Rural Training Center – Thailand (RTC-TH)

FOCUS

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

www.neighborhoodlink.com/org/rtcth

E-mail: hsØzhm@gmail.com

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Quick Start Basic MEWS Weather Observer Training

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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
Or visit www.neighborhoodlink.com/RTC-TH_Tech/pages

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MEWS is 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

E-mail: rtc2k5@gmail.com

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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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Quick Start Basic MEWS Training Overview

- MEWS Weather Observation Log (Basic Sections / Subsections)
- Basic MEWS observation practicum
- Review and Critique
- Commitment / Completion Certificate

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Meet the Trainer: Greg HSØZHM

I was inspired by the long ham tradition of EmComm and public service. I didn't have a lot of ham radio operating experience. So I created MEWS and offered it free to all hams in order to make a contribution to ham radio and EmComm.

- 12 years environmental consultant in private industry
- 29 years college / adult education
- Retired Geography Professor Emeritus
- Relatively new ham (since fall 2007, KI6GIG)
- Now living in a small rural northern Thai village (reciprocal Thai license HSØZHM since 2008)

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General Set Up for Weather Observations

These guidelines apply to setting up all weather sensors to make observations / measurements.

They are “ideals”. In the reality of an actual disaster, do the best you can for your circumstances.

When a disaster strikes, you may be the only source of weather data. The lives and well-being of survivors and the safety of emergency relief flight crews may depend on your weather reports.

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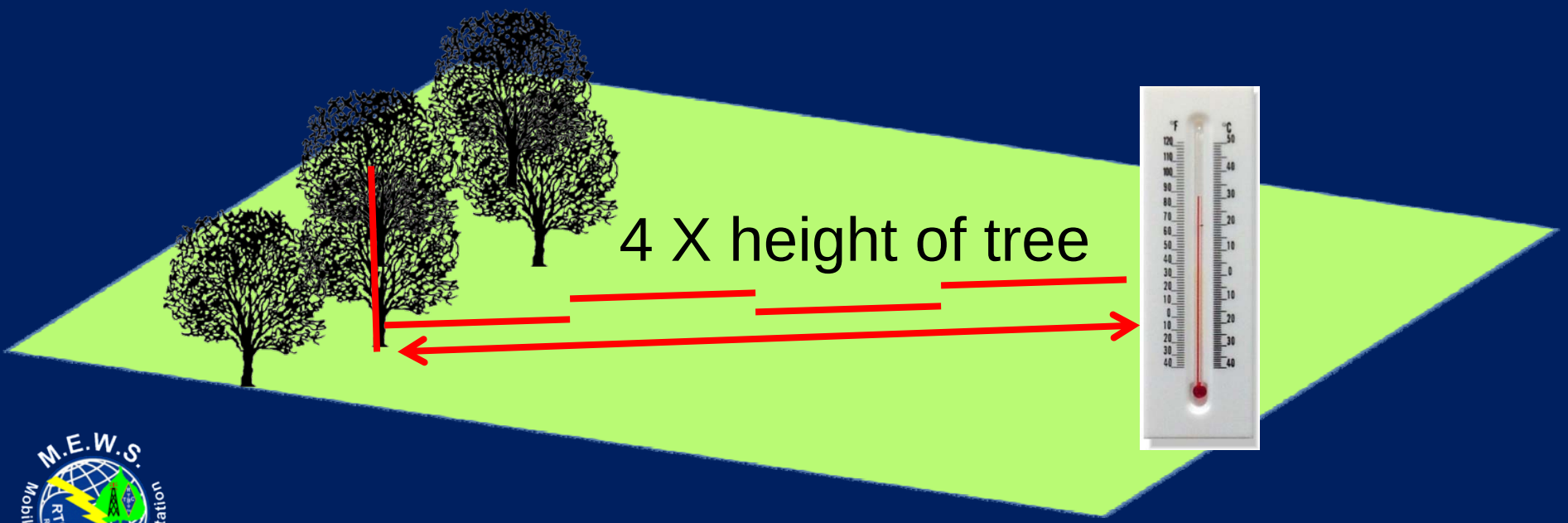
Find an open, level area.

Keep away from tall obstructions.

Stand off distance = 4X height of the obstacle.



See the Addendum after the Lesson B-1 to learn how to use a sight ruler to estimate the height of tall objects.

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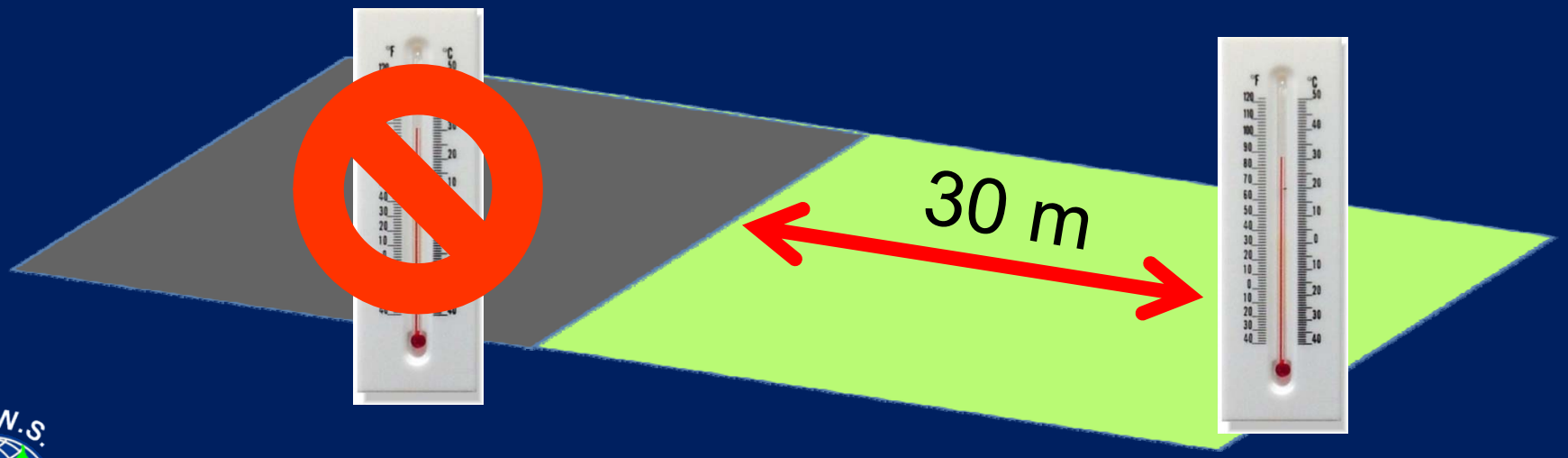
Avoid Large Paved Areas

Stay 30 m away from any large paved area



If you don’t have a long tape measure, see the Addendum after the Lesson B-1 to learn how you can estimate the distance by pacing.

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The Optimum Surface Type

Low grass or bare soil for ~ 9 m radius from the thermometer

If you don’t have a long tape measure, see the Addendum after the Lesson B-1 to learn how you can estimate the distance by pacing.

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The MEWS Weather Observation Log

This is your guide to making systematic weather observations and reports.

This sample form highlights the data blocks used for Basic MEWS Weather Observations and reports

See MEWS Lesson OC for a detailed orientation to the Weather Observation Log

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

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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			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 / 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 5 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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Notes on the form help you make observations with minimal training

2. Temperature / Relative Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5 m above ground	°C
	2.2	Wet Bulb		°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C
	2.6	Heat Stress	Use 2.1, 2.4 ; HSI Table	Heat Stress °C
			Danger Level (if any from Heat Stress Index table)	□Cautn □Danger □ Ex Cautn □Ex Dangr
	2.7	Wind Chill	Use 2.1, 3.1; Wind Chl Tbl	Wind Chill. °C
			Danger Level (if any from Wind Chill chart)	□Trvl Dngr □Frstbte10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5

2.1 Get air temp

The shaded areas are for Advanced MEWS measurements

Brief instructions are on the back of the Log form.

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The Back of the MEWS Weather Observation Log Form

has more notes to help observers in the field.

Full instructions and all needed reference tables are in the MEWS Weather Observer Handbook.

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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

1. Header	RTC-TH M.E.W.S. Weather Observation Log			
	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)			

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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. 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; RH 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 Chi 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

2.4 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. 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/ 8 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	

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. 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 Ref)	Relative to local Mtn m in AMSL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn m AGL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn m AGL	□ Clouds above mtn □ Clouds at mtn top □ Clouds below mtn m AGL
	m	DewCal (2.1-2.5)/9.8x1000m			
		Min flight altitudes: Day = 761m AGL; Night – 500 m AGL; Low cloud ceiling = No flights.			
4.3	Cloud Type	High / Middle / Low / Vertically Developed	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimbstrat □ Cumul □ CuNim	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimbstrat □ Cumul □ CuNim	□ Cirrus □ Altostrat □ Altocum □ Stratus □ Nimbstrat □ Cumul □ CuNim
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 all crews of any severe weather in your area.			

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.

Section 1.0 Header: Location Name

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1. Header

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

For this training session, use the data given by the local training host group.

See Handbook: Location pp. 4-7; Date / Time p. 8; Observer p. 8

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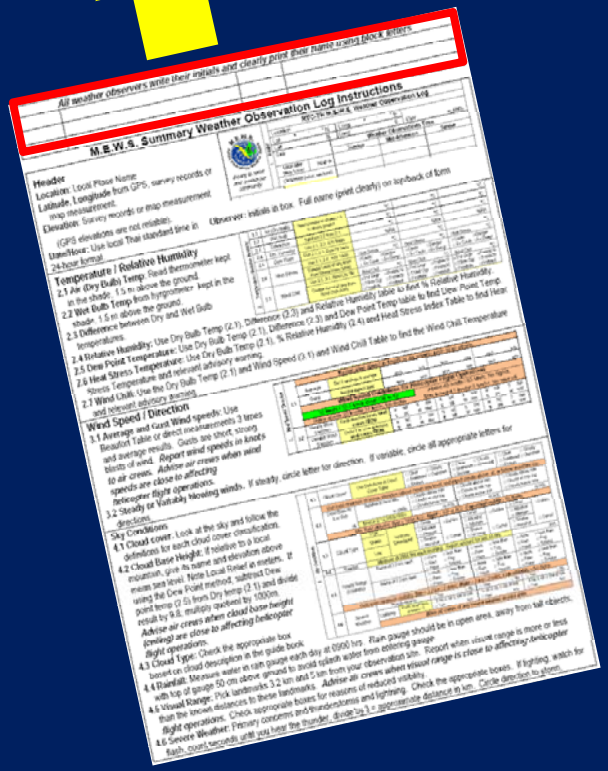
Additional space for observer ID is on the back of the form, top of the page

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

Observation time; observer ID



Print clearly. Observer ID is needed in case writing is not clear or when clarification is needed.

