Rural Training Center – Thailand (RTC-TH)

FOCUS

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

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Basic MEWS Weather Observing Lesson B8: Severe Weather Conditions

2012 Ed

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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

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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.

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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

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MEWS adapts weather lessons from two existing RTC-TH programs

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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.

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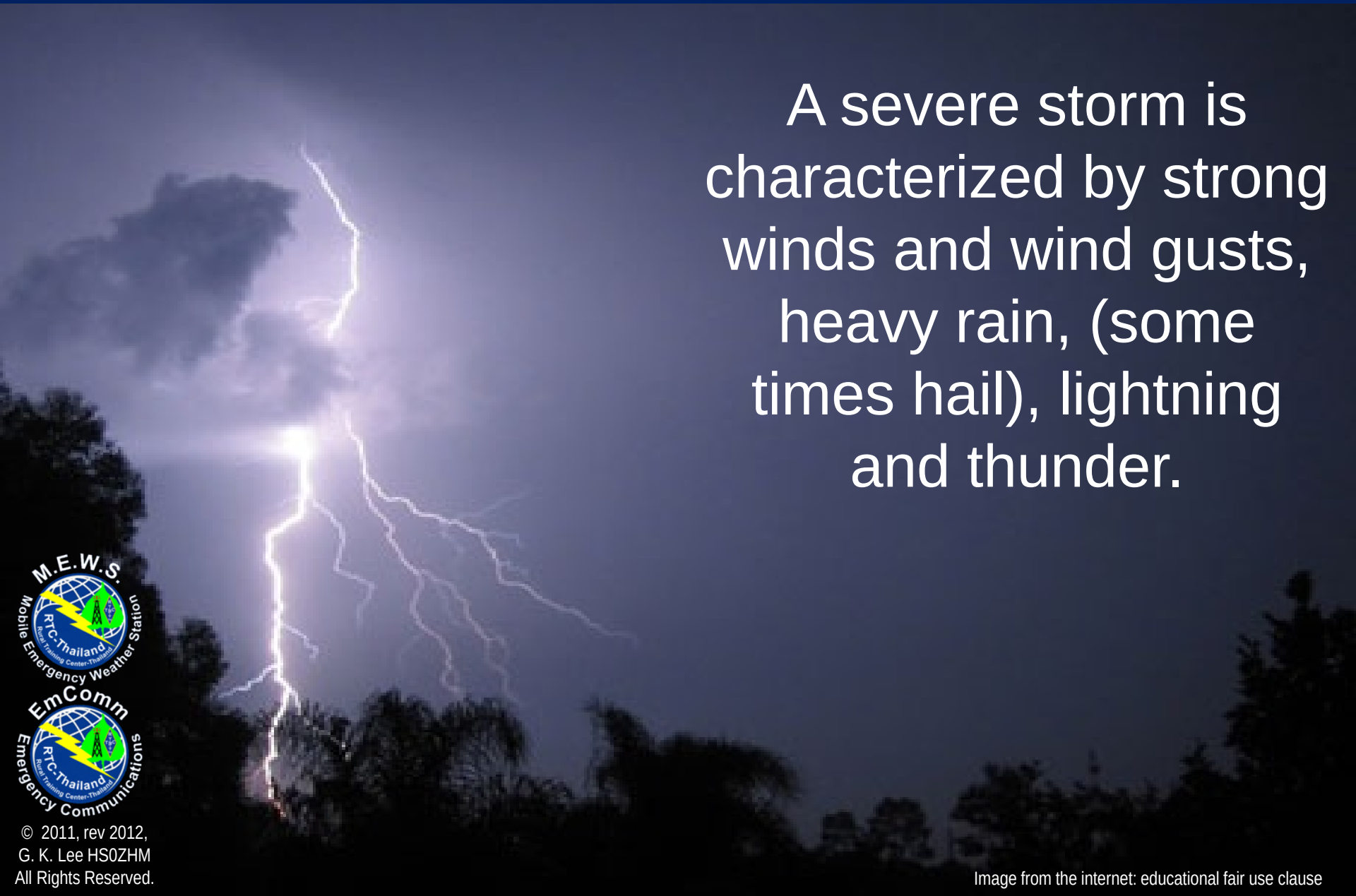
What is a Severe Storm?



A severe storm is characterized by strong winds and wind gusts, heavy rain, (some times hail), lightning and thunder.

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Important Note

Issue Flight Advisory Immediately at the first sign of a severe storm (e.g. dark cumulonimbus clouds, high winds, heavy rain, lightning).

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When do they 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		

Tropical Cyclones associated with the SW monsoon season.

Convective thunderstorms associated with the summer season.

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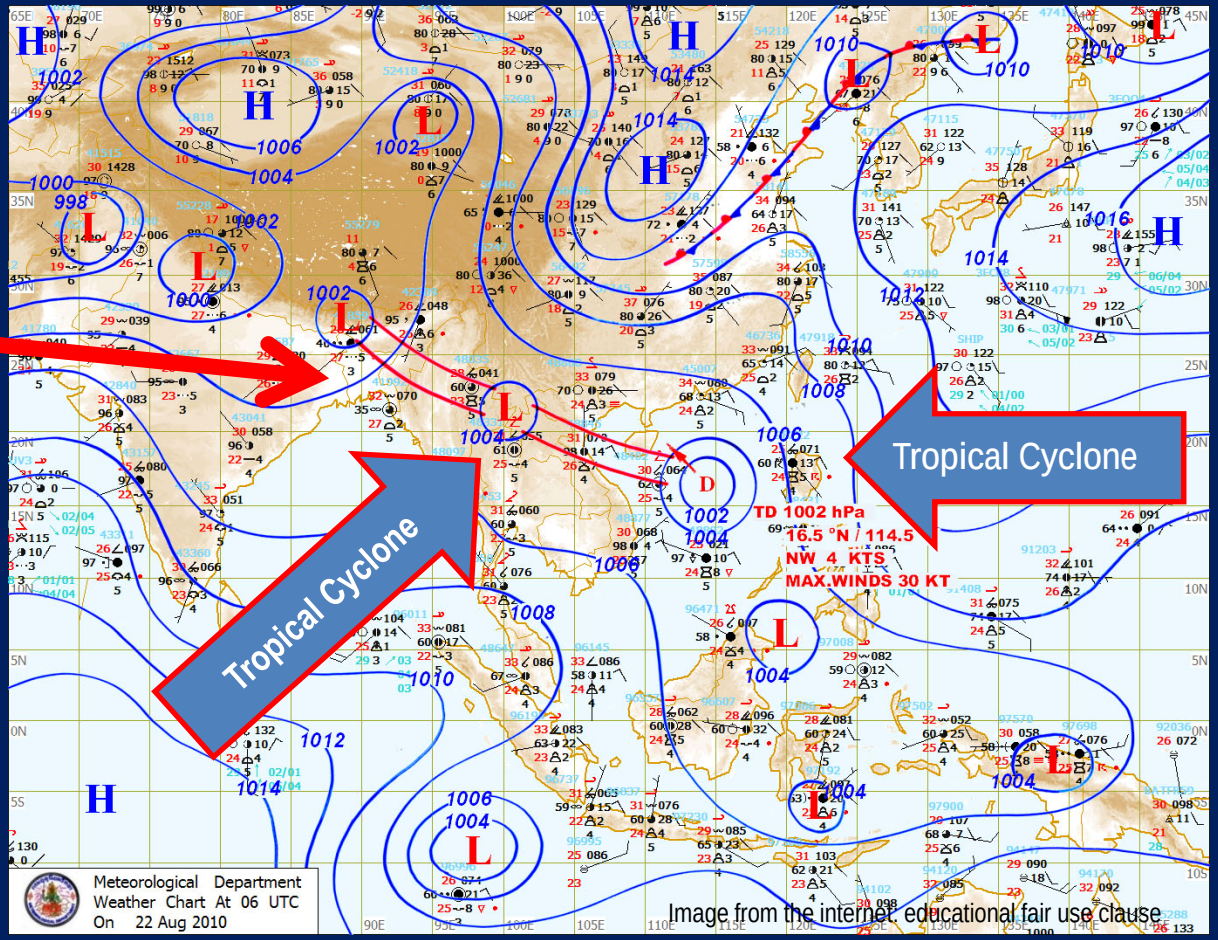
SW Monsoon & Northern Thailand

