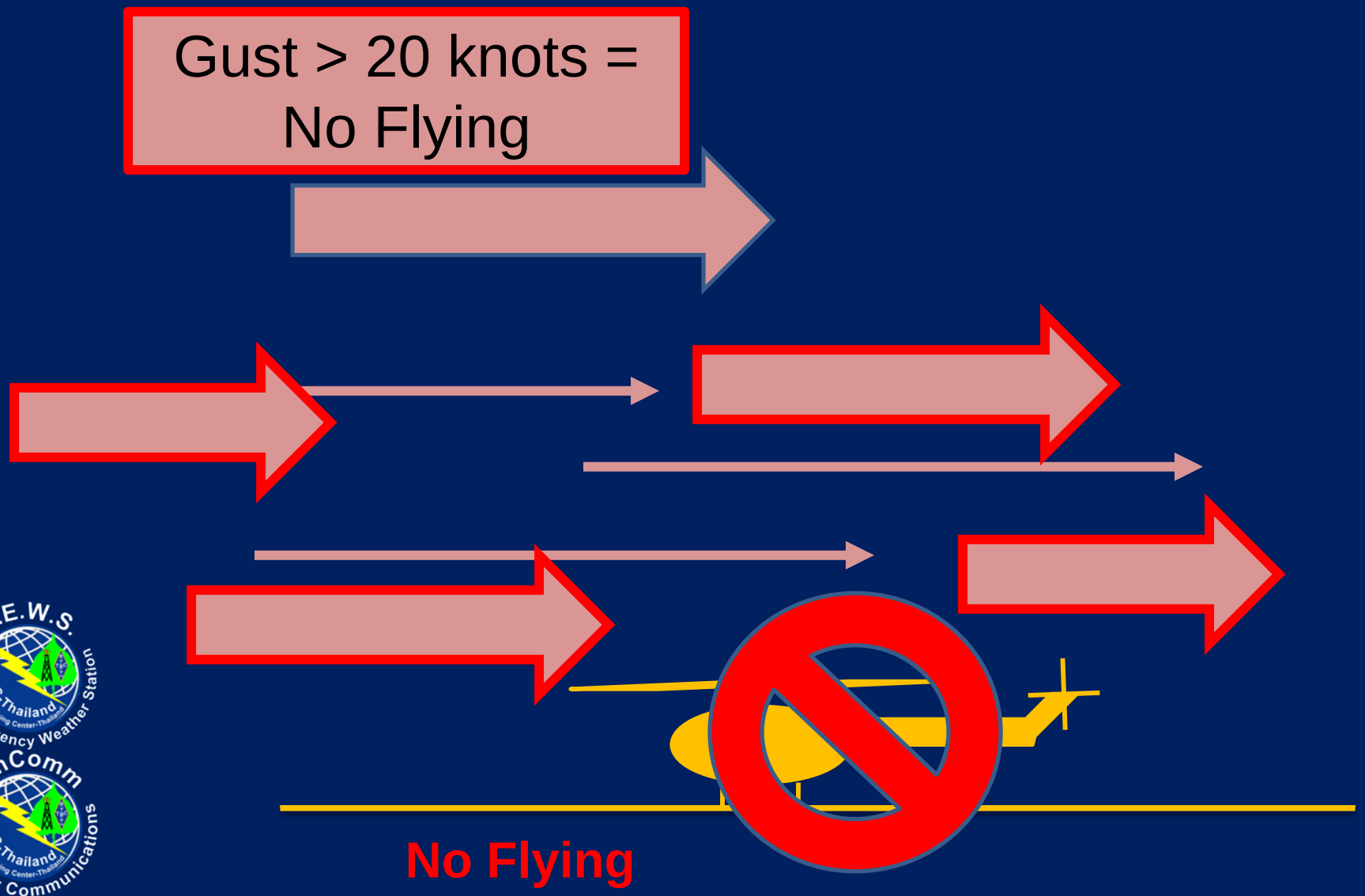
© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