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Handbook Table of Contents

The Section / Subsection numbers match the data blocks on the Weather Observation Log Form

The colored boxes indicate the PDF slide show lesson types and the sequence number

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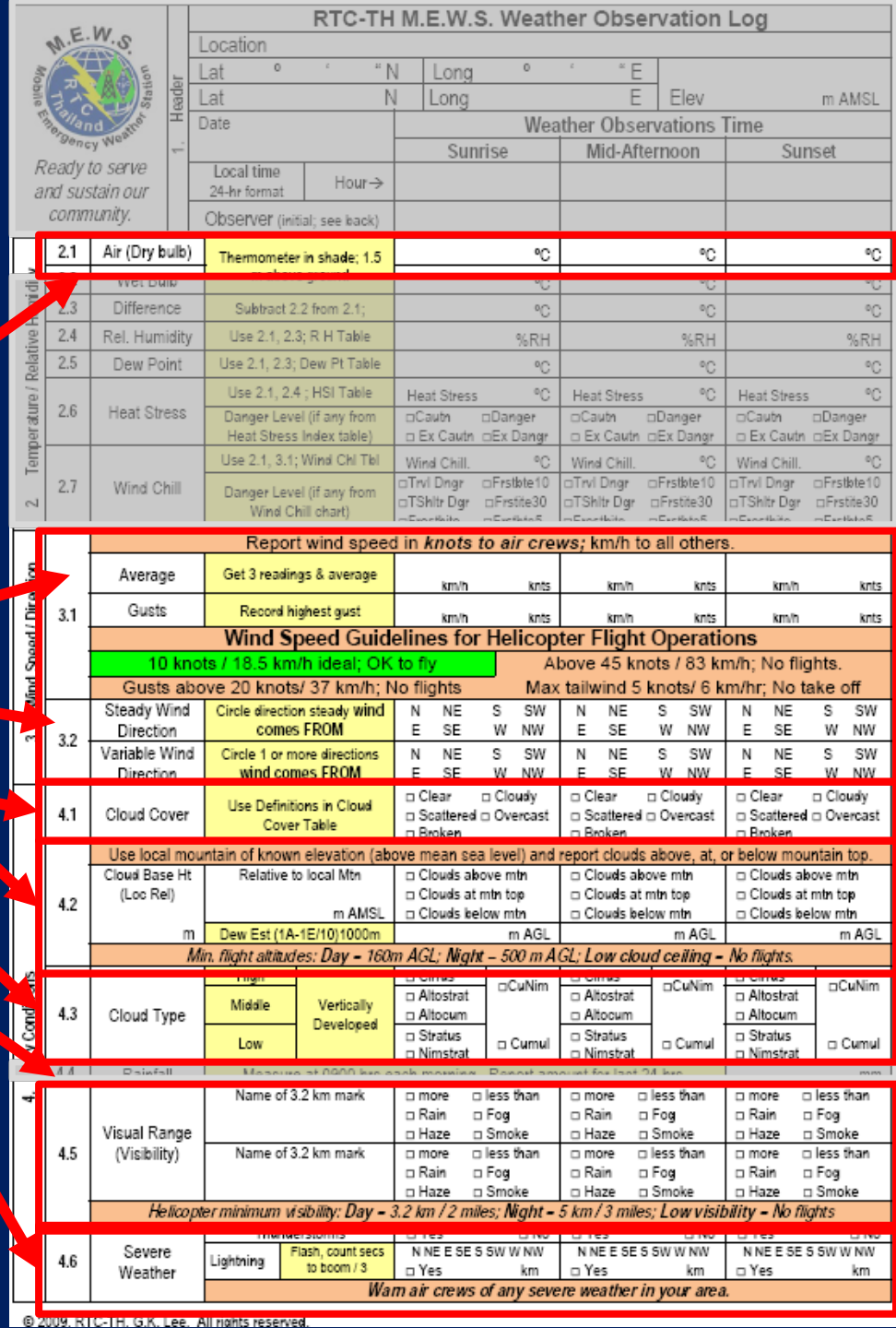
Basic MEWS Observations are recorded here on the Log Form

- Temperature
- Estimate Wind Speed
- Wind direction
- Cloud cover
- Estimate cloud height
- Cloud Type
- Visibility
- Thunder / Lightning

Detailed instructions are in the MEWS manual



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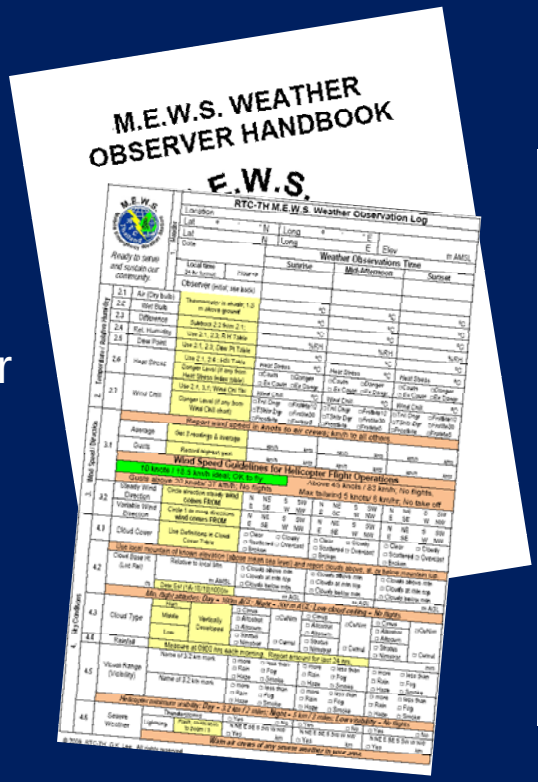
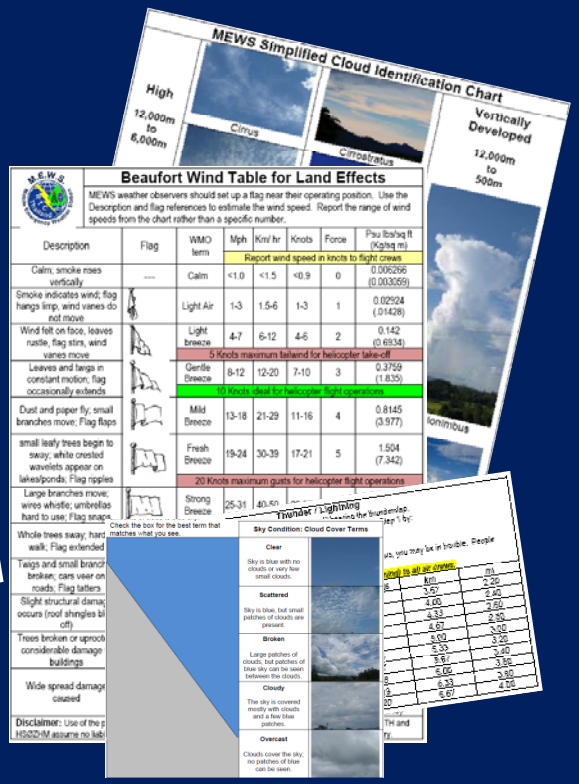
The Basic Weather Observer's kit

Thermometer





Optional Equipment

Long Measuring Tape

Ruler

Magnetic compass

Umbrella; 1.5 m cord

MEWS Handbook, Basic Reference tables

A Basic MEWS Kit has very few items making start-up fairly easy and affordable.

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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Basic
MEWS Weather Observing
Lesson B1:
Temperature Measurement

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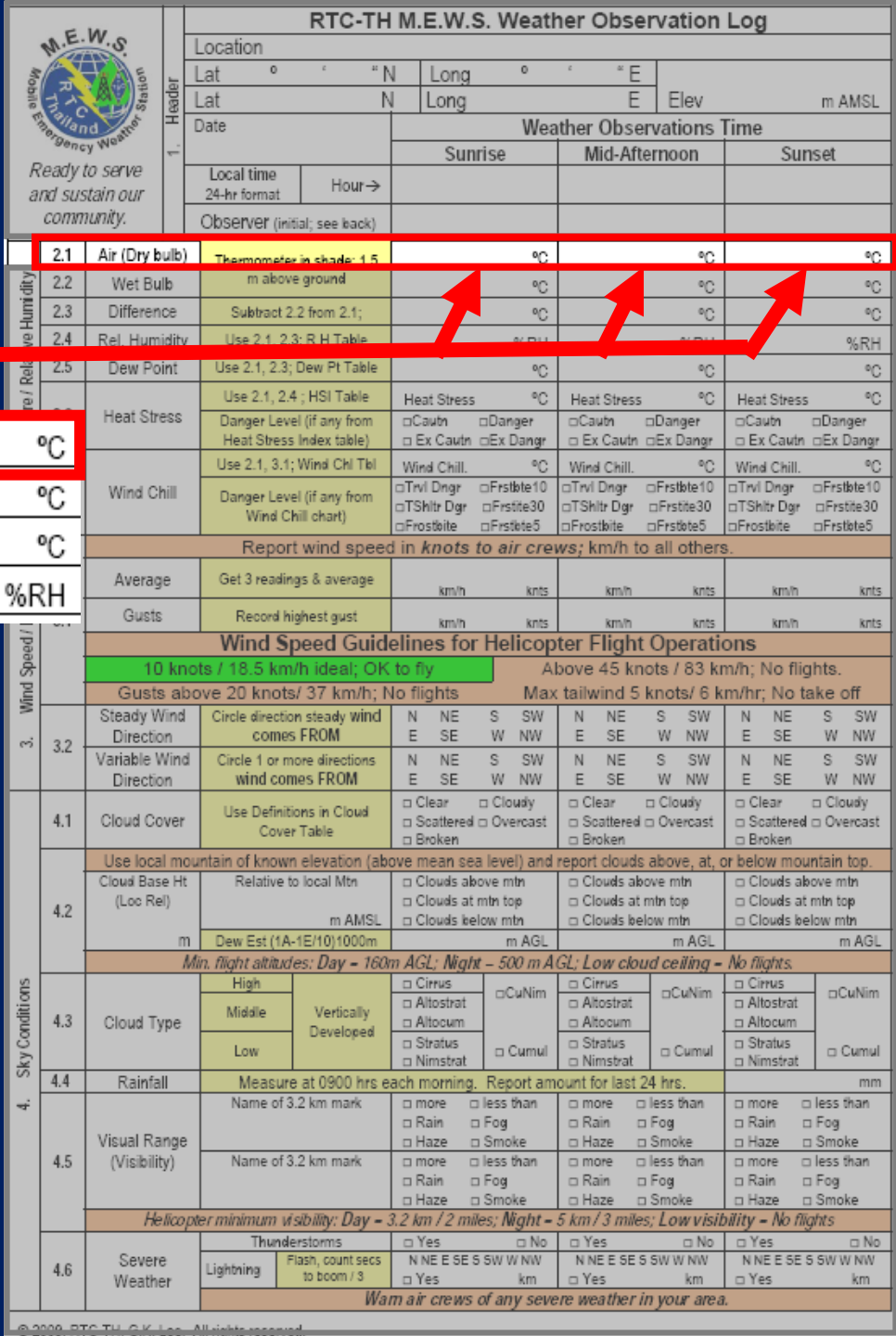
Record the Air Temperature Section 2.1

tive Humidity	2.1	Air (Dry bulb)	Thermometer in shade; 1.5	°C
	2.2	Wet Bulb	m above ground	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH

It is best if you can make a minimum of 3 observations / day.

See Handbook: 2.1 Air (Dry Bulb) Temp, p. 9



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)				
2.1	Air (Dry bulb)	Thermometer in shade; 1.5	°C	°C	°C
2.2	Wet Bulb	m above ground	°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
	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
	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 /	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	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.				

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

EmComm Emergency Communications — RTC-Thailand

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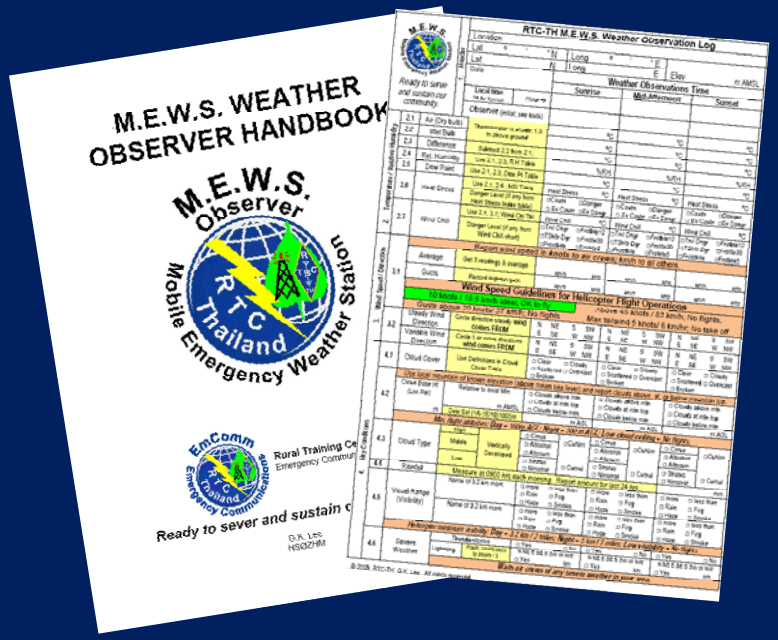
What you need to make a Basic Temperature reading

Pencil

Thermometer



MEWS Handbook and Log Form

Optional Equipment

Umbrella; 1.5 m cord

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MEWS (PWIS)

Portable Weather Instrument Shelter

Measure the temperature

- In the shade
- at least 1.5 m above the ground
- Clear of vertical obstructions
- 30 m away from large paved areas
- 9 m radius of uniform surface materials

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Basic MEWS Weather Observing Lesson B2: Estimating Wind Speed

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Notes on the form help you estimate wind speed with minimal training

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			

Brief instructions are on the back of the Log form.