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

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



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

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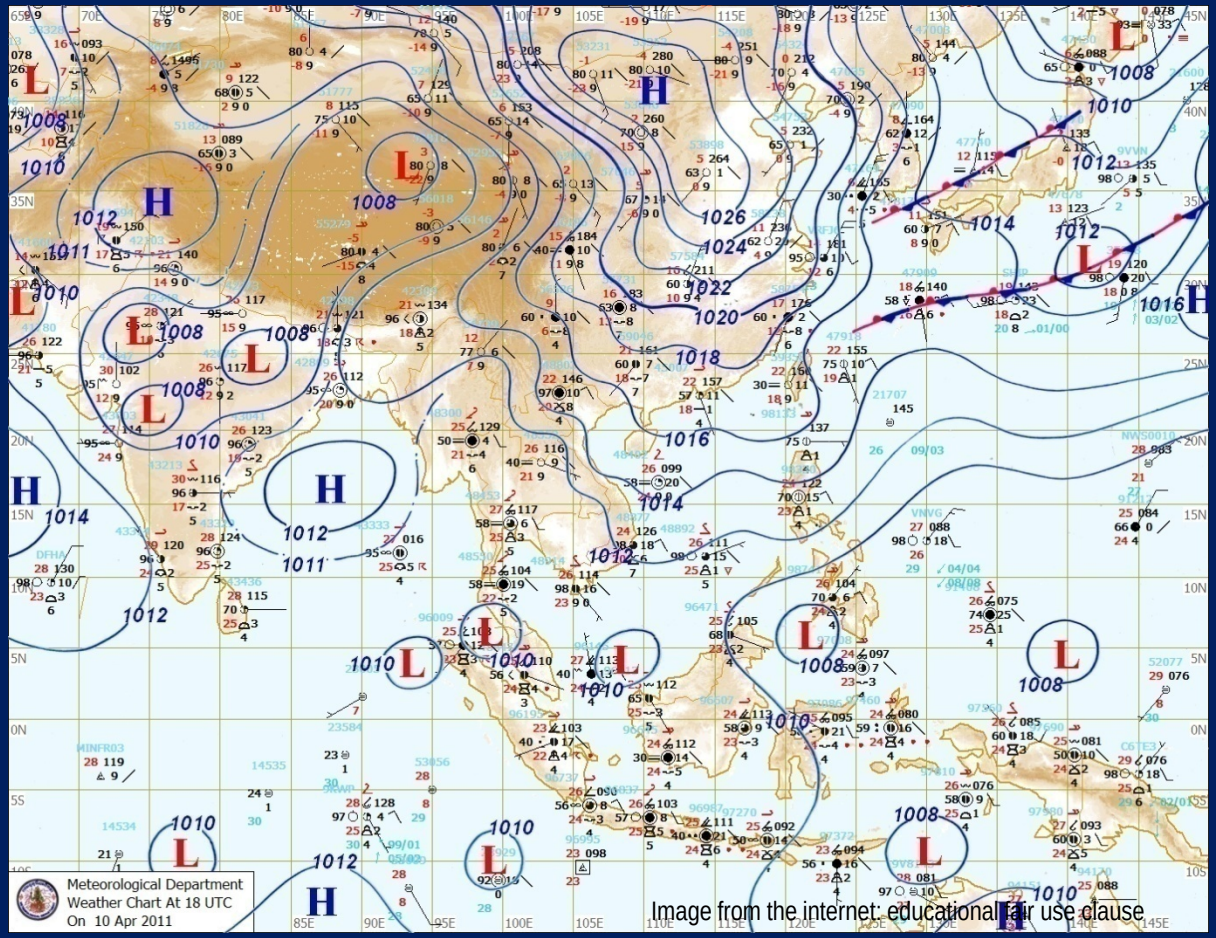
Summer in Northern Thailand

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



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

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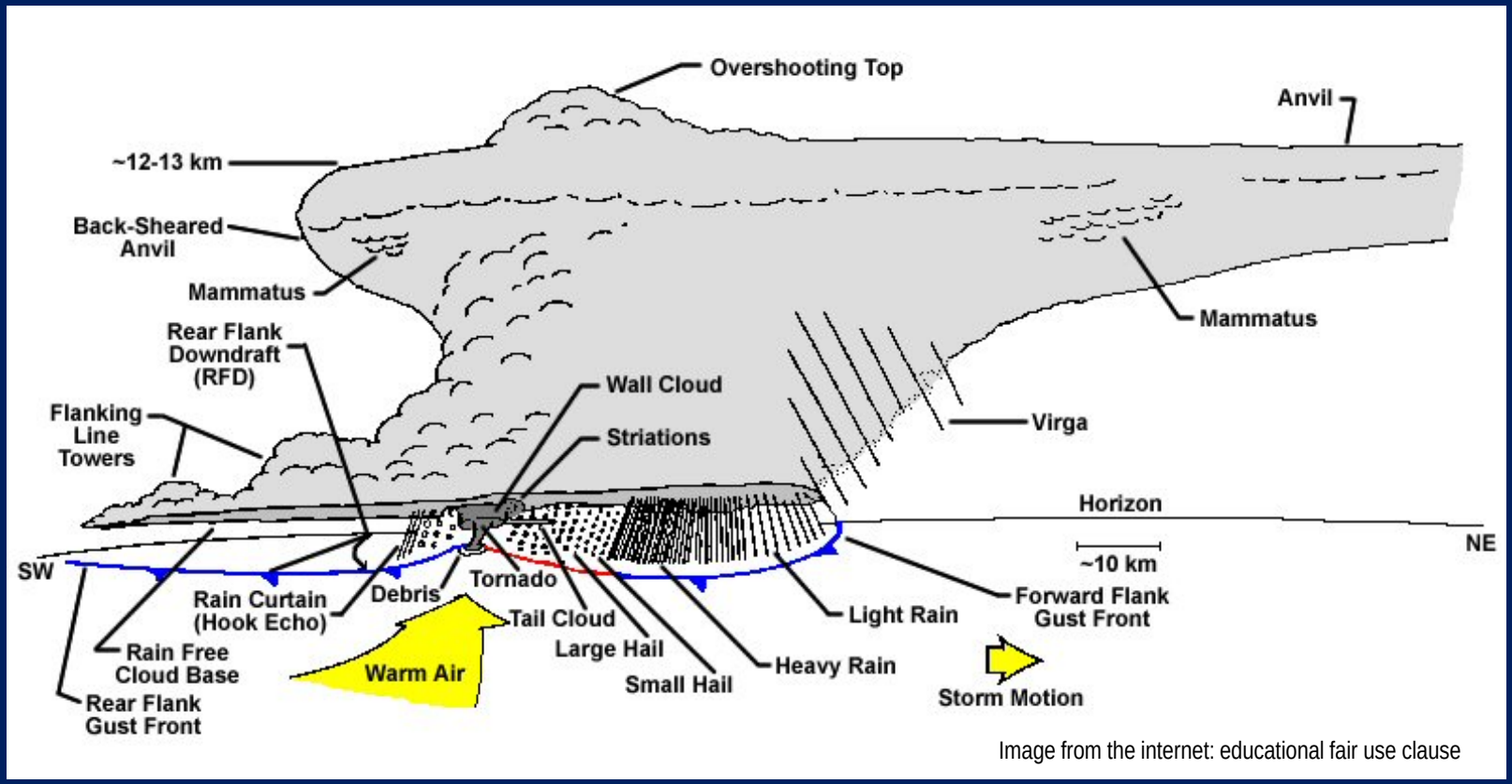
Summer Thunderstorms

can bring heavy rain, lightning, thunder, and sometimes hail.



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The rains can be brief but very intense producing flash floods and landslides.

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Severe Weather Hazards

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

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

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

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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	May exceed safe flight limits	Damage to mast / antenna systems
Heavy Rain	Reduced visibility; LZ flooded	Station flooding; water damage
Low Cloud Base	May exceed safe flight limits	-Not Applicable-
Lightning	Electrical damage	Operator danger; electrical damage
Hail	Aircraft damage	Station and mast / antenna damage

MEWS observers should use local knowledge and judgment to immediately report severe storm conditions to crews and authorities needed for safe flight operations.