How wind affects flight operations



© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

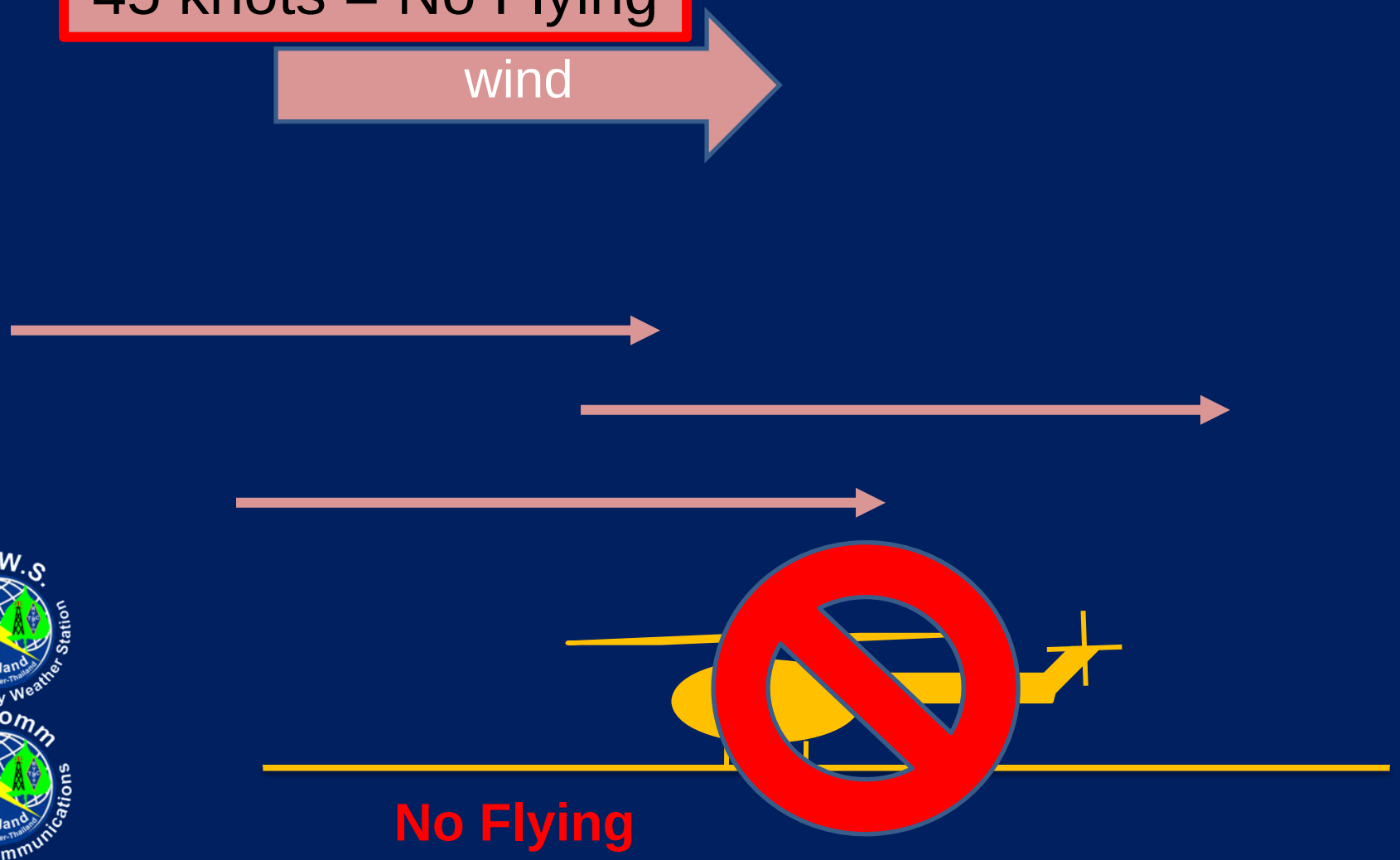
How wind affects flight operations



© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

How wind affects flight operations

45 knots = No Flying



© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Strong Wind Hazards

Helicopter flight operations are affected by winds. Use the guidelines on the Log Form.

Wind Speed / Direction	3.1	Report wind speed in *knots to air crews;* km/h to all others.						
		Average	Get 3 readings & average	km/h	knts	km/h	knts	km/h knts
		Gusts	Record highest gust	km/h	knts	km/h	knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations						
		10 knots / 18.5 km/h ideal; OK to fly				Above 45 knots / 83 km/h; No flights.		
		Gusts above 20 knots/ 37 km/h; No flights				Max tailwind 5 knots/ 6 km/hr; No take off		

- Wind 10 Knts/18.5 km/h = **OK**
- Wind above 45 knts/83 km/h = **No Flights**
- Gusts more than 20 knts/37 km/h = **No Flights**
- Max tailwind 5 knots/6 km/h; more = **No Take off**

Report a Flight Advisory any time conditions are near ***to, at, or greater*** than the warning limits listed on the Log Form.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Strong Wind Hazards

High winds can damage towers and power lines

Cell phone towers, radio and TV antennas can de damaged by winds

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

When power lines and towers go down…

…HAM radio operators need to be prepared to operate using battery power…

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Photos courtesy of E20NXT

…and portable antenna systems

Radio Operators Advisory

If you use a solar PV panel, consider that stormy weather means little sunshine.

Have a back up plan for charge batteries in case there isn't enough sunshine.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Radio Operators Advisory

You need to know how much battery power you have and a plan to recharge batteries

Images from the internet: educational fair use clause

If you are using a generator, make sure you have enough fuel (it may be in short supply).

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Strong winds: Radio Operator Advisory

Strong Winds

Amateur radio operators should know the wind loads on their antenna / mast systems. Find an antenna and mast that can withstand varying intensities of wind or consider a variety of antennas / masts for a range of possible wind conditions.

Pay attention to this when supporting flight operations near a Landing Zone (LZ). Winds at the LZ can reach intensity of a hurricane.

Beaufort Wind Table for Land Effects

MEWS weather observers should set up a flag near their operating position. Use the Description and flag references to estimate the wind speed. Report the range of wind speeds from the chart rather than a specific number.

Description	Flag	WMO term	Mph	Km/ hr	Knots	Force	Psu lbs/sq ft (Kg/sq m)
			Report wind speed in knots to flight crews				
Calm; smoke rises vertically	---	Calm	<1.0	<1.5	<0.9	0	0.006266 (0.003059)
Smoke indicates wind; flag hangs limp, wind vanes do not move		Light Air	1-3	1.5-6	1-3	1	0.02924 (.01428)
Wind felt on face, leaves rustle, flag stirs, wind vanes move		Light breeze	4-7	6-12	4-6	2	0.142 (0.6934)
		5 Knots maximum tailwind for helicopter take-off					
Leaves and twigs in constant motion; flag occasionally extends		Gentle Breeze	8-12	12-20	7-10	3	0.3759 (1.835)
		10 Knots ideal for helicopter flight operations					
Dust and paper fly; small branches move; Flag flaps		Mild Breeze	13-18	21-29	11-16	4	0.8145 (3.977)
Small leafy trees begin to sway; white crested wavelets appear on lakes/ponds; Flag ripples		Fresh Breeze	19-24	30-39	17-21	5	1.504 (7.342)
		20 Knots maximum gusts for helicopter flight operations					
Large branches move; wires whistle; umbrellas hard to use; Flag snaps		Strong Breeze	25-31	40-50	22-27	6	2.485 (12.13)
Whole trees sway; hard to walk; Flag extended		Near Gale	32-38	51-61	28-33	7	3.822 (18.66)
Twigs and small branches broken; cars veer on roads; Flag tatters		Gale	39-46	62-74	34-40	8	5.597 (27.33)
Slight structural damage occurs (roof shingles blow off)		Strong Gale	47-54	75-87	41-47	9	7.769 (37.93)
		45 Knots maximum winds for helicopter flight operations					
Trees broken or uprooted, considerable damage to buildings		Storm	55-63	88-101	48-55	10	10.53 (51.39)
Wide spread damage caused	---	Violent Storm	64-72	102-114	56-63	11	13.78 (67.3)
	---	Hurricane	>73	>115	>63	12	>13.78 (>67.3)

Disclaimer: Use of the pressure data to calculate tower/antenna wind loads is at your own risk. The RTC-TH and HSØZHM assume no liability for the use of this data. Pressure values are the upper limits for a wind category.