Full instructions and all needed reference tables are in the MEWS Weather Observer Handbook.

See Handbook: 3.1 Wind Speed, p. 17

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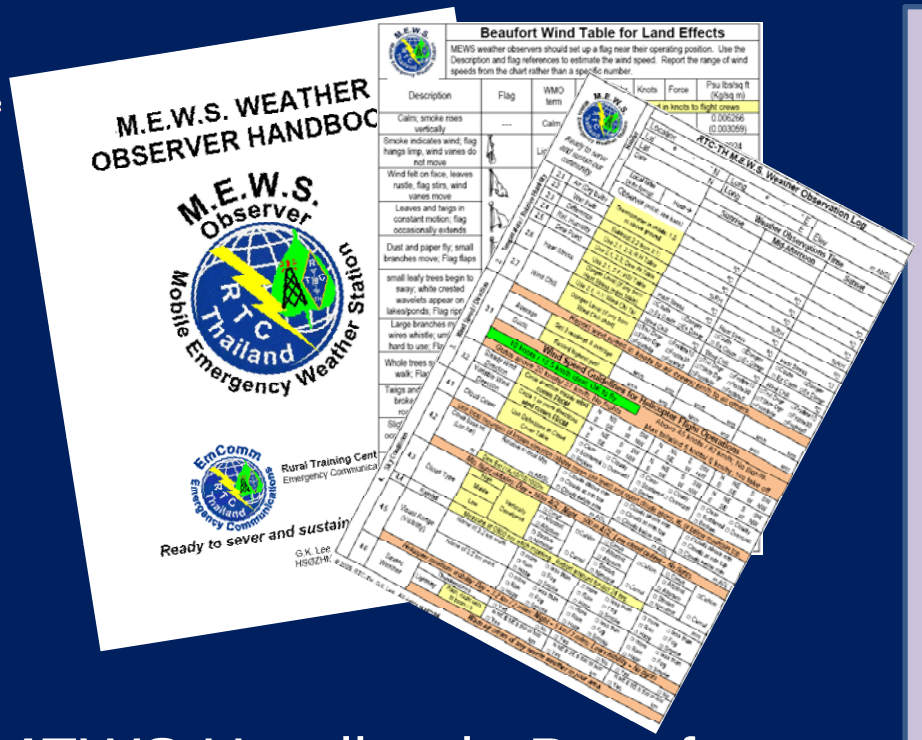
What you need to Estimate Wind Speed

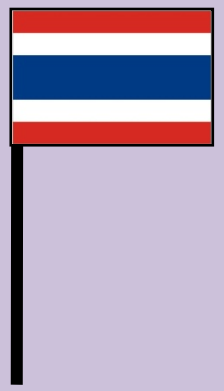
Pencil



MEWS Handbook, Beaufort Wind Table, and Log Form

Optional Equipment

Flag or wind sock



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See Handbook: Beaufort Wind Table for Land Effects, p. 18

Two Ways to use this table

You can match the description to what you see around you.

You can use a nearby flag as a reference.

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		lear 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)
	---	lurricane	>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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Seeing signs of wind

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The some common signs of wind are blowing dust, smoke plumes, or flags.

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Basic MEWS Weather Observing Lesson B3: Measuring Wind Direction

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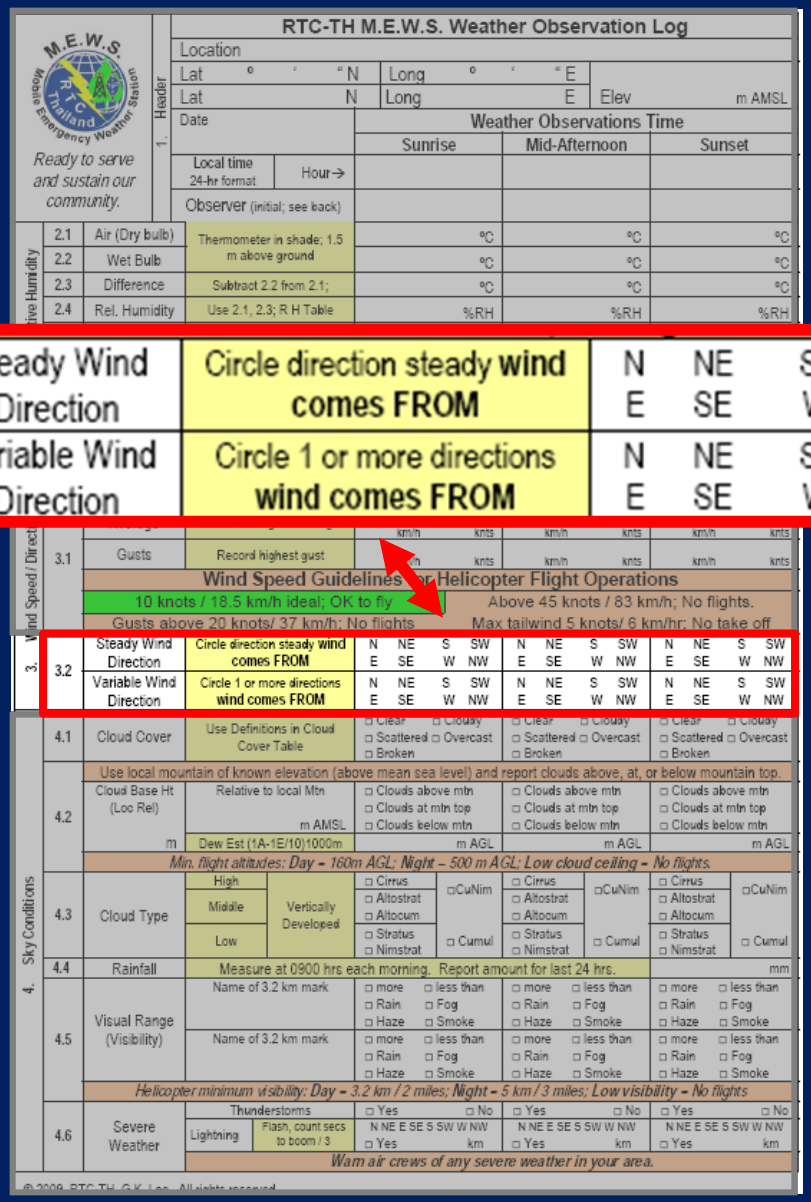
The MEWS Weather Observation Log Form



3.	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

Basic Wind Direction is recorded in Section 3.2

Wind directions are recorded for both steady winds and variable winds.

Avoid confusion and errors: report all azimuths are Magnetic (relative to Magnetic North)

See Handbook: 3.2 Wind Direction, p. 20-21

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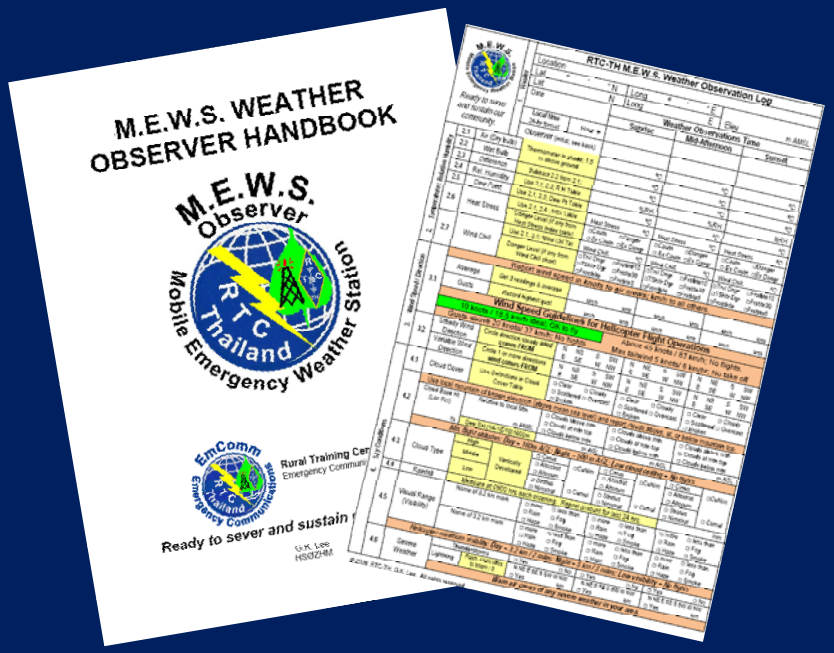
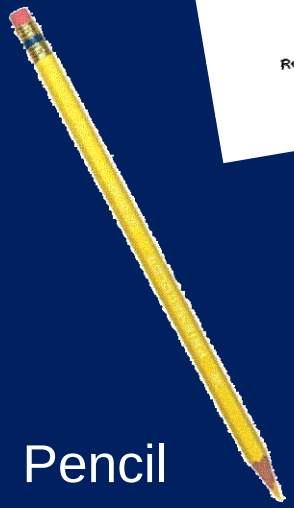
What you need to make a Basic Wind Direction Measurement



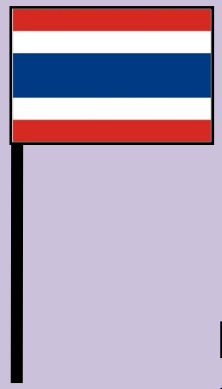
MEWS Handbook and Log Form



Pencil

Optional Equipment

Flag or wind sock



Magnetic Compass

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You need to know the “cardinal” directions: N, S, E, W

- If you are familiar with the area, you may already know the directions.
- If you are in an unfamiliar area, a magnetic compass is useful.

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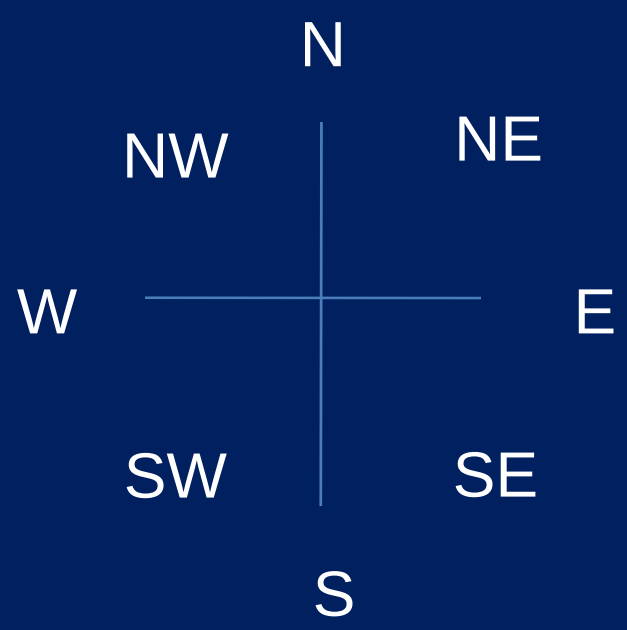
Casual observation vs. Measurement

You can call the wind by its directional name or by a measured azimuth (degree) number.

Just be sure you face directly into the wind.