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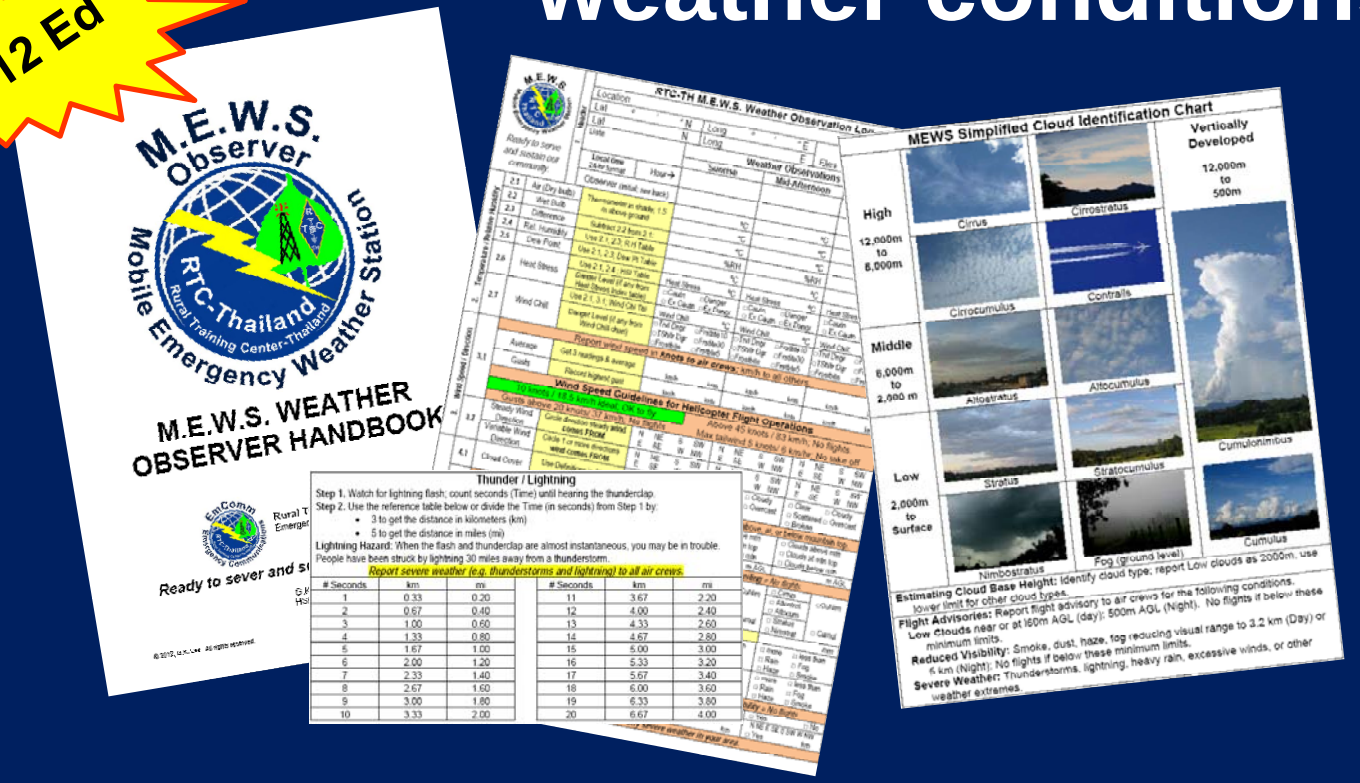
What you need to have to report severe weather conditions

2012 Ed

Pencil



MEWS Handbook, Log form, Flash-boom reference card

Cloud Identification Chart

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

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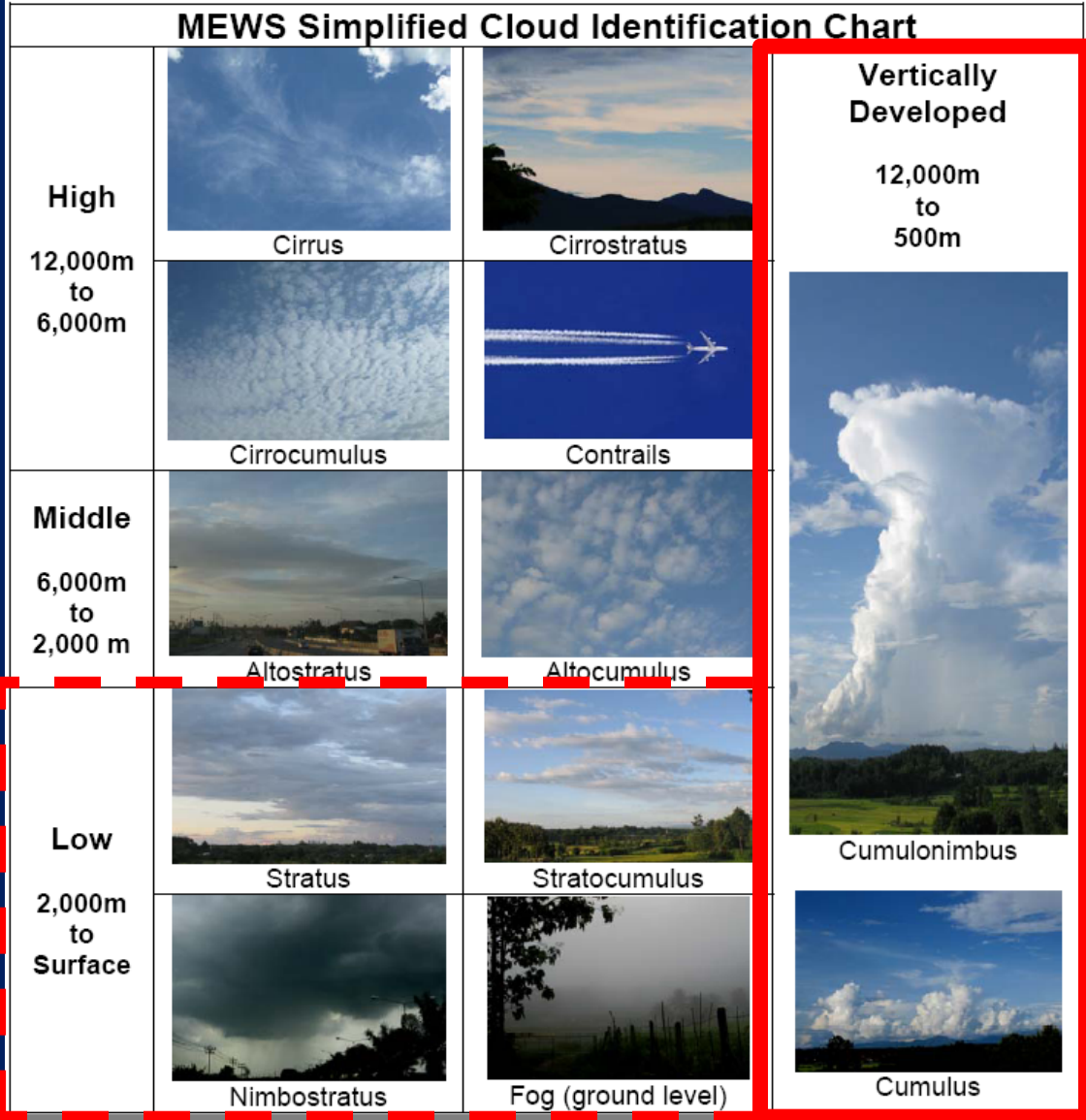
The main concern are clouds affecting helicopter flight operations (low and thunderstorm clouds)

Severe weather is often associated with Cumulonimbus cloud formations.



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Severe Weather Hazards

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

See the VFR flight minimums listed on the MEWS Log form

Severe Weather	Flight Ops	EmComm Ops
Strong / Gusting Winds; Turbulence	May exceed safe flight limits	Damage to mast / antenna systems
Heavy Rain	Reduced visibility; LZ flooded	Station flooding; water damage
Low Cloud Base	May exceed safe flight limits	-Not Applicable-
Lightning	Electrical damage	Operator danger; electrical damage
Hail	Aircraft damage	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.

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Severe Storm Hazards

- Strong winds
- Heavy rains
  - Flooding
  - Landslides
- Lightning
- Hail

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Strong Wind Hazards

- Dust and Debris
- Falling Trees & Branches
- Fallen Power lines
- Falling Towers & Poles
- Unsafe to Drive
- Difficult to walk
- Destroys temporary shelters
- Hypothermia

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Strong Wind Hazards

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This means 50 knots or more; 93 km/h or 58 mph or more.

This is dangerous for flight crews and operations.

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	02-114	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.

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Strong Wind Hazards

High winds can damage towers and power lines

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

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Strong winds can be bad for antennas

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.

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Beaufort Wind Table for Land Effects

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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 helicopte					r 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 op					rations
Dust and paper fly; small branches move; Flag flaps		Mild Breeze	13-18	21-29	11-16	4	0.8145 (3.977)
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Lack of Power for Radio Operators

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

Photo courtesy of E20NXT

…and portable antenna systems

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Radio Operators Advisory

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

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

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Radio Operators Advisory

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

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

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Strong can winds damage aircraft

Strong Winds

Flying is very dangerous in stormy weather.
These planes were damaged on the ground.

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Strong winds affect flight operations

Strong Winds

It is important to report wind conditions that affect flight operations:

- 5 knts tail winds (relative to take-off direction)
- 20 knts gusts at the LZ
- 45 knts at the LZ

Be prepared to advise air crews when gusts at the LZ also approach limits for take-off.

Beaufort Wind Table for Land Effects

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Blowing dust/debris is dangerous for helicopters.

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Be aware of the soil and surface conditions at potential helicopter landing zones in order to minimize dust hazards.