M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand Rural Training Center-Thailand

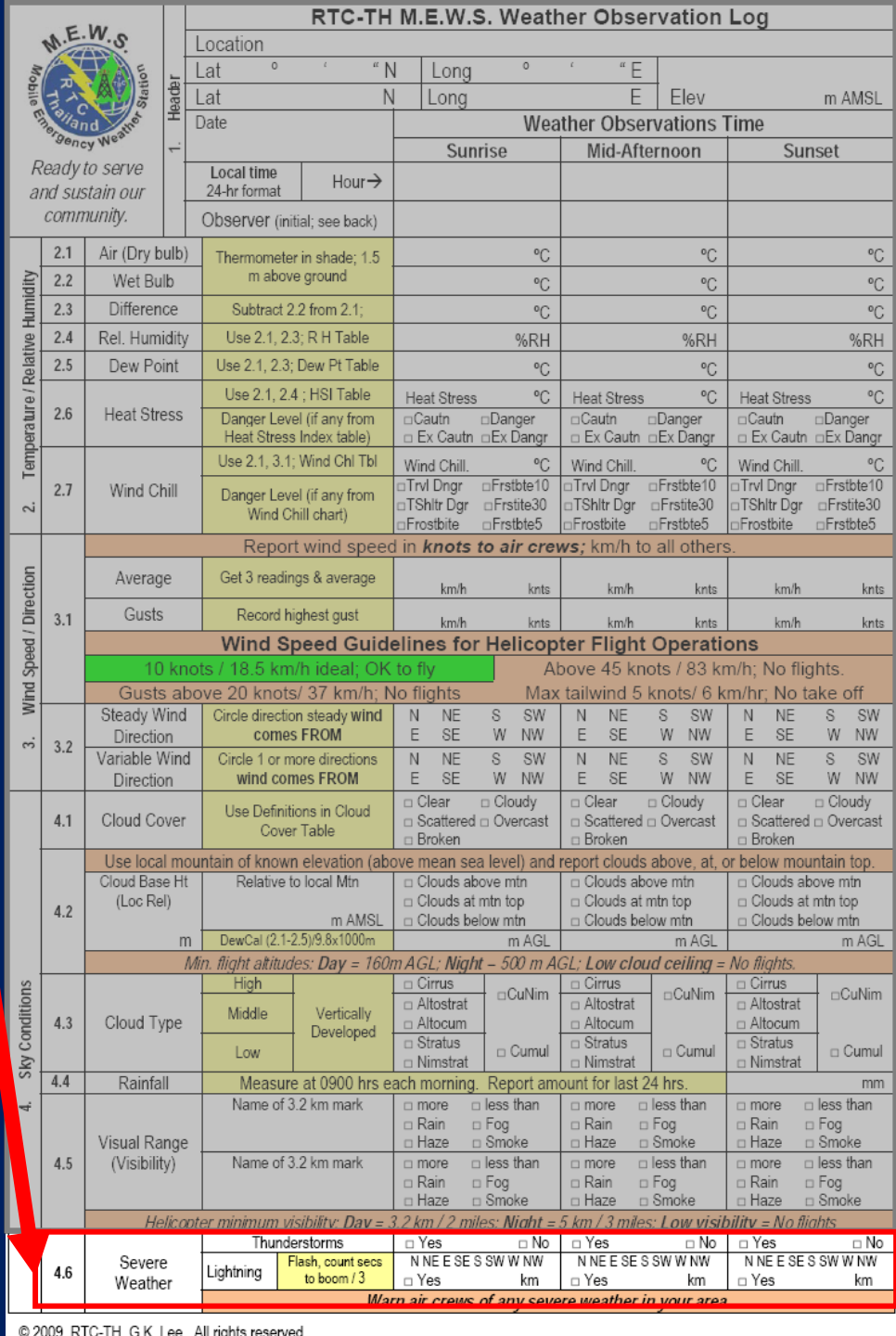
EmComm Emergency Communications — RTC-Thailand Rural Training Center-Thailand

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Record the Severe weather conditions in Section 4.6 on the form

Back of the form has more detailed notes

See Handbook Section 4.6, pp. 29-30



M.E.W.S. Mobile Emergency Weather Station — RTC Thailand

Ready to serve and sustain our community.

RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location			
Lat ° ' " N	Long ° ' " E		
Lat N	Long E	Elev m AMSL	
Date	Weather Observations Time		
	Sunrise	Mid-Afternoon	Sunset
Local time 24-hr format / Hour→			
Observer (initial; see back)			

2. Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
3. Wind Speed / Direction	3.1	Report wind speed in ***knots to air crews;*** km/h to all others.				
		Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
		Gusts	Record highest gust	km/h knts	km/h knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations				
		10 knots / 18.5 km/h ideal; OK to fly			Above 45 knots / 83 km/h; No flights.	
		Gusts above 20 knots/ 37 km/h; No flights			Max tailwind 5 knots/ 6 km/hr; No take off	
	3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
		Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
4. Sky Conditions	4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken
	4.2	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.				
		Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
		m	DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL
		*Min. flight altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*				
	4.3	Cloud Type	High / Middle / Low — Vertically Developed	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimstrat □CuNim □ Cumul
	4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*				
	4.6	Severe Weather	Thunderstorms	□ Yes □ No	□ Yes □ No	□ Yes □ No
			Lightning — Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km
		Warn air crews of any severe weather in your area				

© 2009, RTC-TH, G.K. Lee. All rights reserved.