N = 0° or 360°
NE = 45°
E = 90°
SE = 135°
S = 180°
SW = 225°
W = 270°
NW = 315°

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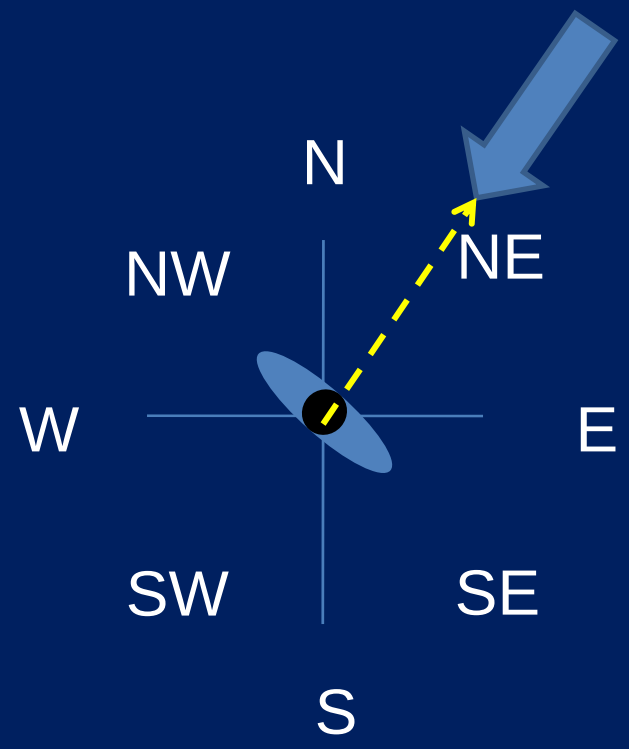
Casual observation

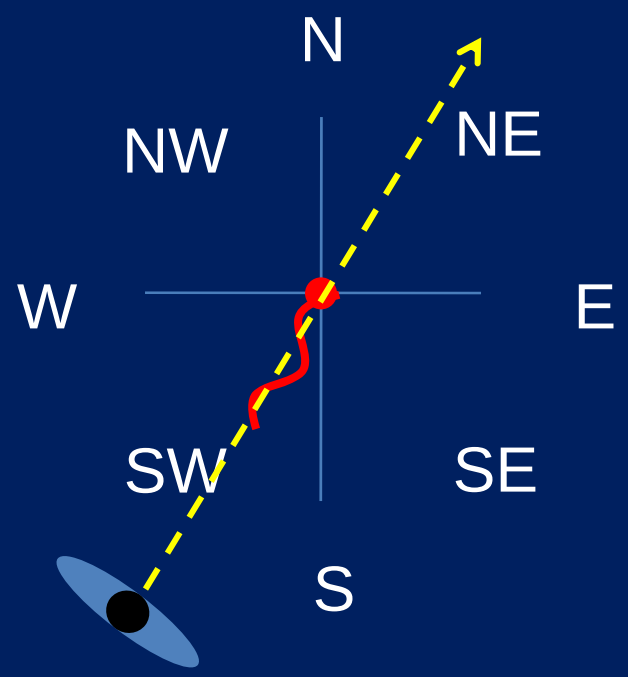
You can call the wind by its directional name.

Just be sure you face directly into the wind.

Remember, the wind direction is named by the direction it comes **FROM**.



If you have a flag, you can use it.



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Basic MEWS Weather Observing Lesson B4: Estimating Cloud Cover

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The MEWS Weather Observation Log Form

Cloud Cover is recorded in Section 4.1

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

Refer to the Cloud Cover Table for examples.

Brief instructions are on the front of the Log form.

Additional notes are on the back of the form. Full instructions and the Cloud Cover reference table are in the MEWS Weather Observer Handbook.

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The MEWS Weather Observation Log Form

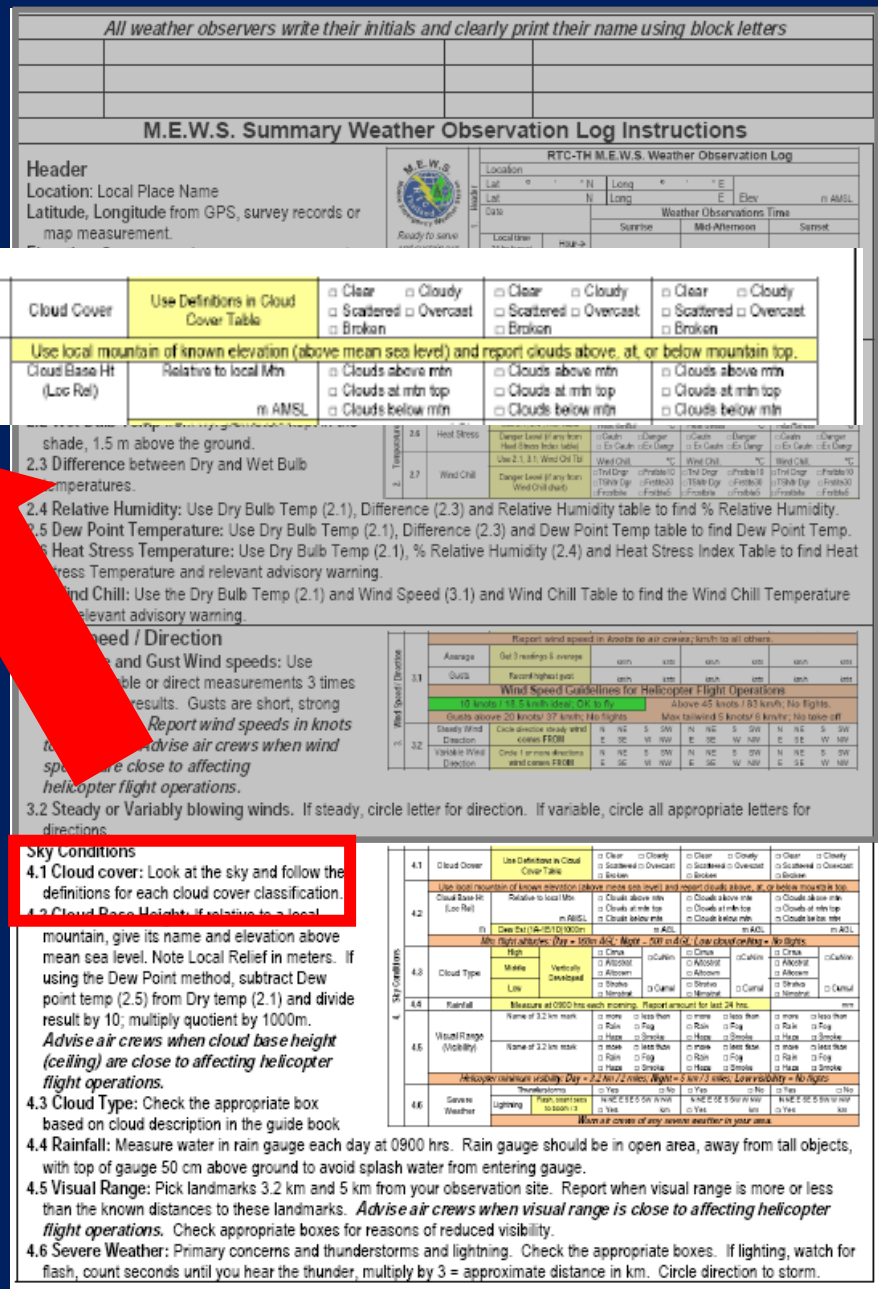
More notes are on the back of the form.

Sky Conditions

4.1 Cloud cover: Look at the sky and follow the definitions for each cloud cover classification.

Additional notes are on the back of the form. Full instructions and Cloud Cover reference table are in the MEWS Weather Observer Handbook.

See Handbook: 4.1 Cloud Cover, p. 22



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.

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

Weather Observations Time: Sunrise | Mid-Afternoon | Sunset

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 Ref)	Use local mountain of known elevation (above mean sea level) and report clouds above, at, or below mountain top. 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

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 anemometer or direct measurements 3 times and average results. Gusts are short, strong bursts. Report wind speeds in knots to 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.

Wind Speed Guidelines for Helicopter Flight Operations: 10 knots / 18.5 km/h clear, OK to fly; Above 45 knots / 83 km/h, No flights.

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 10; 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, multiply by 3 = approximate distance in km. Circle direction to storm.

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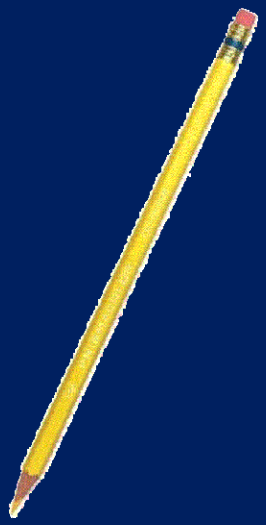
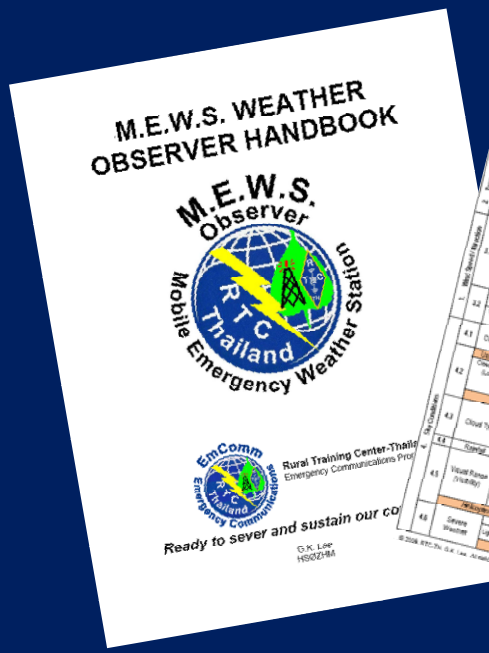
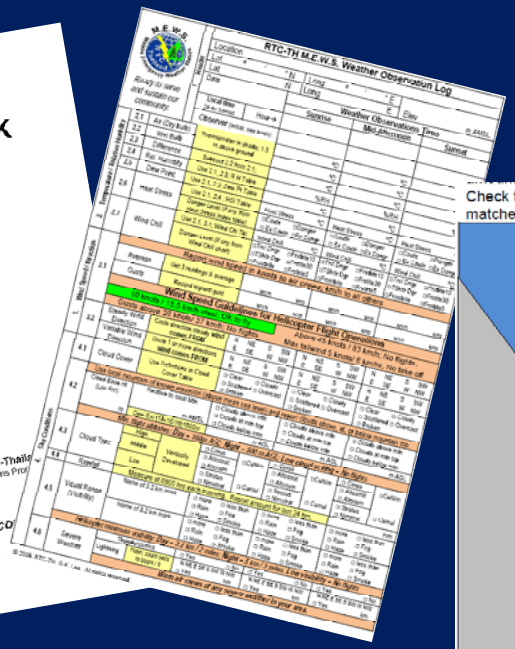
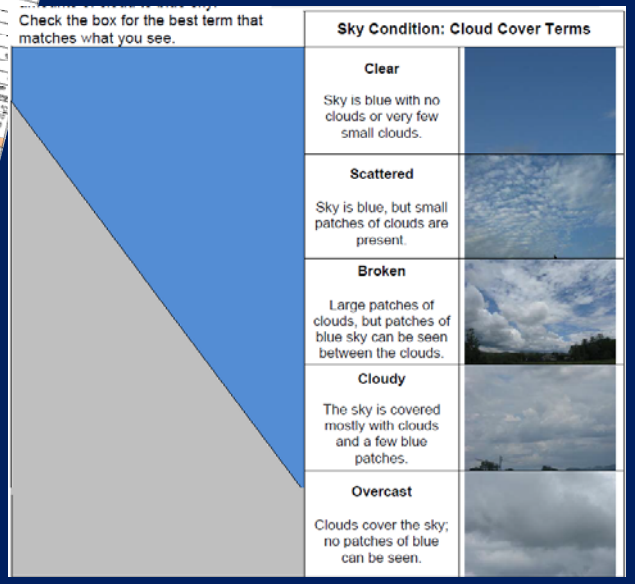
What you need to make Basic Estimates of Cloud Cover









See Handbook: 4.1 Cloud Cover Reference Table, p. 22

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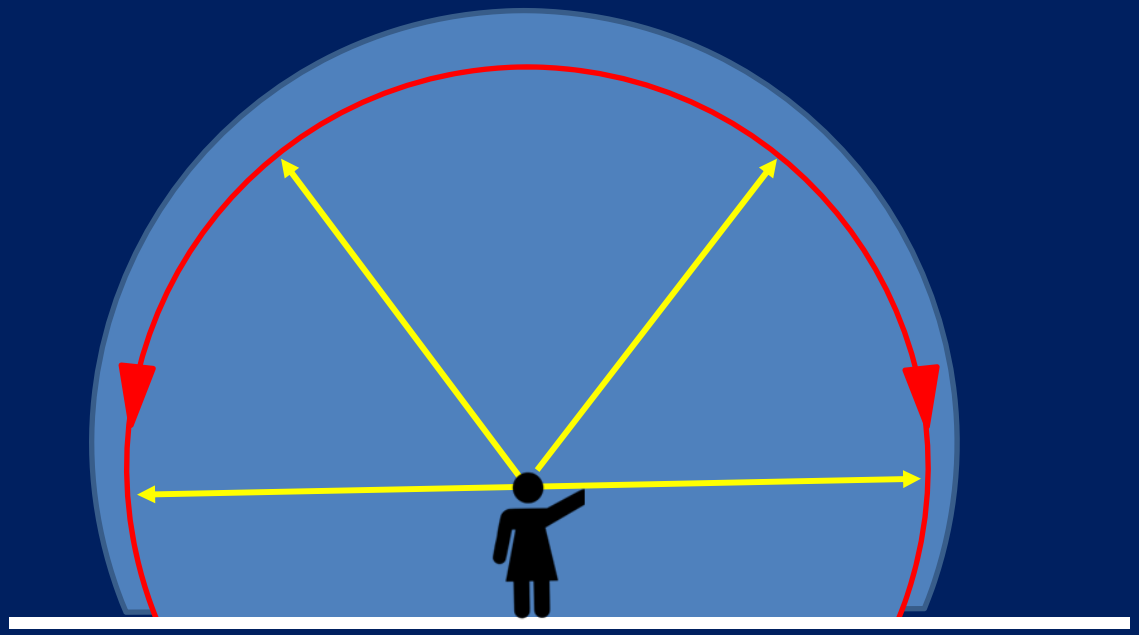
To estimate the cloud cover...