Wind Velocity and Dust Particle Size	
A wind speed of 3.5-4 m/s (1.26-14 km/h) or (6.8-7.7 knots) is the critical wind speed to suspend soil particles in the air.	Particle / Diameter
	Clay (less than 0.0002 mm)
	Silt (0.02-0.0002 mm)
	Very Fine sand (0.05-1 mm)

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Wind-blown dust reduces visibility

Blowing dust can reduce visibility to less than 11 km / 7 miles.

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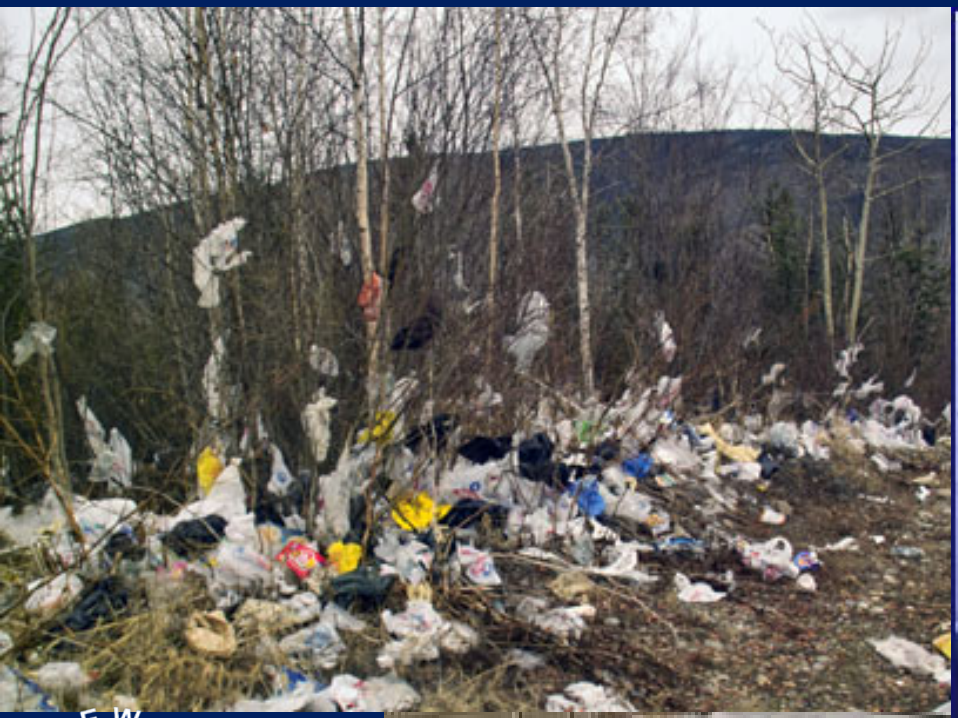
Wind blown debris

…is dangerous to people and helicopters.



Flying debris can damage the engines or aircraft

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Landing zones must be kept clear of all trash.

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Strong winds can make debris fly

Strong Winds

Use the Beaufort table to get an idea of the wind speeds which can make various kinds of debris fly. This will give you an idea of the kinds of debris hazards are associated with different wind speeds.

When picking possible “safe” operating positions, consider potential debris from nearby structures at various wind speeds.

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Wind chill is a problem for survivors

Strong Winds

Wet clothing and strong winds can cause hypothermia

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Severe storms combine heavy rain, strong wind, loss of shelter subjecting survivors to cold wet conditions.

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

EmComm Emergency Communications
RTC-Thailand Rural Training Center-Thailand

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Heavy Rain Hazards

- Unsafe to Drive
- Flooding & Flash flooding
- Blocked or damaged roads
- Dams may fail
- Landslides
- Damaged bridges
- Destroys temporary shelters
- Hypothermia

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Heavy rains create driving hazards

Driving in rain and on wet roads is dangerous.

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Flooding Hazards

General floods and flash floods are common in Nan during the rainy season (May to October).

Flash floods can occur in mountain areas with thunderstorms in the hot/dry season.

Floods are a major cause of emergencies in Nan. Learn more about Floods in Lesson EP-7.

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Heavy rains can disrupt transportation

Floods can damage or destroy bridges.

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This makes it hard for people to evacuate and for relief supplies to reach them.

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Heavy rains can flood roads

Flooded roads block evacuation routes and relief supplies

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Heavy rains can destroy roads

Flooded roads block evacuation routes and relief supplies

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Heavy rains destroy basic needs

Floods destroy clean water, food supplies, and shelter

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Almost immediately there is a shortage of medical services, clean drinking water and sanitation systems. Then in a matter of hours, food, shelter, safety and energy (esp. fuel for cooking) become major concerns.

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Floods destroy basic needs

Floods destroy clean water, food supplies, and shelter

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In many disaster relief operations, the rush to give aid resulted in waste and inefficiency. The aid did not meet the needs of the survivors. Lack of communication was a problem.

Ham radio can help get the messages through.

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Heavy rains make floods contaminate water

Floods increase disease and infections

People are forced into contact with water contaminated with a mixture of human and animal wastes and many different types of bacteria and viruses

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Heavy rains obscure vision

Most helicopters operate VFR (Visual Flight Rules).
They must see the ground to know where they are going.

View from the cockpit with overcast sky but no rain.

View from the cockpit with clouds and rain.

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Heavy rains can flood Landing Zones

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Flooded landing zones complicate operations

When scouting landing zones, check on access roads to, from, and around the LZ to assure supplies and people can have ready access. To be effective, the LZ needs to be fit for operations and not be vulnerable.

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Landslide Hazards

Landslides are common in Nan during the warm/wet season (May-Oct).

Landslides can occur in mountain areas with thunderstorms and flash floods in the hot/dry season.

Landslides are often part of emergencies in Nan. Learn more about Landslides in Lesson EP-8.

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Landslide Hazards

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Landslides can destroy shelters and supplies leaving survivors with little more than the clothes on their backs

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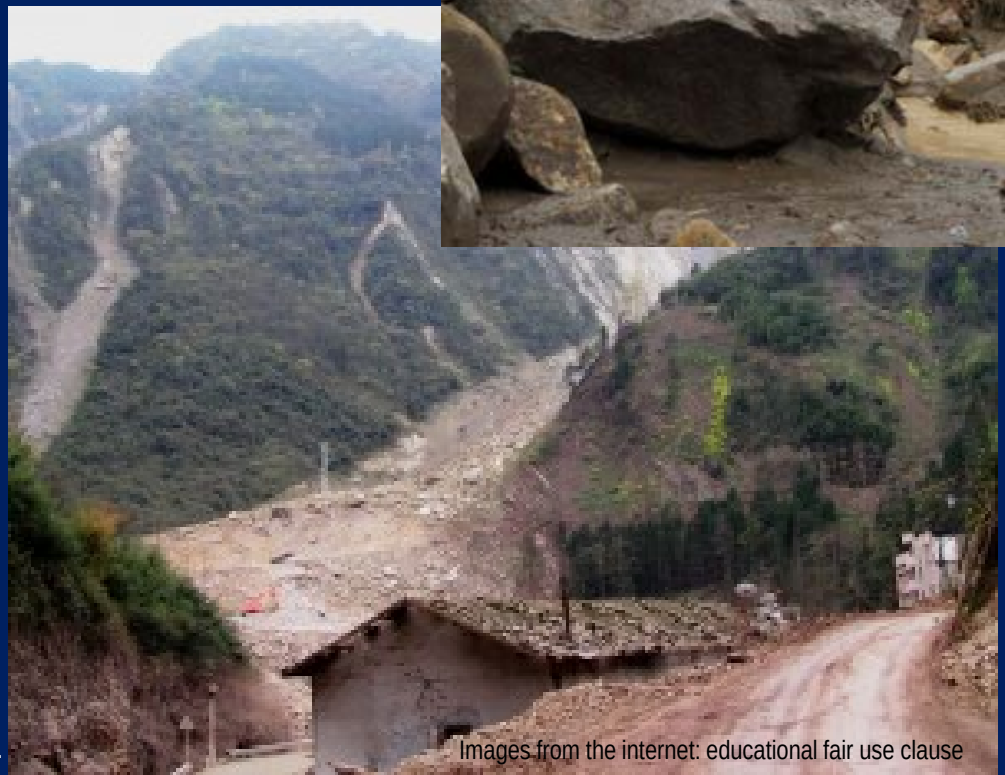
Landslide Hazards

Landslides destroy homes and buildings…



…leaving people without shelter

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Landslides block roads

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Landslides block roads by burying them as debris falls from above

The RTC-TH has rapid recon methods to assess potential landslide areas to anticipate which roads may be blocked by landslides.