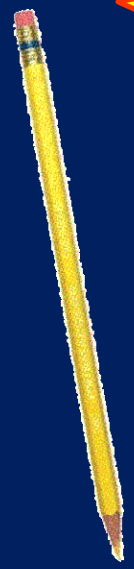
M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand Rural Training Center-Thailand

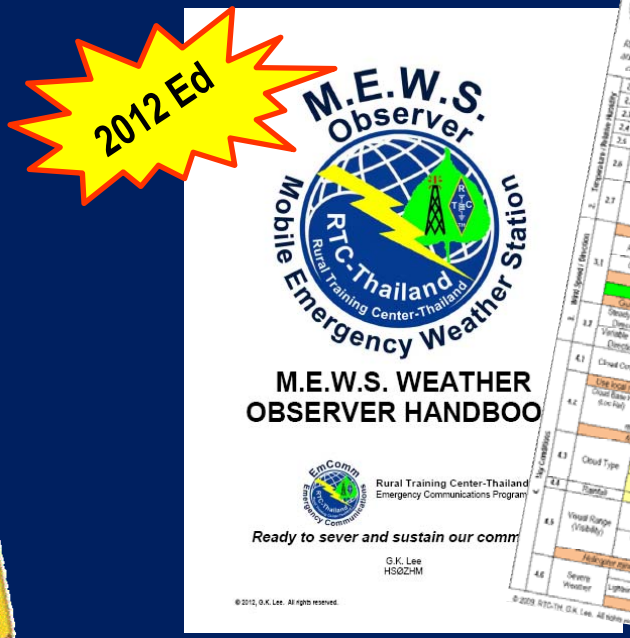
EmComm Emergency Communications — RTC-Thailand Rural Training Center-Thailand

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

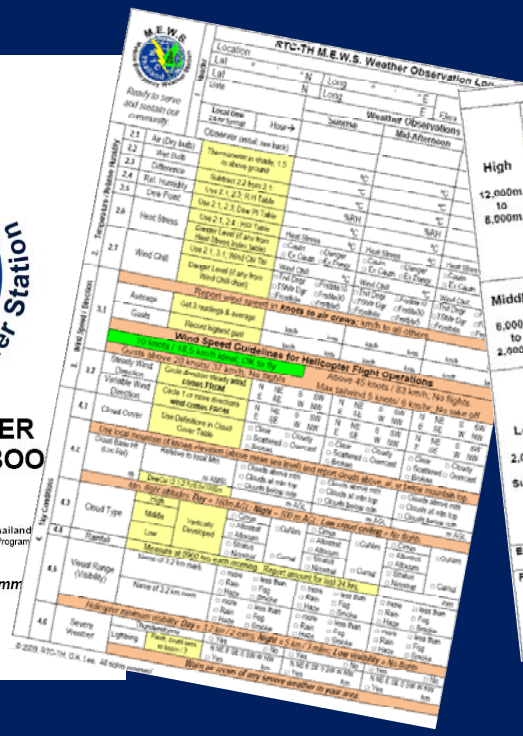
What you need to have to report severe weather conditions

Pencil

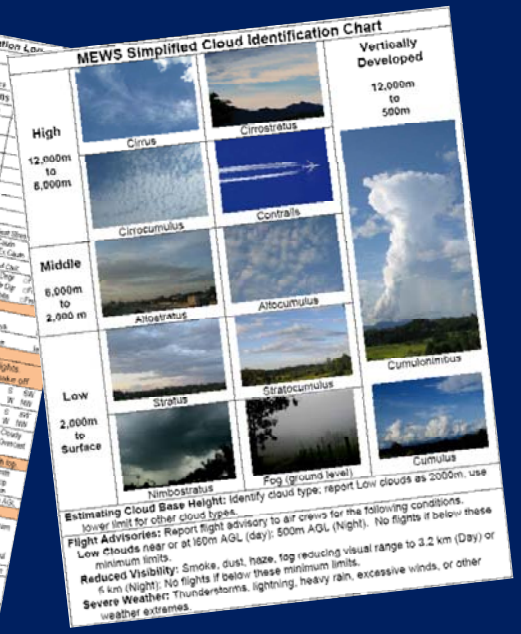




MEWS Handbook



MEWS Log Form



Cloud Identification Chart

A current MEWS Log form is your primary resource to report severe weather conditions.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Optional Lightning Detection Devices

This equipment is optional. It can provide information about the distance, movement, and frequency of lightning activity.

SkyScan Lightning Detector

Be sure to have spare batteries for these devices.

Strike Alert Lightning Detector

Report to flight crews the estimated distance and direction of thunderstorms to your station. For example, “Thunderstorm about 3 km Northwest of my station.”

You may want to review MEWS Lesson B8 about the “Flash / Boom” method to estimate storm distance in case of equipment failure.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Issue Flight Advisories

Report Cumulonimbus cloud development in your area. Be alert to possible severe weather.

- Strong or gusting winds; turbulence
- Heavy rain
- Low Cloud Base Height
- Lightning
- Hail

MEWS Weather Observers should report all hazardous flight conditions to air crews at the earliest possible moment.

MEWS observers should use local knowledge and judgment to provide flight crews with any information needed for safe flight operations.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

May be dangerous to flight crews and EmComm operators. Be alert to severe weather conditions.

Severe Weather	Flight Ops	EmComm Ops
Strong / Gusting Winds; Turbulence	Strong winds / turbulence = dangerous flight conditions	Danger for radio operator; Can damage to mast / antenna systems
Heavy Rain	Reduced visibility; can flood LZ	Station flooding; water damage
Low Cloud Base	Limits flight altitude; reduces visibility	-Not Applicable-
Lightning	Electrical damage to aircraft	Operator danger; electrical damage
Hail	Aircraft damage	Personal injury; Station and mast / antenna damage

Use the VFR minimums listed on the MEWS Log form for safe flight operations.

See Basic MEWS Lesson B8 to learn more about severe weather.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

Warn flight crews when winds are nearing operating limits. Monitor wind gusts!

Severe Weather	Flight Ops	EmComm Ops
Strong / Gusting Winds; Turbulence	Strong winds / turbulence = dangerous flight conditions	Damage to mast / antenna systems

- Wind 10 Knts/18.5 km/h = **OK**
- Wind above 45 knts/83 km/h = **No Flights**
- Gusts more than 20 knts/37 km/h = **No Flights**
- Max tailwind 5 knts/6 km/h; more = **No Take off**

Pay special attention to wind gust measurements. Use the helicopter flight operating notes about wind limits on the MEWS log form.

See Basic MEWS Lesson A2 to learn more about Wind Speed measurement.

© 2010, rev 2012, G. K. Lee HS0ZHM All Rights Reserved.

Severe Weather Hazards

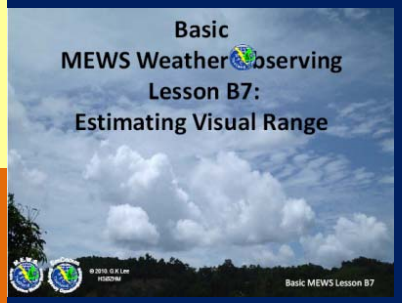
Report heavy rain that limits visual range or floods landing zones to flight crews.