You should look at the sky “from horizon to horizon” in all directions.

It is best if you can make a minimum of 3 observations / day.

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Basic Cloud Cover Terms

This is a simple way to describe cloud cover using 5 sky condition terms.

Cloud cover term	Amount of blue	Amount of cloud	
Clear	Nearly all blue	Little or no clouds	
Scattered clouds	Mostly blue	Some clouds	
Broken clouds	Big blue patches	Mostly clouds	
Cloudy	Some blue	Mostly clouds	
Overcast	Little or no blue	Nearly all clouds	

This simple classification system is based on comparing / contrasting the amount of blue sky to cloud in the sky over your operating position

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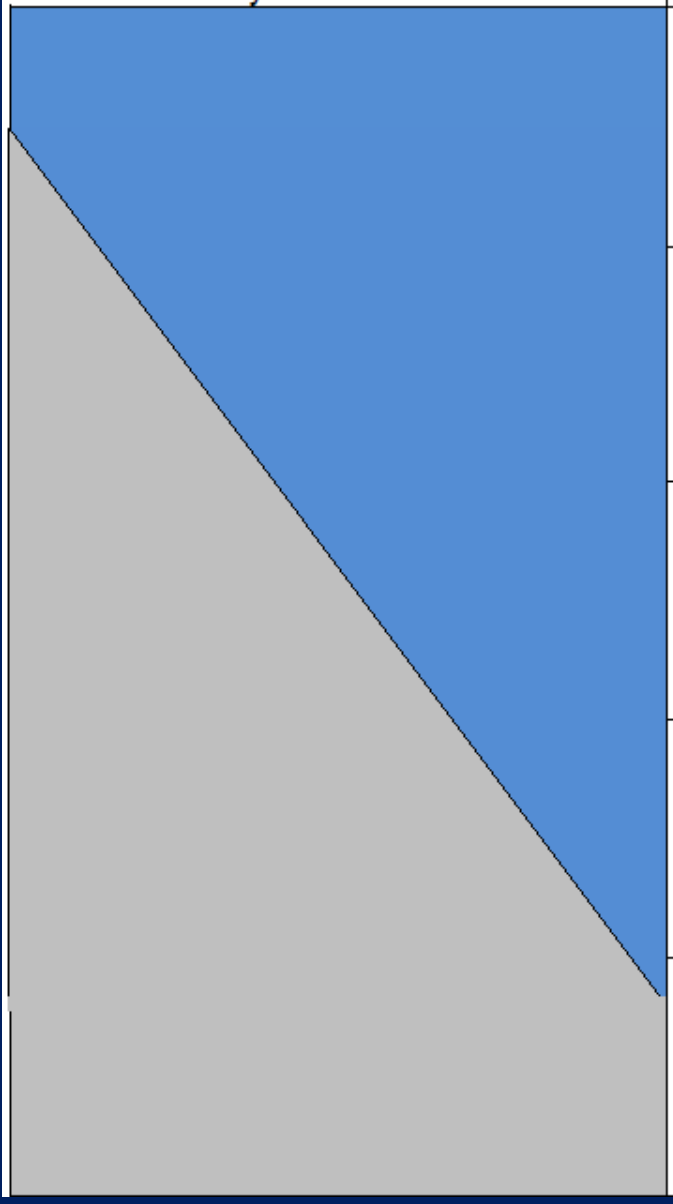
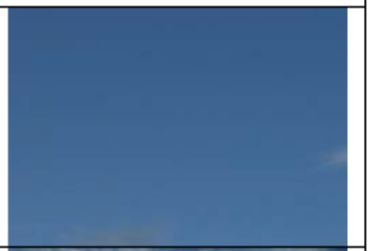
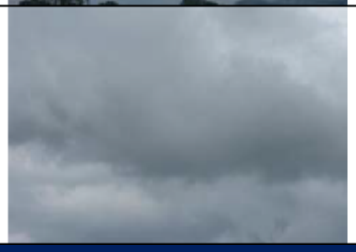
Just find the description that best fits what you see

Check the box for the best term that matches what you see.



Sky Condition: Cloud Cover Terms	
Clear Sky is blue with no clouds or very few small clouds.	
Scattered Sky is blue, but small patches of clouds are present.	
Broken Large patches of clouds, but patches of blue sky can be seen between the clouds.	
Cloudy The sky is covered mostly with clouds and a few blue patches.	
Overcast Clouds cover the sky; no patches of blue can be seen.	

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See Handbook: 4.1 Cloud Cover Reference Table, p. 22

Basic
MEWS Weather Observing
Lesson B5:
Estimating Cloud Base Height

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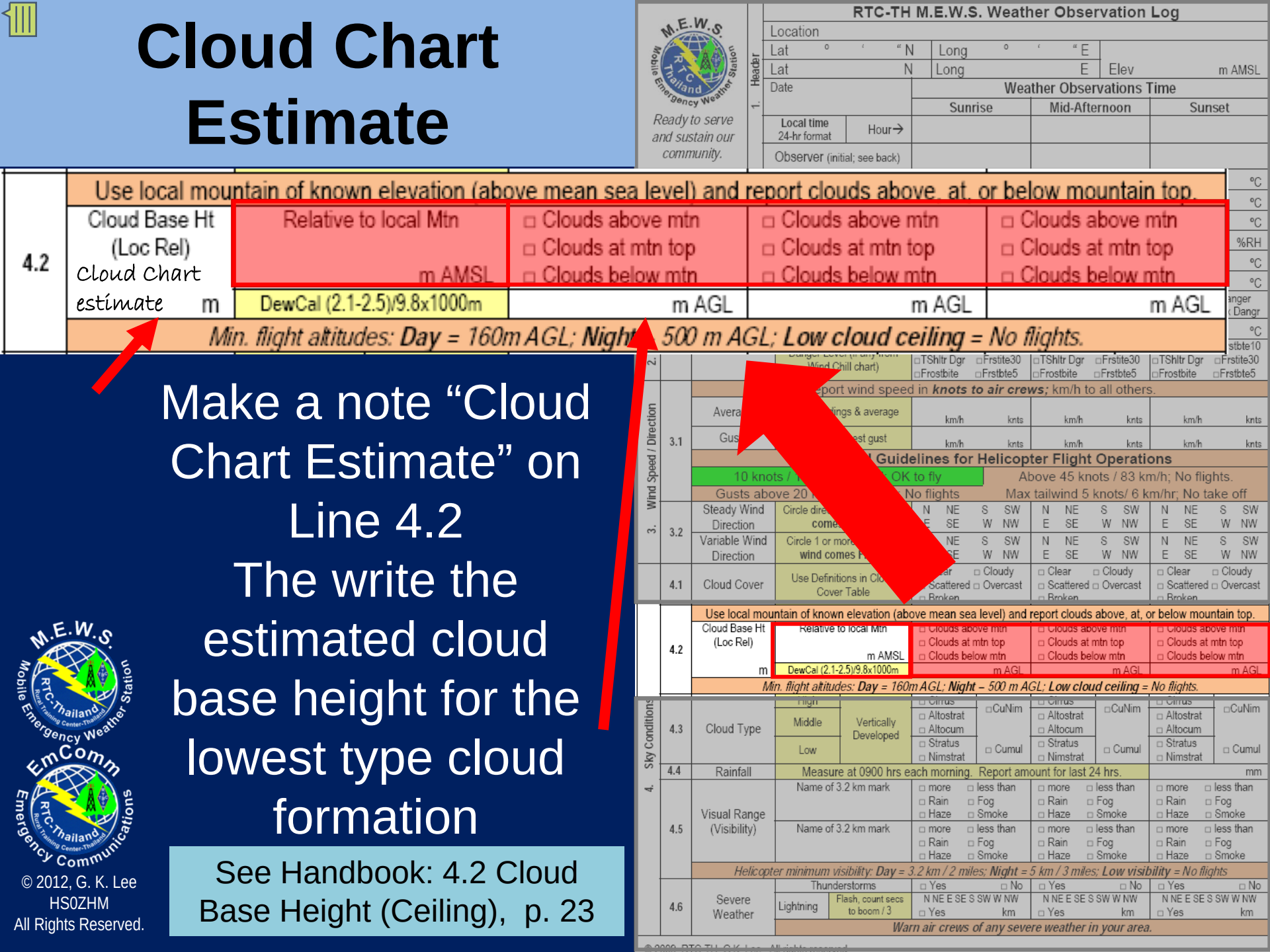
Cloud Chart Estimate



Make a note "Cloud Chart Estimate" on Line 4.2

The write the estimated cloud base height for the lowest type cloud formation

See Handbook: 4.2 Cloud Base Height (Ceiling), p. 23

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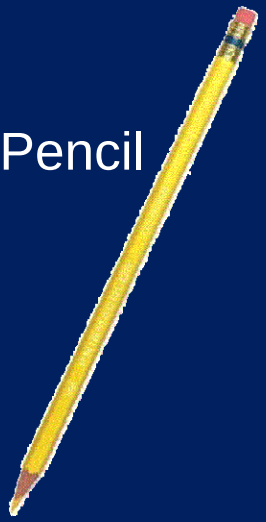
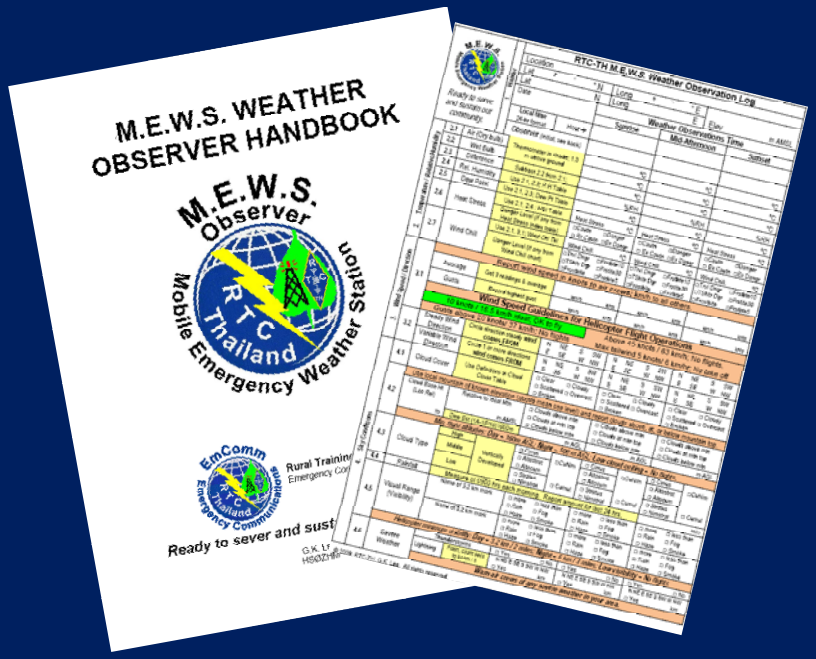
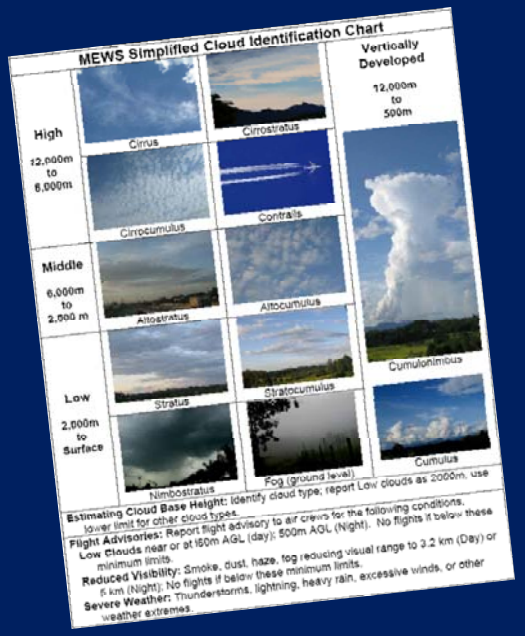
What you need to make estimate cloud base height for the Quick Start Basic MEWS