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Landslides damage roads

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Landslides destroy by undercutting roads and collapsing them

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Avoid Landslide Areas

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Avoid locating safe areas, evacuation shelters, and landing zones where landslides can affect them

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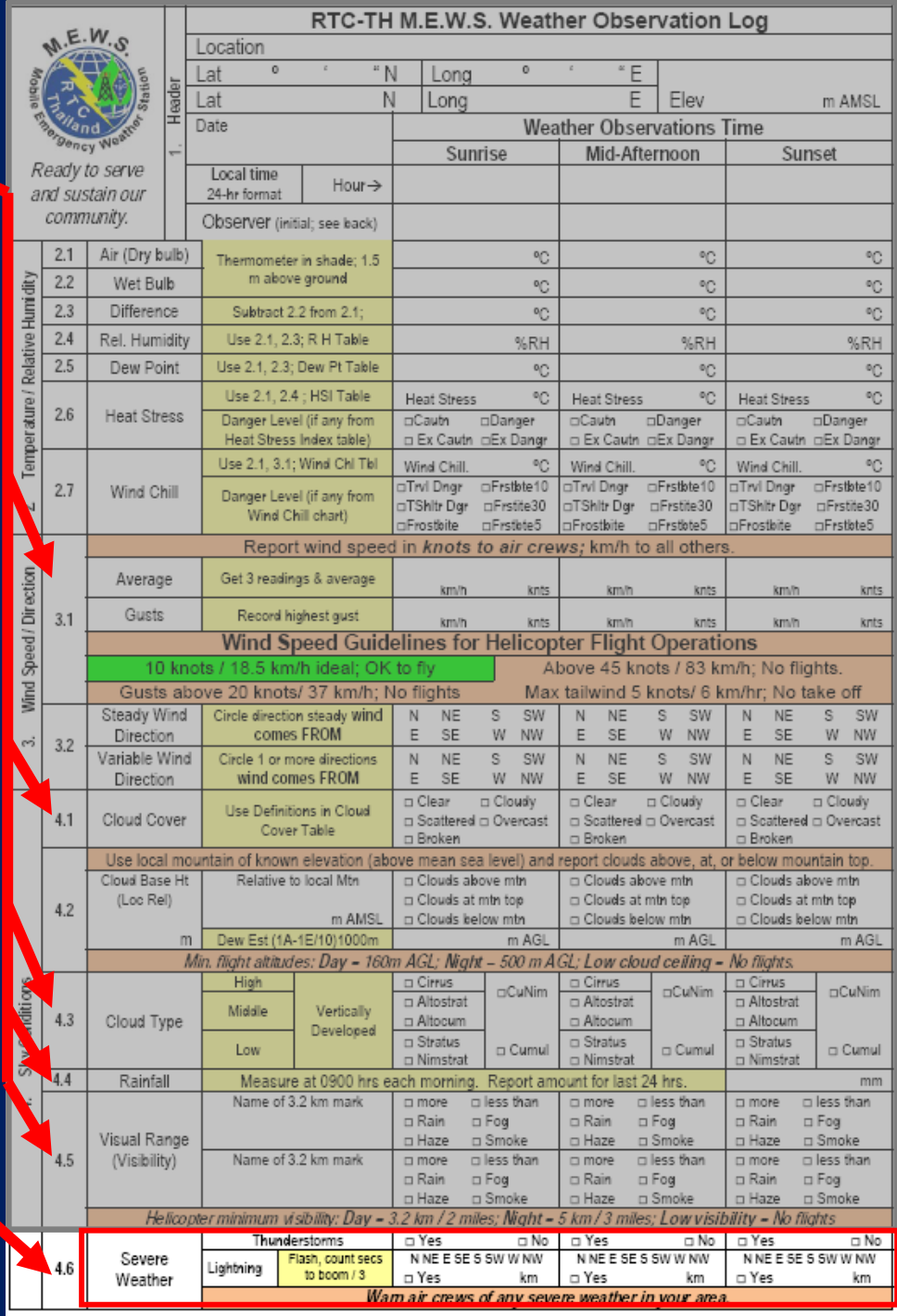
Severe storm conditions of wind conditions, cloud type, visibility and rain are reported in other parts of the MEWS form

Report Lightning hazards in Section 4.6

This section is specifically for Thunderstorms and Lightning.



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

Mobile Emergency Weather Station — RTC Thailand — Ready to serve and sustain our community.

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)

1. Header

2. Temperature / Relative Humidity

			Sunrise	Mid-Afternoon	Sunset
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 □Frstbite10 □TShltr Dgr □Frstite30 □Frostbite □Frstbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstite30 □Frostbite □Frstbite5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstite30 □Frostbite □Frstbite5

3. Wind Speed / Direction

Report wind speed in *knots to air crews;* km/h to all others.

			km/h	knts	km/h	knts	km/h	knts
3.1	Average	Get 3 readings & average						
	Gusts	Record highest gust						

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	Cloud Base Ht (Loc Rel)	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.			
		Relative to local Mtn	□ 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	m AMSL / Dew Est (1A-1E/10)1000m	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

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

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

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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 Lightning in Lesson EP-9.

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Lightning Hazards

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Lightning struck this helicopter's tail rotor. The crew was lucky and survived .

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.

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Lightning: Distance to Storm Estimation

You can use the “Flash to Boom” method to estimate thunderstorm distance to your station.

	1 one thousand… 2 one thousand… 3 one thousand…. BOOM	3 / 3 = 1 km
1. See the lightning “**Flash**”.	**2.** Count number of seconds until you the “**Boom**” of the thunder.	3. Divide the number of seconds by 3 = the estimated distance in km.

Also, make a note of the direction to the thunder / lightning.

Seek safety any time you see lightning.

Wait 30 min after hearing the last thunder before resuming work outdoors.

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Lightning: Distance to Storm Estimation

You can use the “Flash to Boom” method to estimate thunderstorm distance to your station.

Step 1. See the lightning “Flash”.

Step 2. Count number of seconds until you the “Boom” of the thunder.

Step 3. Divide the number of seconds by 3 to get the estimated distance in km.

Step 4. Note the direction the “Flash” came from.

Step 5. Record the distance and direction on the MEWS Log form.

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

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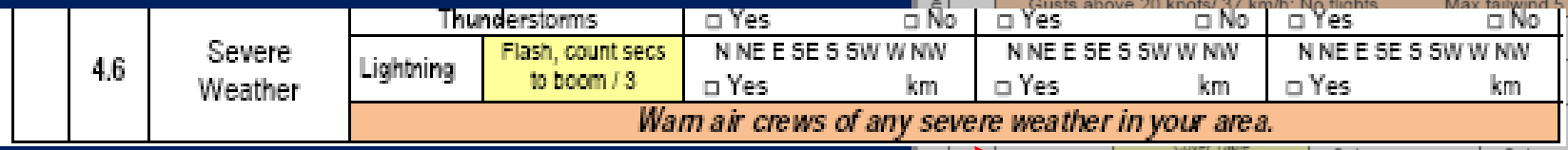
Record the flash / boom results

In Section 4.6 and circle the letter(s) for the direction of the storm relative to your location.



	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.					

If lightning present, check “Yes” and indicate distance and direction from your position.

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

Ready to serve and sustain our community.

1. Header

Location

Lat ° ' " N Long ° ' " E

Lat N Long E Elev m AMSL

Date

Local time 24-hr format Hour→

Observer (initial; see back)

			Sunrise	Mid-Afternoon	Sunset
			Weather Observations Time		
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 ☐Frstbite10 ☐TShltr Dgr ☐Frstbite30 ☐Frostbite ☐Frstbite5	☐Trvl Dngr ☐Frstbite10 ☐TShltr Dgr ☐Frstbite30 ☐Frostbite ☐Frstbite5	☐Trvl Dngr ☐Frstbite10 ☐TShltr Dgr ☐Frstbite30 ☐Frostbite ☐Frstbite5

2. Temperature / Relative Humidity

3. 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

4. Sky Conditions

			☐ Broken	☐ Broken	
4.2	Cloud Base Ht (Abv Rel)	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top.			
		Relative to local Mtn	☐ 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	m AMSL / Dew Est (1A-1E/10)1000m	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.			

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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.

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Lightning Hazard for Radio Operators

A lightning strike can be lethal to radio operators and radios.

- Properly ground all your equipment.
- Use lightning arrestors at the base of all mast / antenna systems
- **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.

Learn more about Lightning in Lesson EP-9.

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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.