Severe Weather	Flight Ops	EmComm Ops
Heavy Rain	Reduces visibility; Can flood LZ	Station flooding; water damage

Day: Minimum 3.2 km
Night: Minimum 5 km

Know specific landmarks to judge visual range for the landing zone or operating position. Refer to the helicopter flight operations notes on the MEWS log form.

See Basic MEWS Lesson B7 to learn more about visual range.



© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

Warn flight crews when the cloud base height is approaching minimum operating limits.

Severe Weather	Flight Ops	EmComm Ops
Low Cloud Base	Limits flight altitude; reduces visibility	-Not Applicable-

Day: Minimum 160 m AGL*

Night: Minimum 500 m AGL*

* AGL = Above Ground Level (do not confuse with sea level)

Use the Dew Point Temperature to calculate the height of the cloud base above the ground. Check the helicopter flight operations warning notes on the log form.

See Basic MEWS Lesson A3 to review the Dew Point Temperature calculation for cloud base height.

Advanced MEWS Weather Observing Lesson A3:

Using Dew Point Temperature to Calculate Cloud Base Height

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

Report lightning in the area to flight crews.

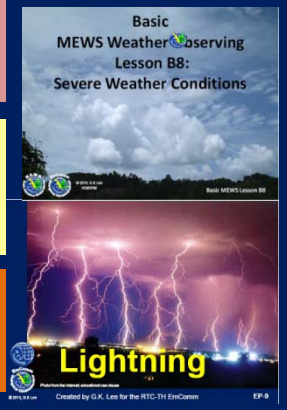
Severe Weather	Flight Ops	EmComm Ops
Lightning	Electrical damage to aircraft	Operator danger; electrical damage

- **Shut down** any time lightning is 9.5 km away or less; disconnect antenna from radio.
- Wait 30 min after hearing the last thunder before resuming operations

Report when you are shutting down due to lightning (or any other reason) and advise others of the frequency to monitor for your return to operation.

Lightning can occur with thunderstorms in both summer and rainy seasons.

See Basic MEWS Lesson B8 to learn more about severe weather and EP-9 about Lightning.

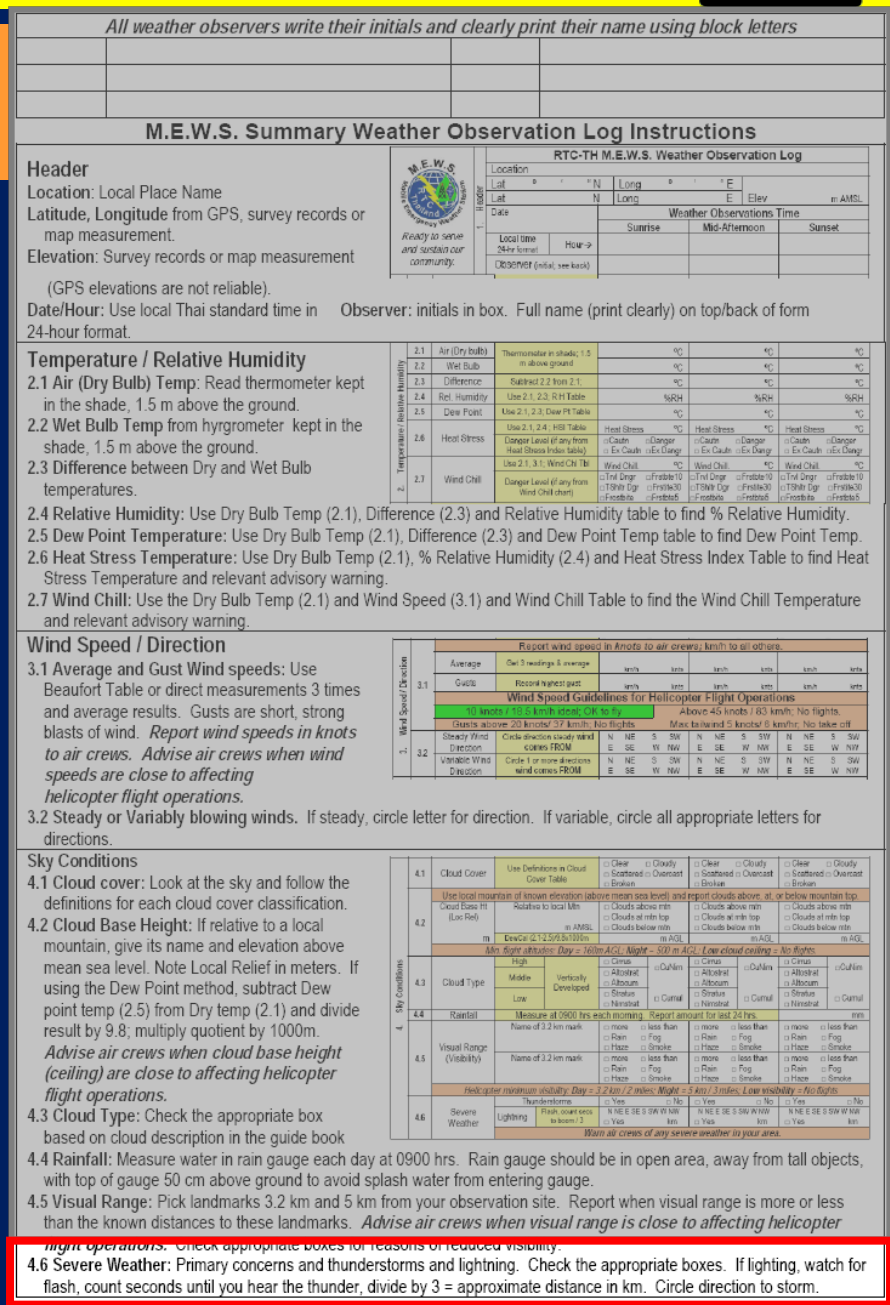


© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Lightning: Distance to Storm Measurement

On the back of the MEWS Log Form is a brief note about the “Flash to Boom” method to estimate your distance to a thunder storm.

If a lightning detector is not available or the unit malfunctions, use the “Flash to Boom” method. Notes about this method are on the back of the Log form.