Pencil





MEWS Handbook, Cloud Identification Chart, and Log Form



Cloud Identification Chart

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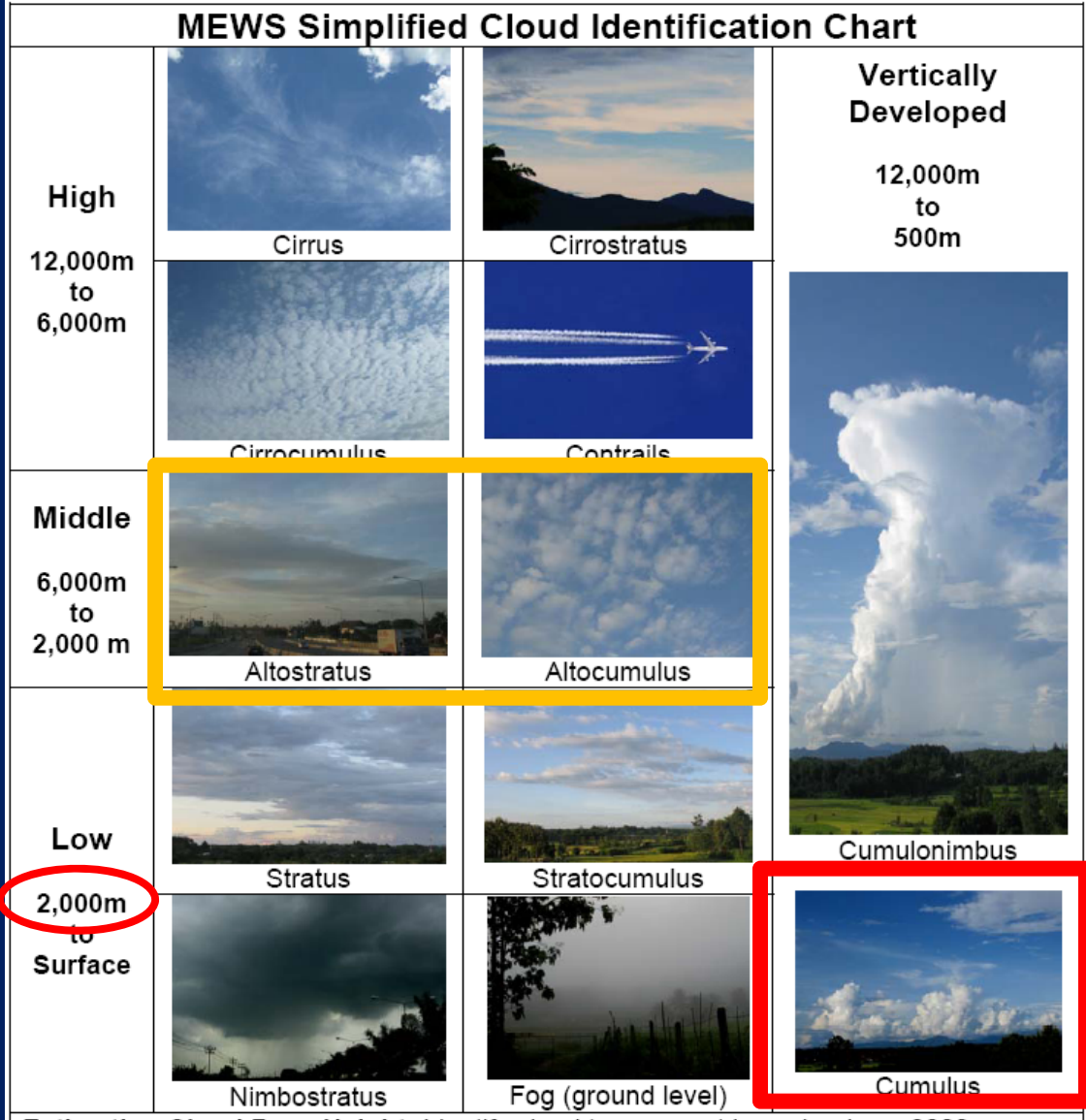
Use the Cloud Identification Chart in the MEWS Weather Observer Handbook.

Of the clouds you saw, pick the type with the lowest altitude range. The cumulus cloud was the lowest. Report 2,000m as the altitude since it clearly was not at ground level.



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.

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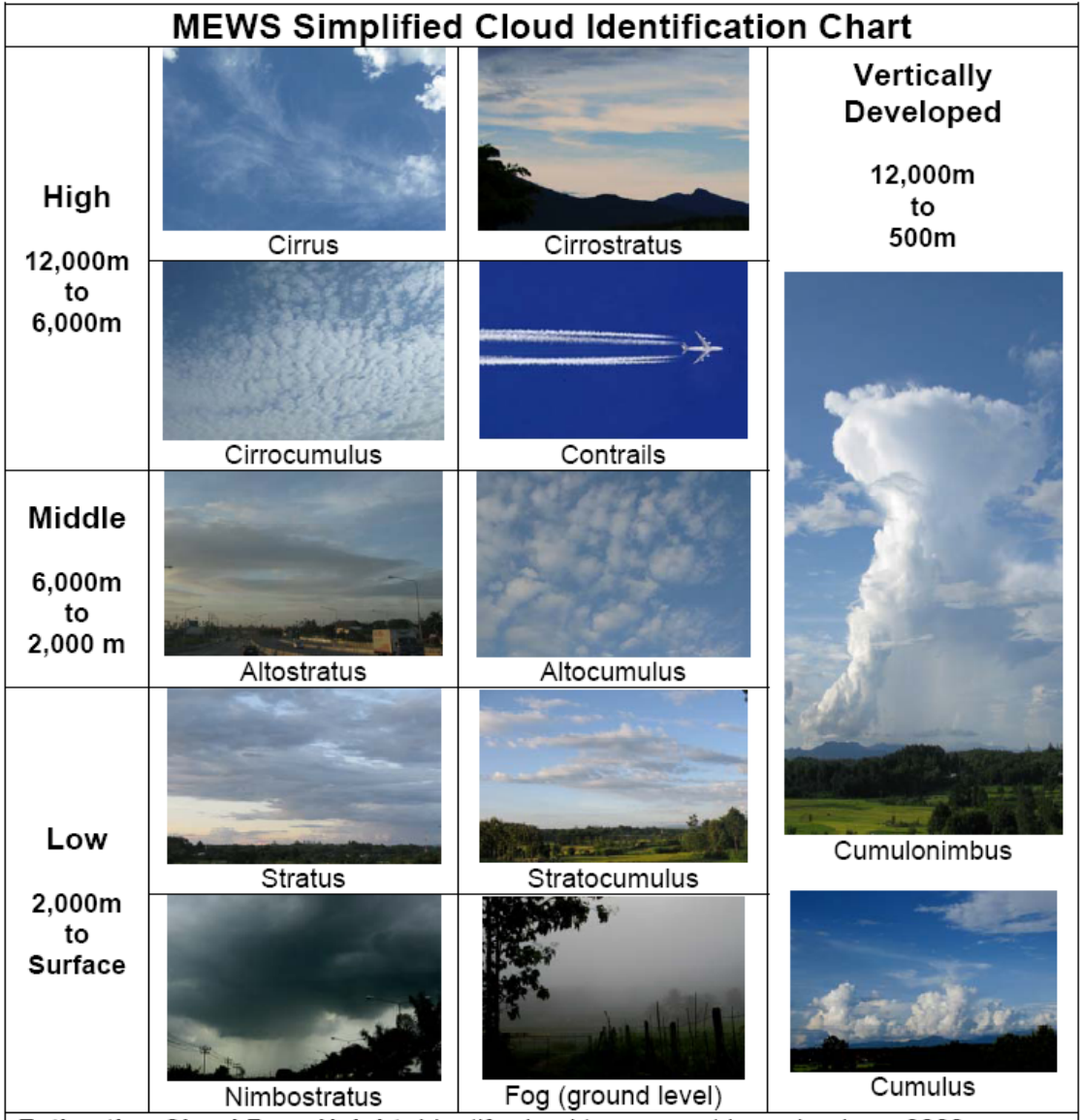
Flight Advisory

Report a Flight Advisory any time cloud base height is ***near to, at, or less*** than the warning limits listed on the Log Form.



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

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.

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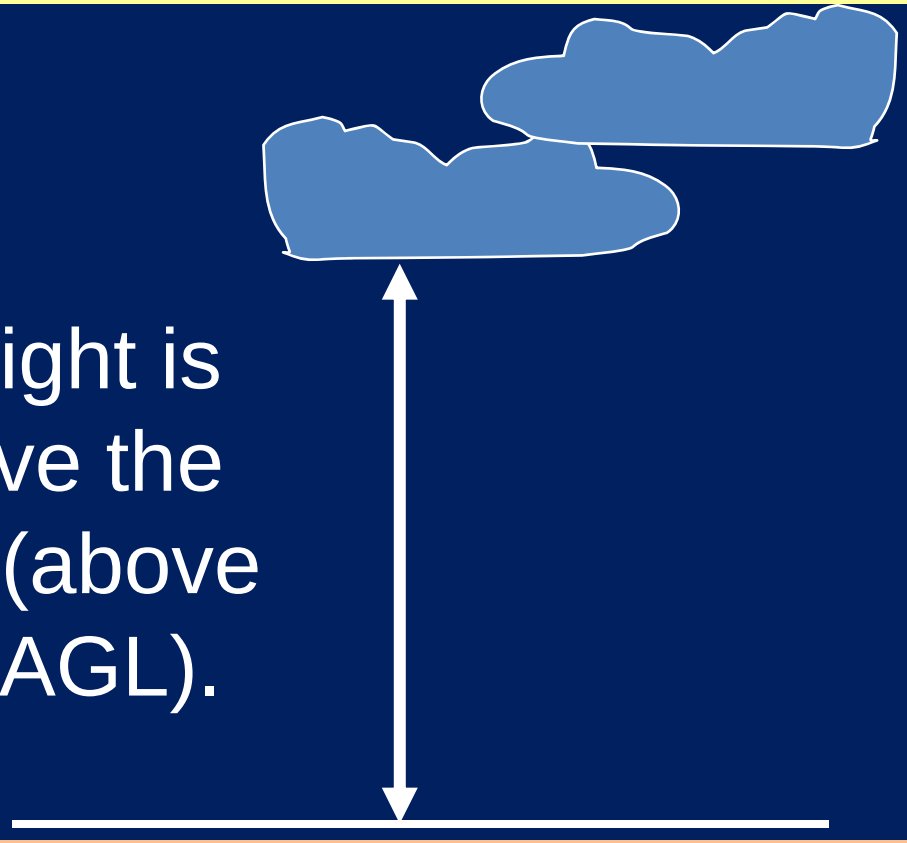
Height of the Cloud Base

There may be different types of clouds forming at different altitudes above the ground.