Issue a Flight Advisory Immediately at the first sign of a severe storm (high winds, heavy rain, lightning, dark cumulonimbus clouds)

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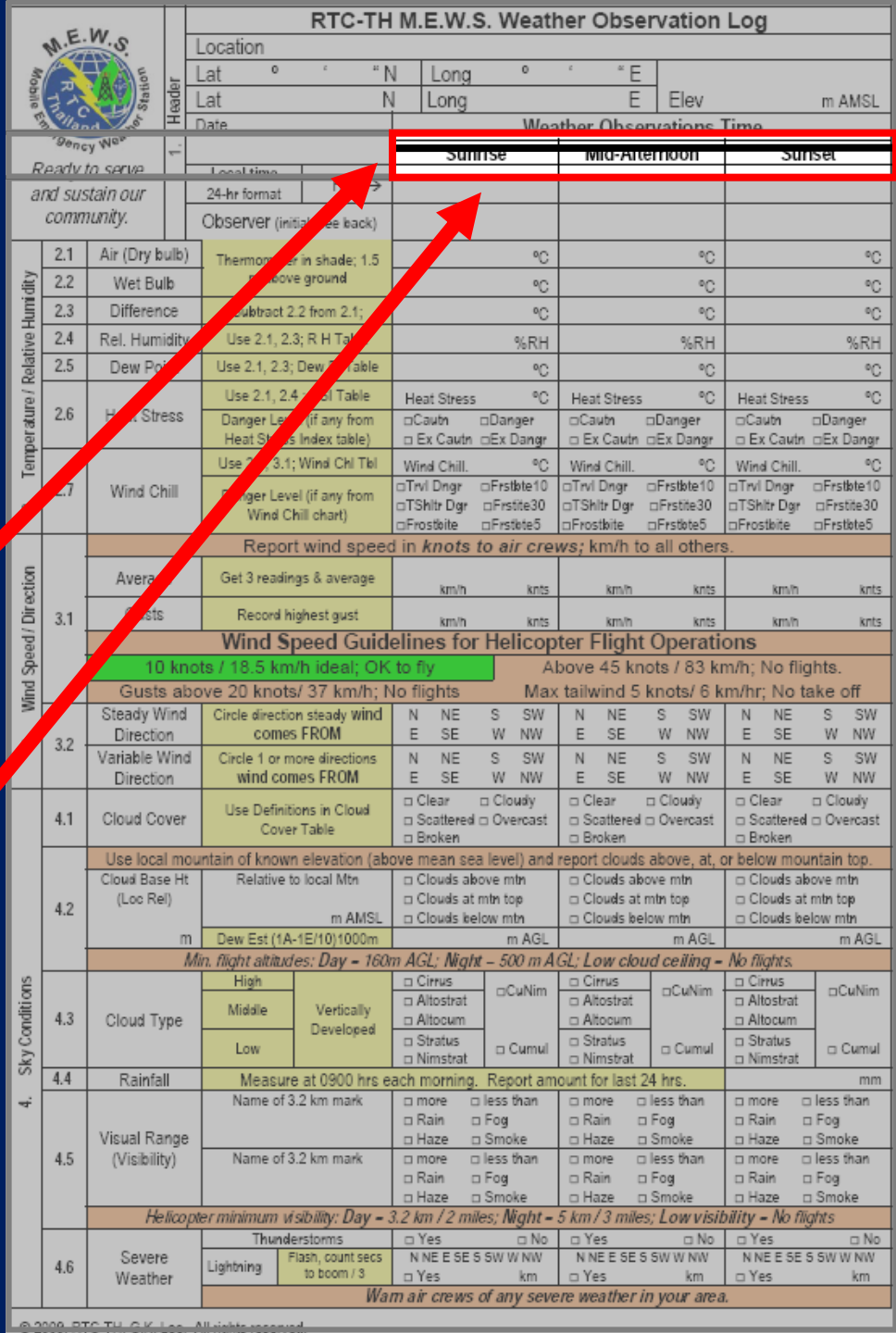
If more frequent observations are done to support flight operations...

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



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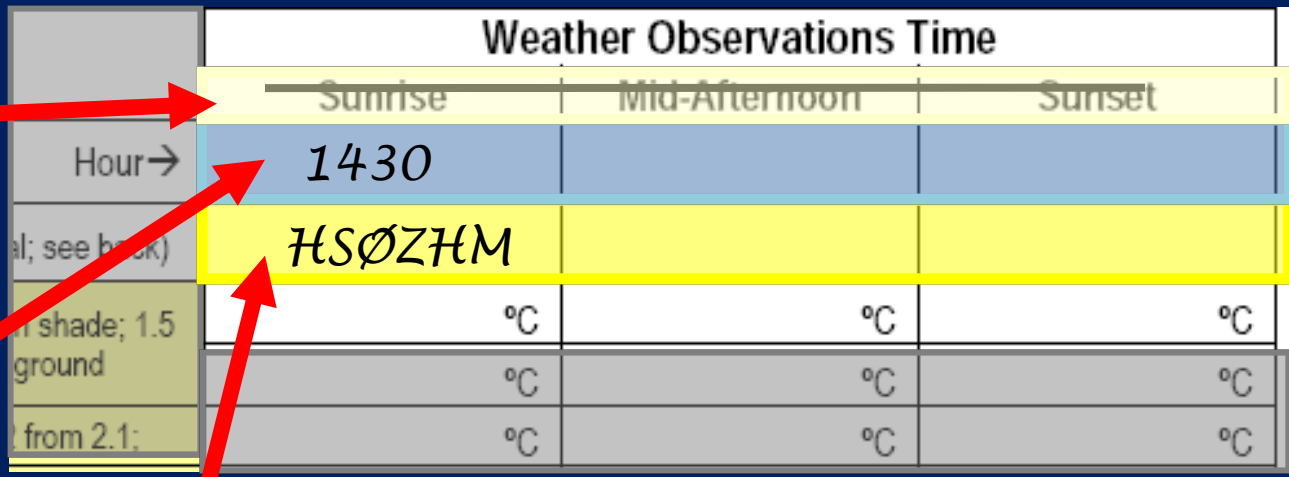
For flight operations, make and report observations to flight crews before landings and take-offs

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

Record the specific local time of your observations



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

Record thunderstorm and lightning in Section 4.6

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

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What is hail?

Hail is a ball of ice falling from a cloud. Hail has fallen in Thailand!

1989 Chiang Mai

2002 Hail fell on the towns of Mae Kaotom, Chiang Rai, Chiang San, Pan, Mae Jan, and Wieng Chai

2006 Hail fell on a Thai village on the Cambodian border

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Cumulonimbus (Thunderstorms) can produce hail.
Hail stones can be larger in wet tropical storms.

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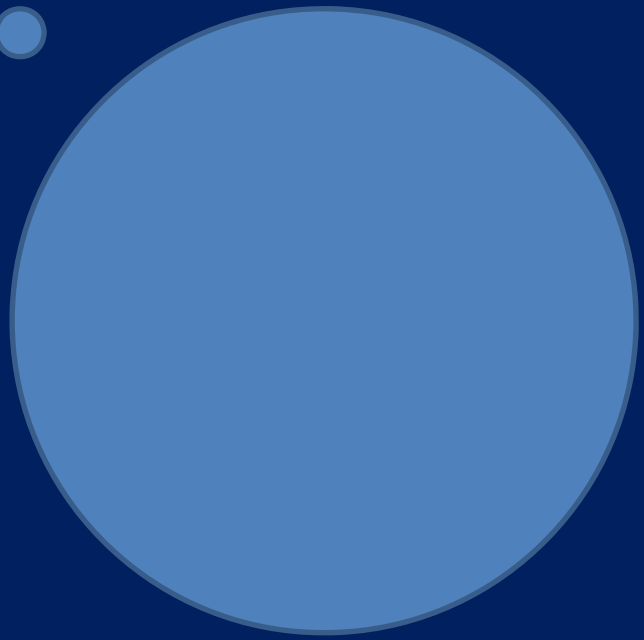
How big is it?

Hail can range in size from 0.635 cm to 11.43 cm in diameter.

Relative sizes, not to scale.



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Hail can be very damaging

Hail can be falling about 90+ km/h!

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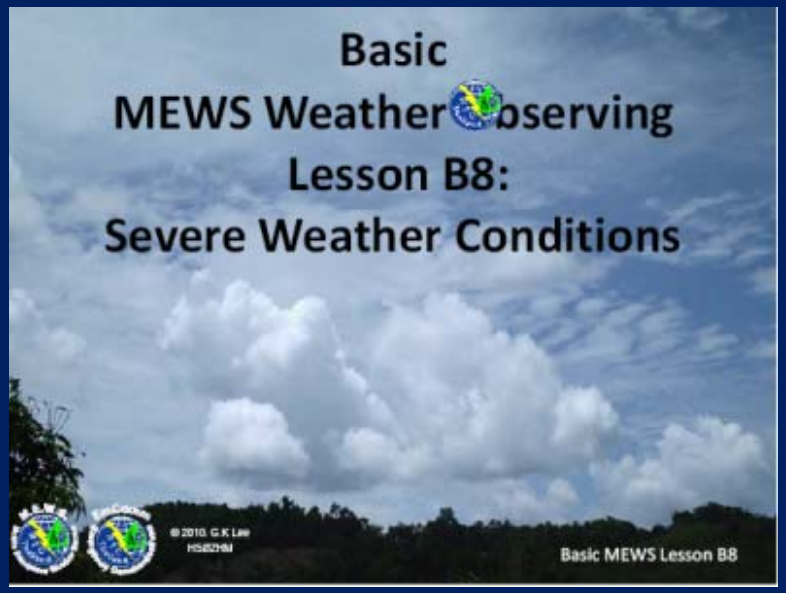
Now you know how to report severe weather conditions



Please continue your MEWS Training by going on the Advanced MEWS Lesson A-1 Measuring Relative Humidity and Heat Stress.