All weather observers write their initials and clearly print their name using block letters

M.E.W.S. Summary Weather Observation Log Instructions

Header
Location: Local Place Name
Latitude, Longitude from GPS, survey records or map measurement.
Elevation: Survey records or map measurement (GPS elevations are not reliable).
Date/Hour: Use local Thai standard time in 24-hour format.
Observer: initials in box. Full name (print clearly) on top/back of form

Temperature / Relative Humidity
2.1 Air (Dry Bulb) Temp: Read thermometer kept in the shade, 1.5 m above the ground.
2.2 Wet Bulb Temp from hyrgrometer kept in the shade, 1.5 m above the ground.
2.3 Difference between Dry and Wet Bulb temperatures.
2.4 Relative Humidity: Use Dry Bulb Temp (2.1), Difference (2.3) and Relative Humidity table to find % Relative Humidity.
2.5 Dew Point Temperature: Use Dry Bulb Temp (2.1), Difference (2.3) and Dew Point Temp table to find Dew Point Temp.
2.6 Heat Stress Temperature: Use Dry Bulb Temp (2.1), % Relative Humidity (2.4) and Heat Stress Index Table to find Heat Stress Temperature and relevant advisory warning.
2.7 Wind Chill: Use the Dry Bulb Temp (2.1) and Wind Speed (3.1) and Wind Chill Table to find the Wind Chill Temperature and relevant advisory warning.

Wind Speed / Direction
3.1 Average and Gust Wind speeds: Use Beaufort Table or direct measurements 3 times and average results. Gusts are short, strong blasts of wind. *Report wind speeds in knots to air crews. Advise air crews when wind speeds are close to affecting helicopter flight operations.*
3.2 Steady or Variably blowing winds. If steady, circle letter for direction. If variable, circle all appropriate letters for directions.

Sky Conditions
4.1 Cloud cover: Look at the sky and follow the definitions for each cloud cover classification.
4.2 Cloud Base Height: If relative to a local mountain, give its name and elevation above mean sea level. Note Local Relief in meters. If using the Dew Point method, subtract Dew point temp (2.5) from Dry temp (2.1) and divide result by 9.8; multiply quotient by 1000m. *Advise air crews when cloud base height (ceiling) are close to affecting helicopter flight operations.*
4.3 Cloud Type: Check the appropriate box based on cloud description in the guide book
4.4 Rainfall: Measure water in rain gauge each day at 0900 hrs. Rain gauge should be in open area, away from tall objects, with top of gauge 50 cm above ground to avoid splash water from entering gauge.
4.5 Visual Range: Pick landmarks 3.2 km and 5 km from your observation site. Report when visual range is more or less than the known distances to these landmarks. *Advise air crews when visual range is close to affecting helicopter flight operations.* Check appropriate boxes for reasons of reduced visibility.
4.6 Severe Weather: Primary concerns and thunderstorms and lightning. Check the appropriate boxes. If lighting, watch for flash, count seconds until you hear the thunder, divide by 3 = approximate distance in km. Circle direction to storm.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

How far can lightning strike?

Up to 48+ km away from where the rain is falling.

- You can hear thunder up to about 9.5-16 km away from the storm
- Lightning can strike you about 3 times farther than you can estimate by the Flash-Boom method.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Lightning Hazard for Radio Operators

Lightning can be lethal to radio operators and radios.

- **Shut down** any time lightning is 9.5 km away; disconnect antenna from radio.
- Wait 30 min after hearing the last thunder before resuming operations
- Properly ground all your equipment.
- Use lightning arrestors at the base of all mast/antenna systems

When reporting you are shutting down due to lightning, advise what frequency to monitor for your return to operation.

See Basic MEWS Lesson B8 to learn more about severe weather.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Lightning Hazards

In Nan lightning is common in some severe storms in the hot/dry season (Mar-Apr) and during the warm/wet season (May-Oct).

Lightning is often part of emergencies in Nan. Learn more about Landslides in Lesson EP-9.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Severe Weather Hazards

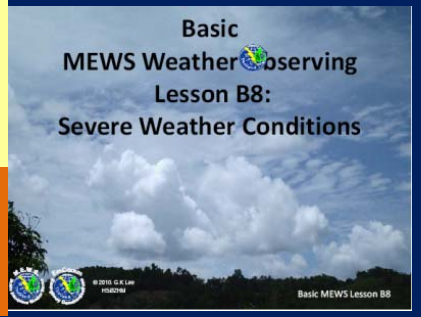
Report Hail in the area to flight crews.

Severe Weather	Flight Ops	EmComm Ops
Hail	Aircraft damage	Station and mast / antenna damage

Hail has occurred in other parts of northern Thailand due to severe thunderstorms

This may be unlikely in Nan, so there is no space on the MEWS log form to record this. If hail occurs, attach a special note to the log and report it to flight crews.

See Basic MEWS Lesson B8 to learn more about severe weather and hail.



© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Important Note

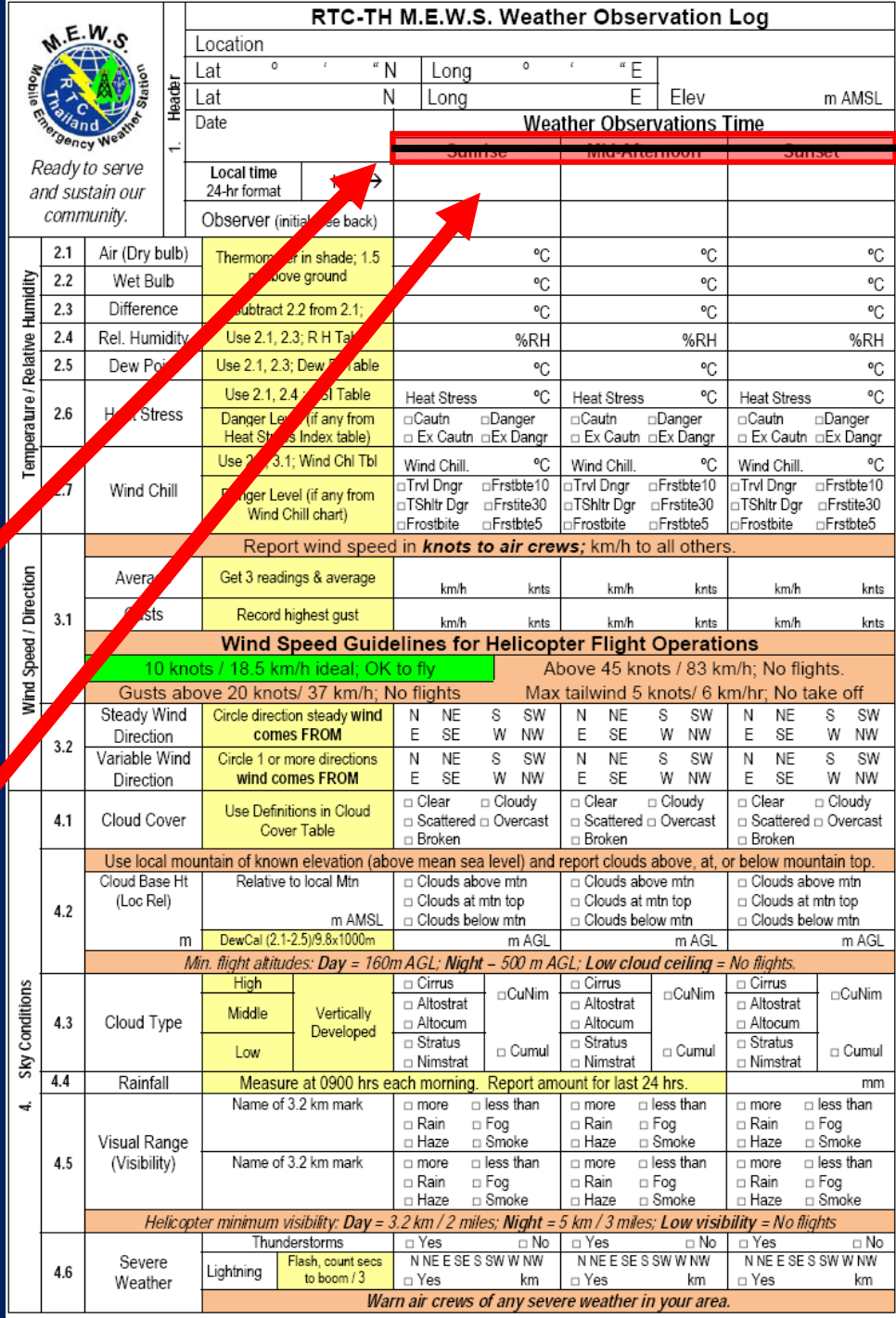
Normally MEWS observations are made 3 times a day. However, if flight operations are in progress, try to provide flight crews with weather updated prior to landings and take-offs for flight safety.

It is vital that MEWS Observers to immediately report cumulonimbus clouds, thunderstorms, and lightning to warn air crews of possible hazardous flight conditions.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

If more frequent observations are done to support flight operations...

…cross out the headings "Sunrise", etc. and record the time of the observations in the space provided.



M.E.W.S. Mobile Emergency Weather Station — RTC Thailand

Ready to serve and sustain our community.

RTC-TH M.E.W.S. Weather Observation Log

1. Header

Location			
Lat ° ' " N	Long ° ' " E		
Lat N	Long E	Elev m AMSL	
Date	**Weather Observations Time**		
	Sunrise	Mid Afternoon	Sunset
Local time 24-hr format →			
Observer (initial see back)			

Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Point Table	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4; Heat Stress Table	Heat Stress °C	Heat Stress °C	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 2.3; Wind Chl Tbl	Wind Chill. °C	Wind Chill. °C	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
Wind Speed / Direction		Report wind speed in ***knots to air crews;*** km/h to all others.				
	3.1	Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
		Gusts	Record highest gust	km/h knts	km/h knts	km/h knts
		Wind Speed Guidelines for Helicopter Flight Operations				
		10 knots / 18.5 km/h ideal; OK to fly		Above 45 knots / 83 km/h; No flights.		
		Gusts above 20 knots/ 37 km/h; No flights		Max tailwind 5 knots/ 6 km/hr; No take off		
	3.2	Steady Wind Direction	Circle direction steady **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
		Variable Wind Direction	Circle 1 or more directions **wind comes FROM**	N NE S SW E SE W NW	N NE S SW E SE W NW	N NE S SW E SE W NW
4. Sky Conditions	4.1	Cloud Cover	Use Definitions in Cloud Cover Table	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken	□ Clear □ Cloudy □ Scattered □ Overcast □ Broken
		Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.				
	4.2	Cloud Base Ht (Loc Rel)	Relative to local Mtn m AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn
		m	DewCal (2.1-2.5)/9.8x1000m	m AGL	m AGL	m AGL
		*Min. flight altitudes: **Day** = 160m AGL; **Night** – 500 m AGL; **Low cloud ceiling** = No flights.*				
	4.3	Cloud Type	High (Vertically Developed)	□ Cirrus □ Altostrat □ Altocum □CuNim	□ Cirrus □ Altostrat □ Altocum □CuNim	□ Cirrus □ Altostrat □ Altocum □CuNim
			Middle			
			Low	□ Stratus □ Nimstrat □ Cumul	□ Stratus □ Nimstrat □ Cumul	□ Stratus □ Nimstrat □ Cumul
	4.4	Rainfall	Measure at 0900 hrs each morning. Report amount for last 24 hrs.			mm
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** = 5 km / 3 miles; **Low visibility** = No flights*				
	4.6	Severe Weather	Thunderstorms	□ Yes □ No	□ Yes □ No	□ Yes □ No
			Lightning — Flash, count secs to boom / 3	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km	N NE E SE S SW W NW □ Yes km
		Warn air crews of any severe weather in your area.				

© 2009 RTC-TH G.K. Lee All rights reserved

M.E.W.S. Mobile Emergency Weather Station — RTC-Thailand Rural Training Center-Thailand

EmComm Emergency Communications — RTC-Thailand Rural Training Center-Thailand

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

For flight operations, make and report observations to flight crews before landings and take-offs

Cross out the headings for Sunrise, Mid-Afternoon, Sunset

Record the specific local time of your observations

	Weather Observations Time		
	~~Sunrise~~	~~Mid-Afternoon~~	~~Sunset~~
Hour→	1430		
al; see back)	HSØZHM		
shade; 1.5	°C	°C	°C
ground	°C	°C	°C
from 2.1;	°C	°C	°C

If a HAM, print your call sign (or name if no call sign)

Record the Severe Weather in Section 4.6

Weather observations to support flight operations are critical for safety of flight crew and LZ area.