Always report the height of the lowest cloud base for the area.

Cloud base height is measured above the Earth's surface (above ground level---AGL).



This method is very general. When combined with the cloud identification in Section 4.3, experience air crews get useful data.

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Observe the clouds on a local mountain

This is better than estimates from the cloud chart; But only if you have nearby mountains of known elevation.

See Handbook: 4.2.1 (Cloud Base Height Ceiling) Relative to a local mountain of known elevation, p. 22

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Basic MEWS Weather Observing Lesson B6: Identifying Cloud Types

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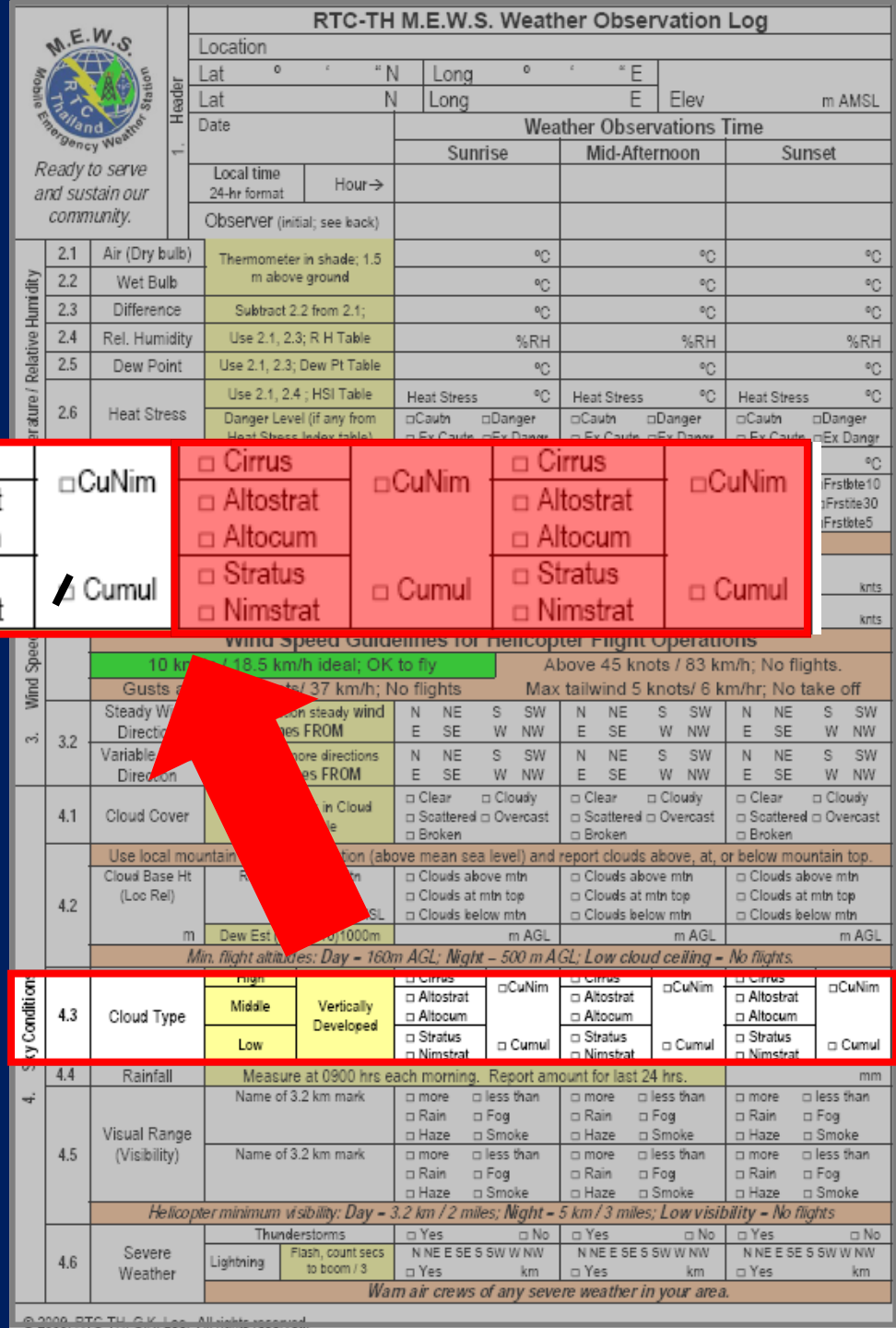
Record the cloud types in Line 4.3 using the basic classification by type.

Sky Conditions	4.3	Cloud Type	High / Middle / Low	Vertically Developed	☐ Cirrus / ☐ Altostrat / ☐ Altocum / ☐ Stratus / ☐ Nimstrat	☐ CuNim / ☐ Cumul

Notice the check box choices follow the layout of the yellow reminder notes based on cloud height; Low, Middle, High, and Vertically Developed.

Remember the cloud base height (Line 4.2) is for the lowest cloud type you see.



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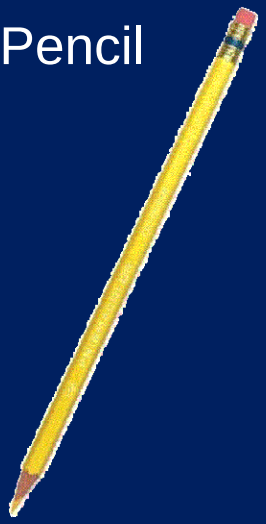
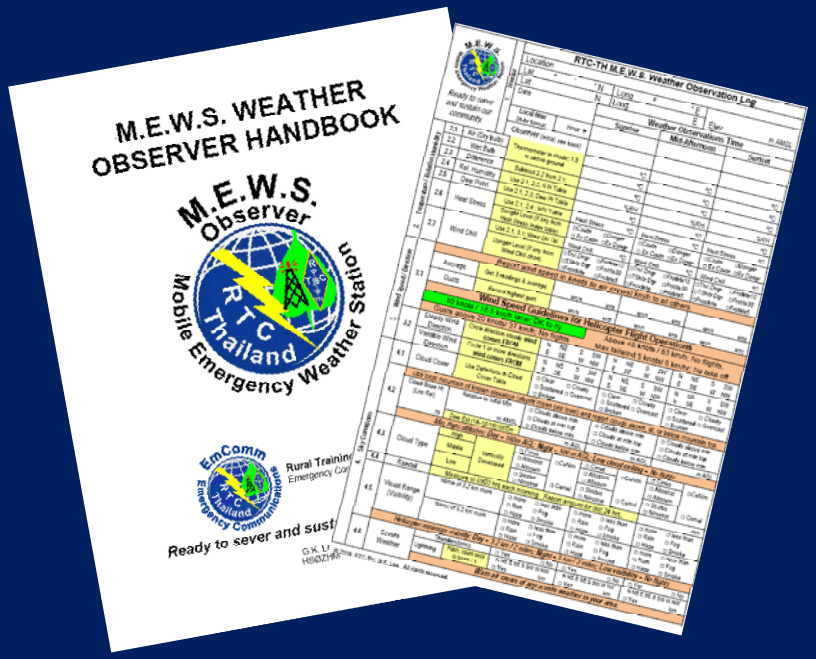
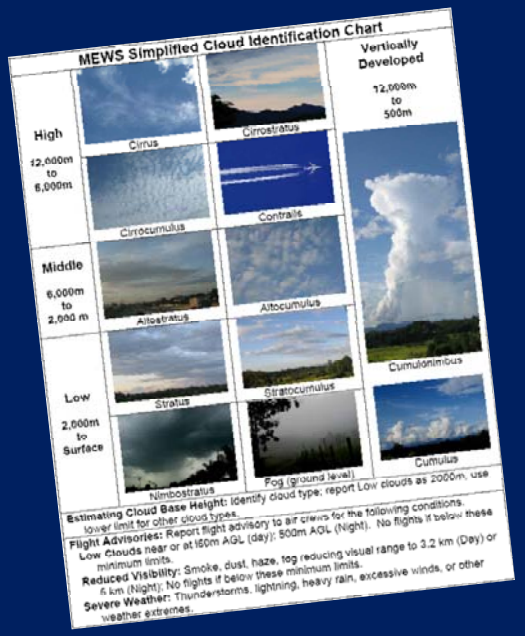
What you need to make a Basic Cloud Type Identification

Pencil





MEWS Handbook and Log Form



Cloud Identification Chart

See Handbook: 4.3 Cloud Type p. 24-26
MEWS Simplified Cloud Identification Chart, p. 25

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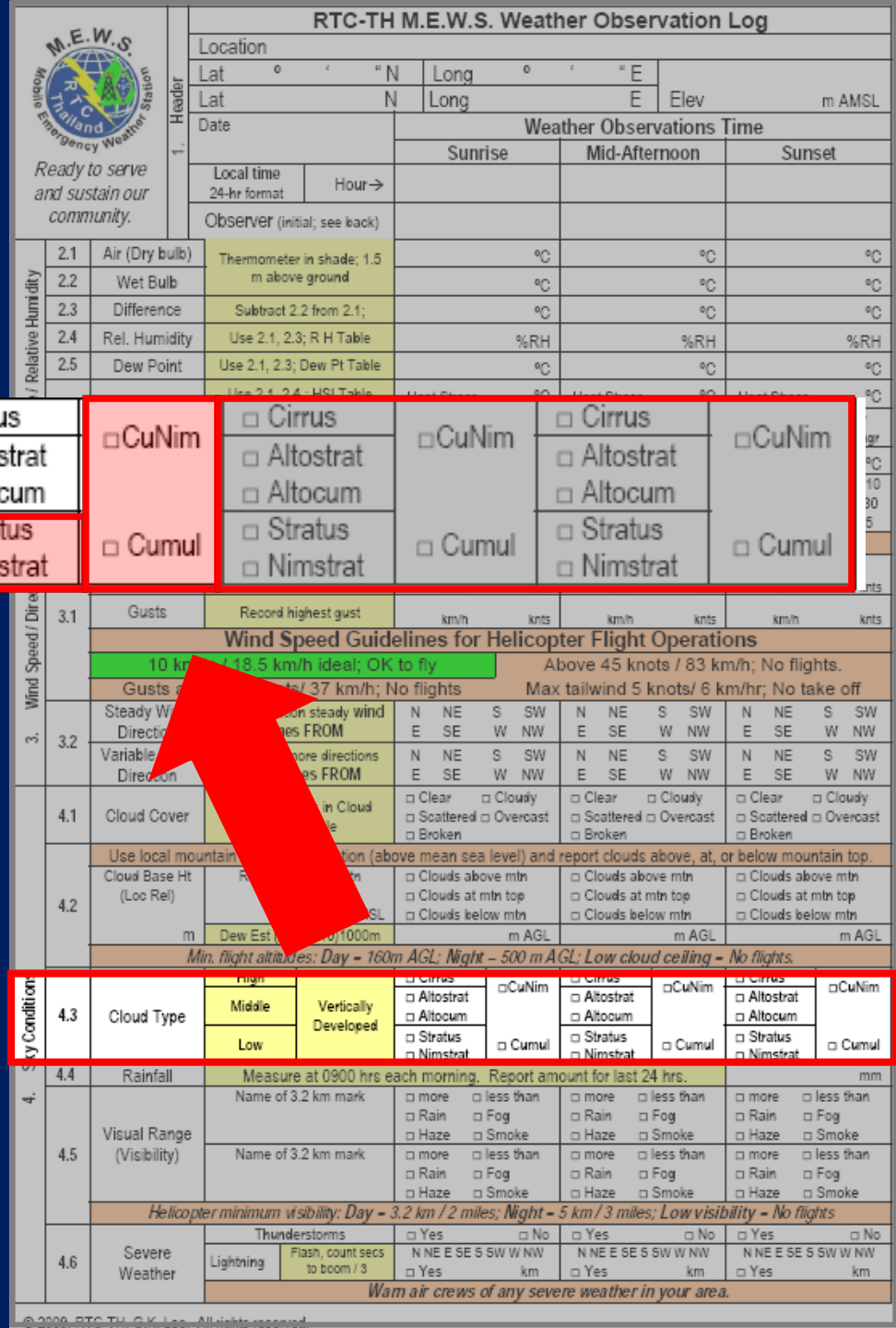
The main concern are **Low** and **Vertically Developed** Clouds

Sky Conditions	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

Low clouds can limit flight altitude and visibility.
Vertically Developed clouds can mean turbulence or severe weather.