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Congratulations!
You have completed the Basic MEWS PDF Lessons

B 1: Measuring Temperature
B 2: Estimating wind speed
B 3: Measuring Wind Direction
B 4: Estimating Cloud Cover
B 5: Estimating Cloud Base Height
B 6: Identifying Cloud Types
B 7: Estimating Visual Range
B 8: Severe Weather Conditions

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

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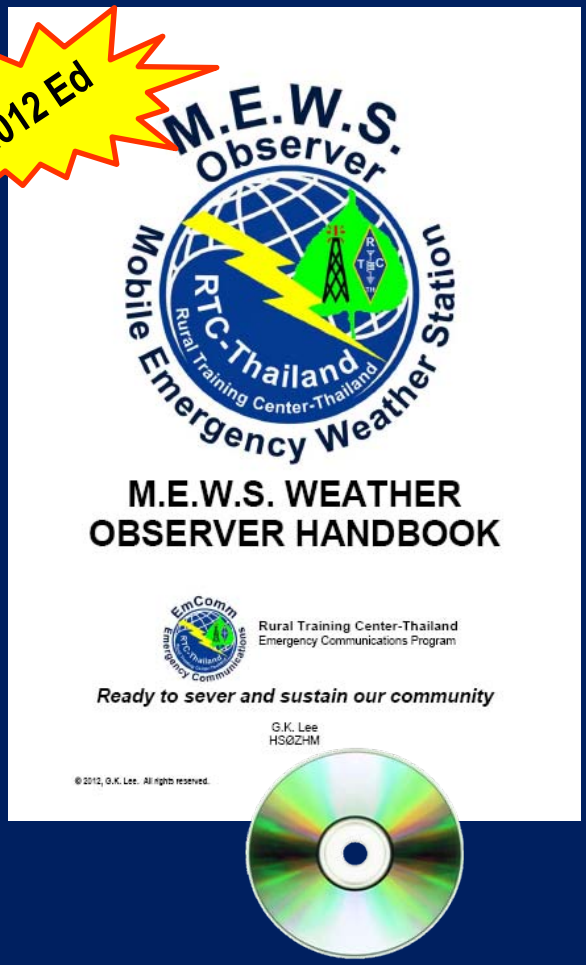
Free Self-Study Materials by Internet

- 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.



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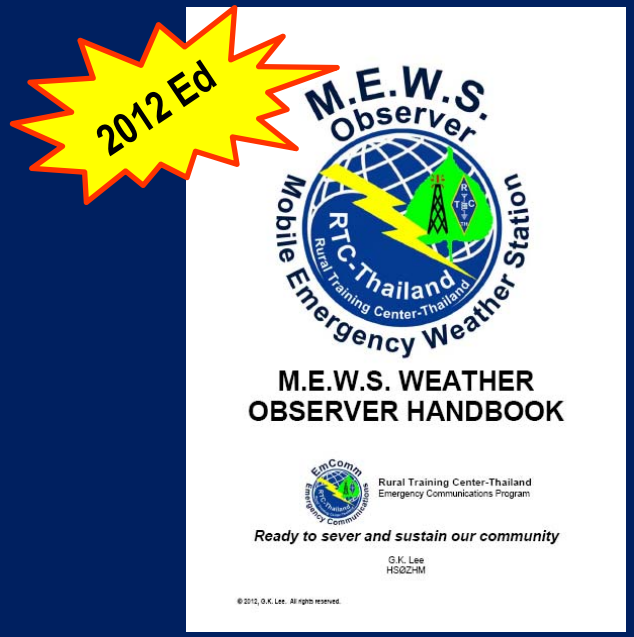
These materials are in English. Volunteer assistance for Thai translation to is welcome and will be acknowledged and cited.

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.

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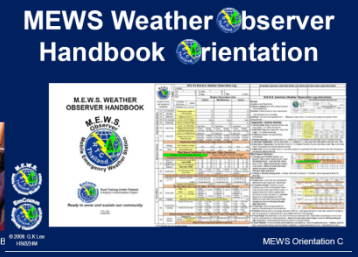
Basic MEWS PDF Lessons



2012 Ed

3 Orientation and 8 Basic lessons.
Some show how to build your own weather equipment.

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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

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Advanced MEWS PDF Lessons

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

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

Contact
Greg, HSØZHM
MEWS Creator / Mentor

Via E-mail / video chat
hsØzhm@gmail.com

Via Skype video
conference call: rtc_th

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Community-based Environmental Education for

The End

See the addendum to learn about Weather Forecasting using Cloud Observations

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Basic Weather Forecasting is Optional

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Weather forecasting is well beyond the scope of MEWS. However, advance notice of possible stormy weather in the local area can make a difference for the well-being of the survivors.

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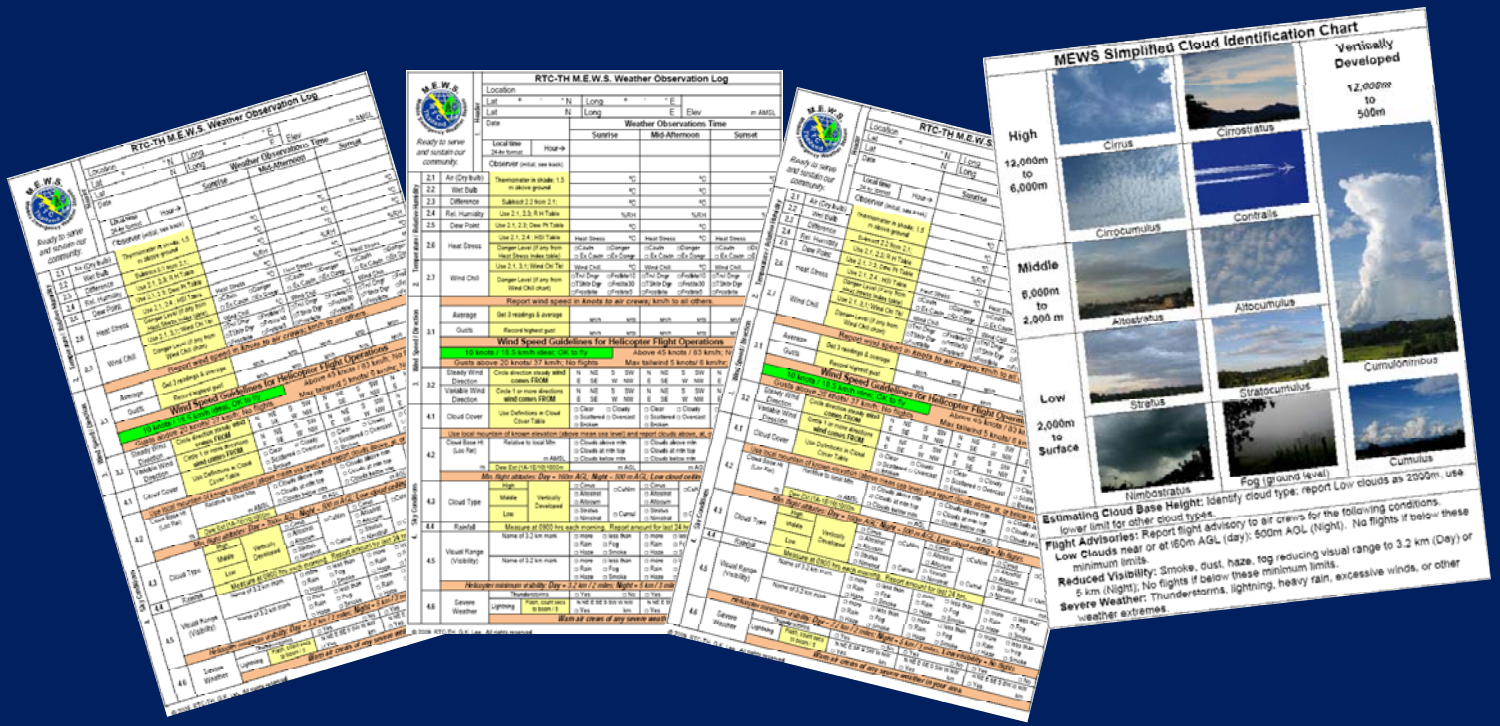
Basic Weather Forecasting by Cloud Observation

Weather forecasting is not always very precise. These simple methods do not replace the government weather service forecasts.