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

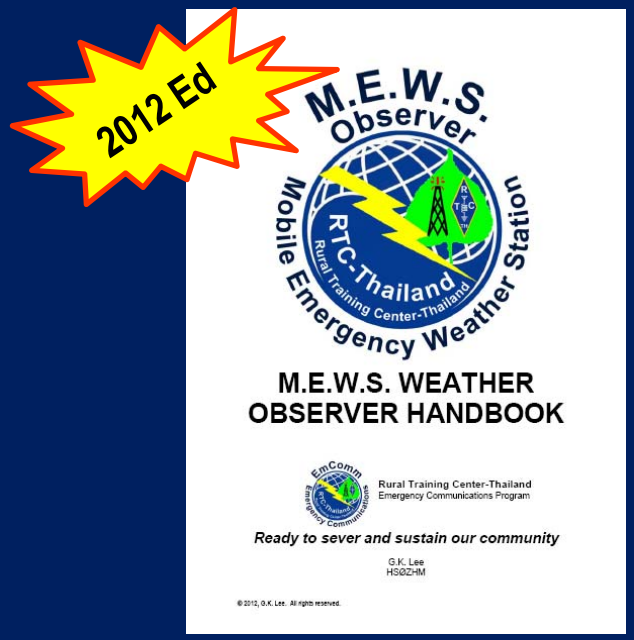
You have completed the Advanced MEWS Lesson A5: Reporting Severe Weather

You are now ready for Advanced MEWS Lesson A6: Weather Forecasting

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Questions or Comments

Refer to the MEWS Weather Observer Handbook for more details on any of the procedures in this lesson.



You may also contact us by e-mail:
hsØzhm@gmail.com
We are always trying to improve our lessons. Your comments and suggestions are welcomed.

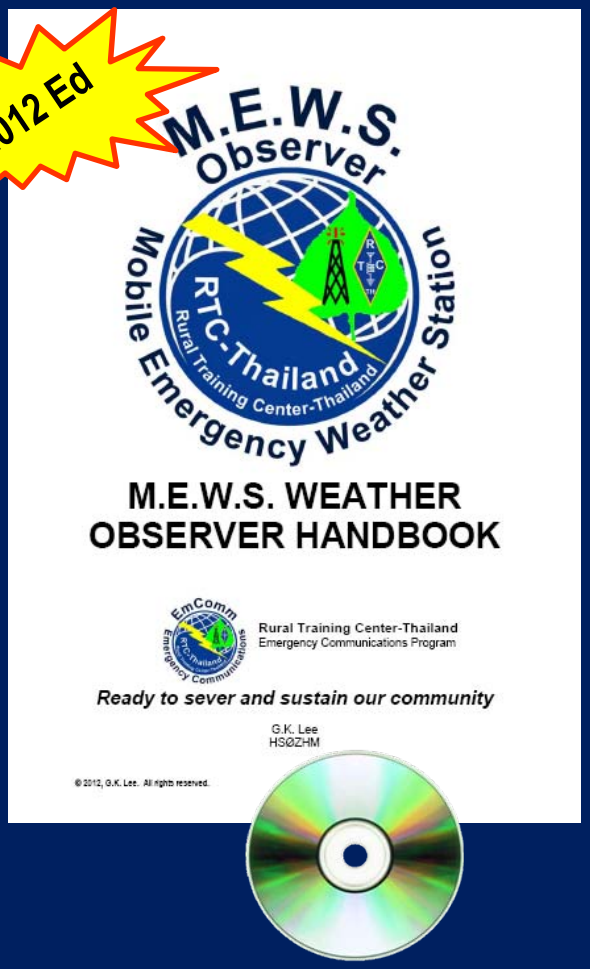
© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Free Self-Study Materials by Internet

- RTC-TH Weather Observer manual
- Illustrated PDF topical lessons

All of the lessons have been classroom and field proven.

Send e-mail to hsØzhm@gmail.com to request free training materials for non-commercial use only.



These materials are in English. Volunteer assistance for Thai translation to is welcome and will be acknowledged and cited.

©2010, rev 2012. G. K. Lee
HSØZHM All rights reserved.

Advanced MEWS PDF Lessons

A 1: Measuring Relative Humidity and Heat Stress

A 2: Measuring Wind Speed and Wind Chill

A 3: Using Dew Point Temperature to Calculate Cloud Base Height

A 4: Measuring Rainfall

A 5: Reporting Severe Weather

A 6: Weather Forecasting

Be sure to check www.neighborhoodlink.com/RTC-TH_Tech/pages for the latest updated editions of MEWS lessons

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Advanced MEWS PDF Lessons

2012 Ed

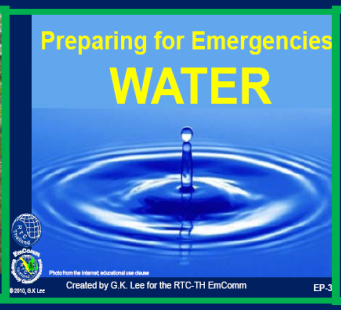
Six slide show lessons;
Some show how to build your own weather equipment

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

The EP Lesson Series

EP-1

EP-2



EP-3

EP-4

EP-5

EP-6

EP-7

EP-8

EP-9

EP-10

EP-11

EP-12

www.neighborhoodlink.com/RTC-TH_Tech/pages

© 2012, G.K Lee

For More Information about M.E.W.S.

Contact
Greg, HSØZHM
MEWS Creator / Mentor

Via E-mail
hsØzhm@gmail.com

Via Skype video
conference call: rtc_th

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.

Community-based Environmental Education for

Self-Sufficiency and Sustainability for Small Rural Family Farms

RTC-Thailand

Rural Training Center-Thailand

The End

www.neighborhoodlink.com/org/rtcth

E-mail: rtc2k5@gmail.com

M.E.W.S. Mobile Emergency Weather Station

EmComm Emergency Communications

© 2010, rev 2012,
G. K. Lee HS0ZHM
All Rights Reserved.