Looking at the Cloud Observations records for the past 2-3 days may allow you to predict some general weather conditions.

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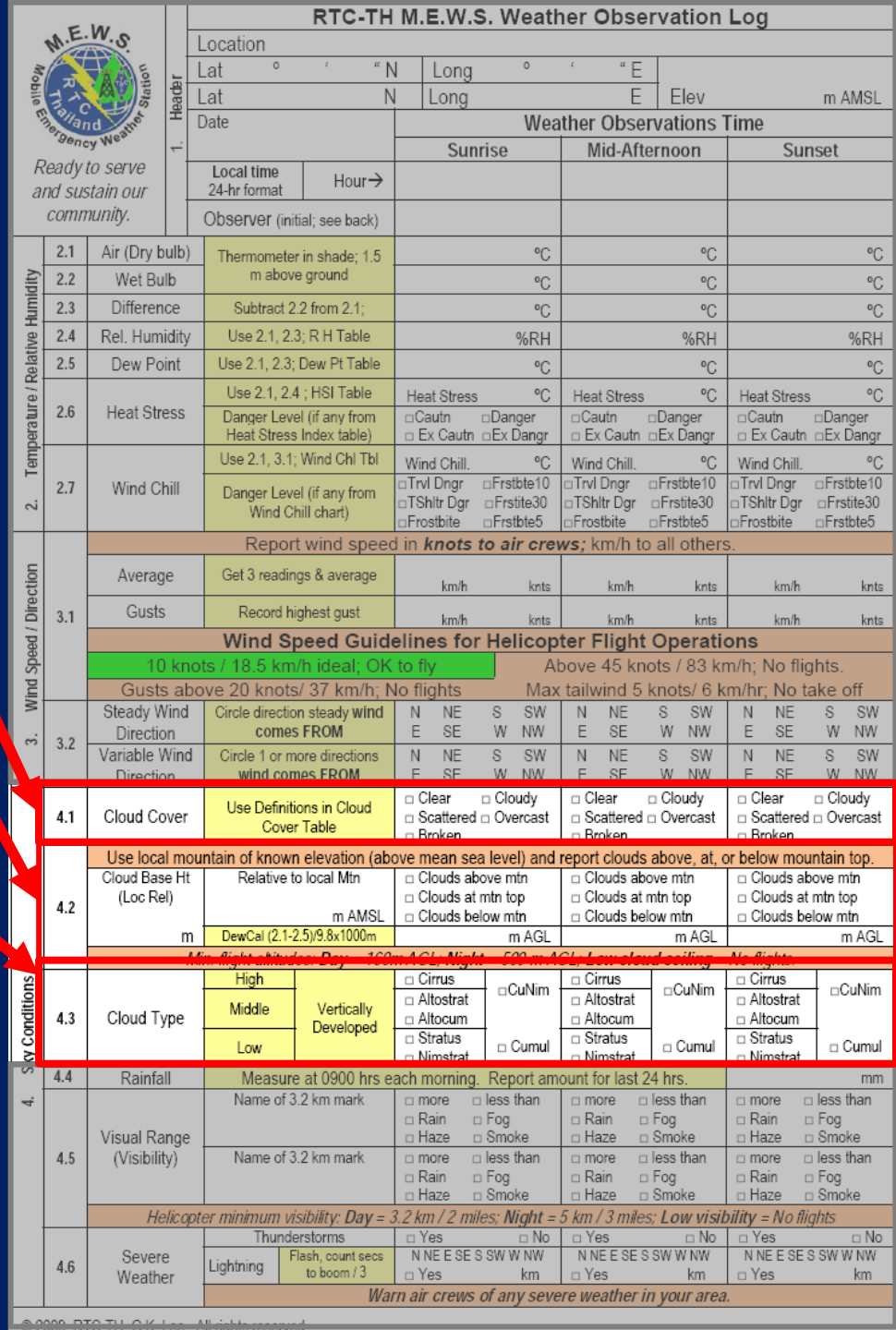
Start with completed log forms

It may be useful to get completed logs from the previous 3 days.

Look at the data on Cloud Cover (4.1), Cloud Base Height (4.2) and Cloud Type (4.3)

Watch for changes over time.

See Handbook: Appendix 2 Weather Forecasting, p. 32-35



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

M.E.W.S. Mobile Emergency Weather Station — RTC Thailand — Ready to serve and sustain our community.

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

			Sunrise	Mid-Afternoon	Sunset
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

Report wind speed in ***knots to air crews;*** km/h to all others.

			km/h	knts	km/h	knts	km/h	knts
3.1	Average	Get 3 readings & average						
	Gusts	Record highest gust						

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	□ 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	m AMSL / 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.

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

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Basic Weather Forecasting by Cloud Observation

Sometimes the changes in the amount of Cloud Cover can help you forecast weather changes in your area.

Cloud Feature	Clear / Fair	Changing	Stormy / Rainy
Cloud / Sky Cover	Decreasing cover ←		→ Increasing cover

MEWS is not intended for weather forecasting, but it can be helpful to survivors and on-site relief officials to get a warning of possible bad weather approaching.

See Handbook: Appendix 2.
pp. 32-34 (Forecasting with clouds)
pp. 34-35 (Advanced Forecasting)

Basic weather forecasting using clouds is discussed further at the end of MEWS Basic Lesson 8: Severe Weather.
Weather Forecasting is Advanced MEWS Lesson A6

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Weather Forecasting by Cloud Changes

Watching the changes in clouds is fundamental to weather forecasting

Cloud Feature	Clear / Fair Weather	Changing Weather	Stormy / Rainy Weather
Cloud Type	Cumulus	Cirrus Cirrostratus Cirrocumulus	Altocumulus Altostratus Cumulonimbus Nimbostratus
Cloud (sky) cover	Decreasing cloudiness		Increasing cloudiness
Cloud Base Height	Increasing height		Decreasing height

Get the Cloud Type data from log form Section 4.3

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Clouds Foretelling Weather Change

Cirrus clouds

Altostratus clouds

Stratus Clouds

Cloud Type	Changing Weather
Cirrus	Storm clouds coming in 24-48 hours
Altostratus	Changing weather is approaching
Stratus	Bad weather is approaching

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Weather Forecasting by Cloud Observation

If the change is from Cumulus to Cirrus type clouds, there may be a change in 24-48 hours to possible stormy or rainy weather.

Cumulus

Cirrus clouds

Cirrostratus

Cirrocumulus

Cloud Feature	Clear / Fair Weather	Changing Weather
4.1 Cloud cover	Decreasing cloudiness	Increasing cloudiness
4.2 Cloud Base Ht	Increasing height	Decreasing height
4.3 Cloud Type	Cumulus	Cirrus Cirrostratus Cirrocumulus

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Weather Forecasting by Cloud Changes

If rain clouds are followed by Cirrus type clouds, fair / clear weather is 24-48 hours away.

Cirrus
Cirrostratus Cirrocumulus

Altocumulus

Altostratus

Cumulonimbus

Nimbostratus

Cloud Feature	Changing Weather	Stormy / Rainy Weather
4.1 Cloud cover	Decreasing cloudiness	Increasing cloudiness
4.2 Cloud Base Ht	Increasing height	Decreasing height
4.3 Cloud Type	Cirrus Cirrostratus Cirrocumulus	Altocumulus Altostratus Cumulonimbus Nimbostratus

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Clouds of Fair Weather

Cumulus clouds

Altocumulus clouds

Cloud Type	Fair Weather
Cumulus	When small and widely scattered
Altocumulus	Settled weather conditions

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Rainy Weather Clouds

Cumulonimbus

Cumulus

Nimbostratus

Stratocumulus

Stratus

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Cloud Type	Rainy Weather
Cumulonimbus	Rain, lightning, thunder, heavy rain, hail possible.
Cumulus	Rain possible especially on hot summer days and when clouds get thick and dark
Nimbostratus	Rainstorm likely when dark gray clouds are low and widely cover the sky; drizzly rain.
Stratocumulus	When wide spread possible drizzly rain.
Stratus	Drizzly rain when clouds stretched out widely in calm flat layers.

Darker clouds are thicker and block more sunlight. Thicker clouds mean more vertical development which could mean more turbulence, rain, lightning, thunder.

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Community-based Environmental Education for

The End

Please go to Advanced MEWS Lesson A1:
Measuring Relative Humidity and Heat Stress

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