Reporting this information helps increase flight safety.



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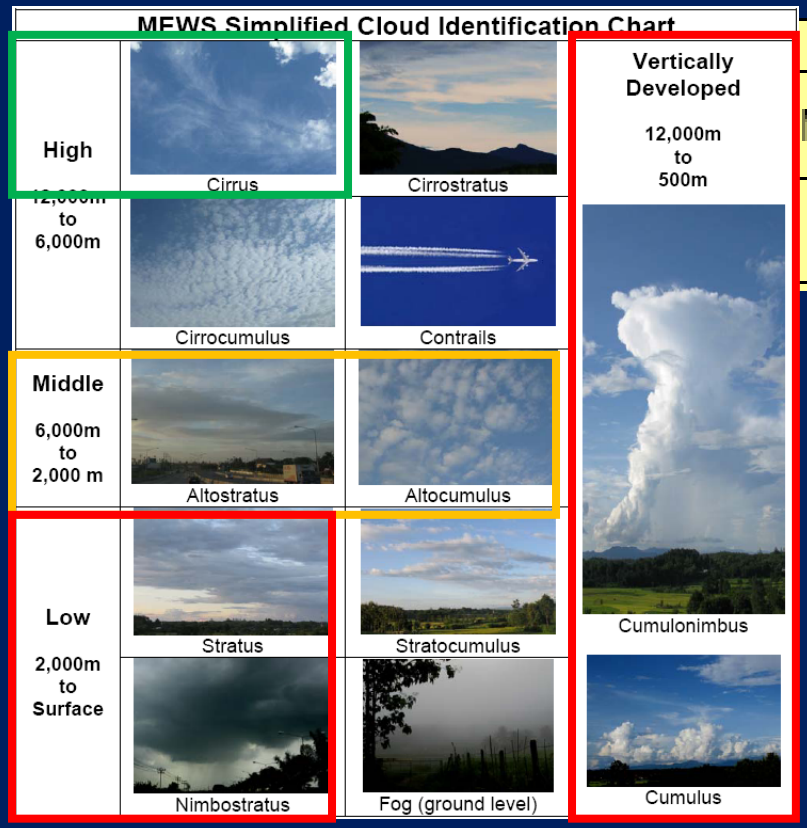
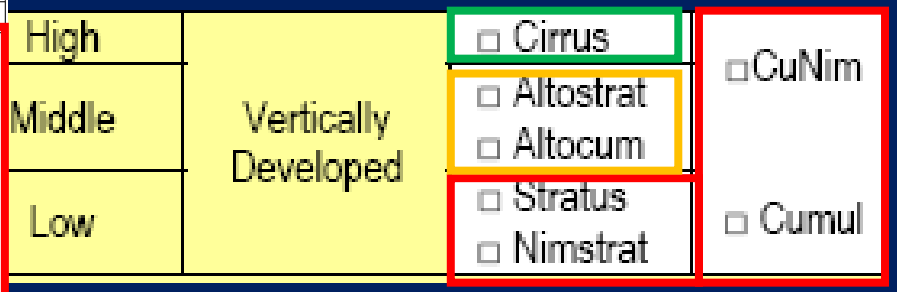
Notice the layout of the selected cloud types follows the layout of the Cloud ID Chart





Due to space limitations on the form, not all cloud types are listed with check boxes.

The selected cloud types listed enable MEWS Observers to characterize sky conditions sufficiently to provide meaningful weather data to support emergency flight operations.

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Basic Cloud Forms

- Cirroform (curly)

- Stratiform (flat)

- Cumuloform (lumpy)

- Fog (no shape)

The cloud shape is a clue to its height and type.

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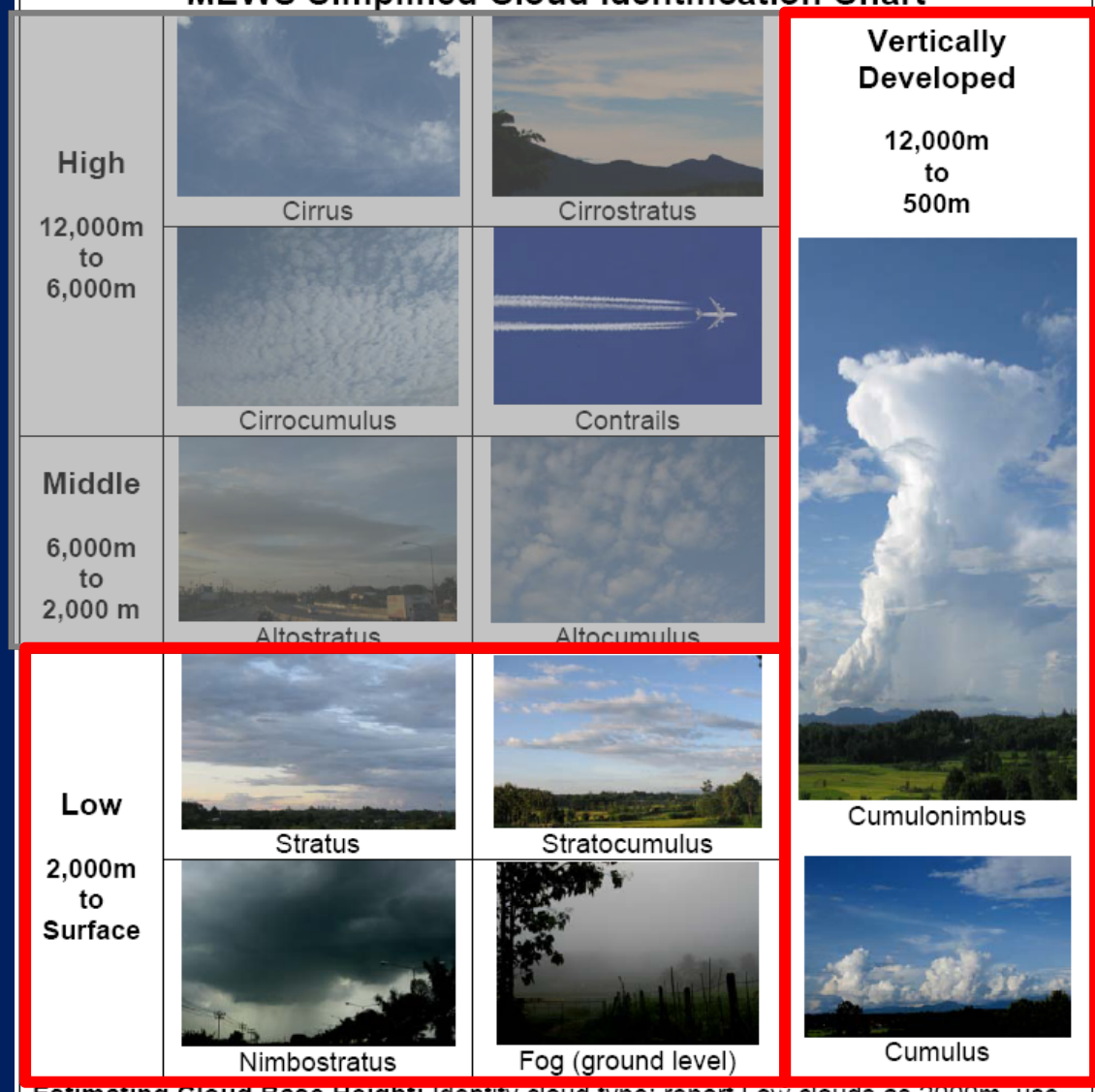
If you know the cloud type you have an idea of the cloud height

The main concern are clouds affecting helicopter flight operations

MEWS Simplified Cloud Identification Chart



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.

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Basic MEWS Weather Observing Lesson B7: Estimating Visual Range

Depending on your local area, this could be the most challenging item on the Basic MEWS observation list.

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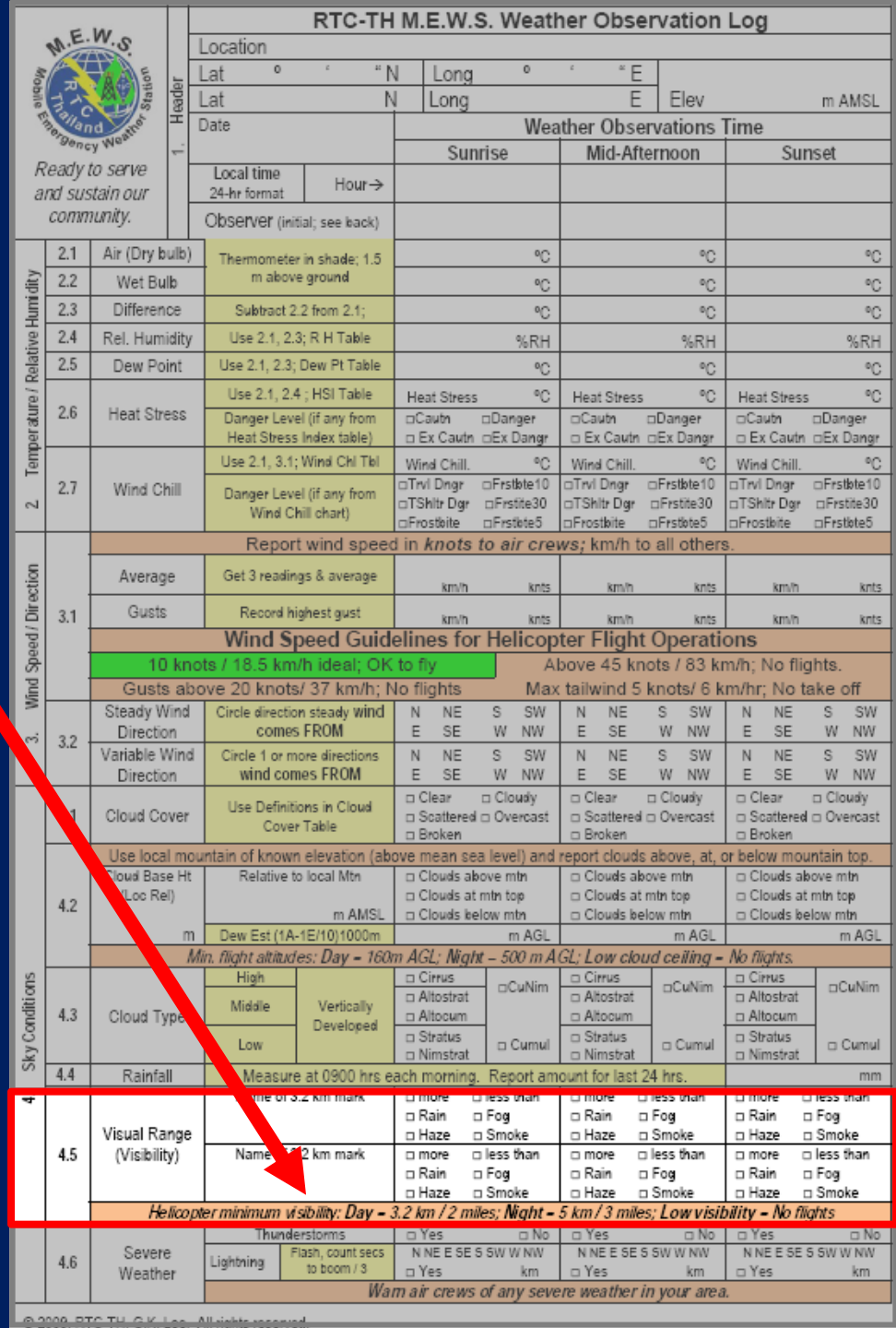
Critical Ranges for MEWS

3.2 km in Daylight
5 km at Night

Advise flight crews when visibility is below these limits.
We do not control flight operations. We provide updated weather reports to ***aid*** flight operations.

See Handbook: 4.5 Visual Range (Visibility), p. 28-29



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	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 ☐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 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	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 5.12 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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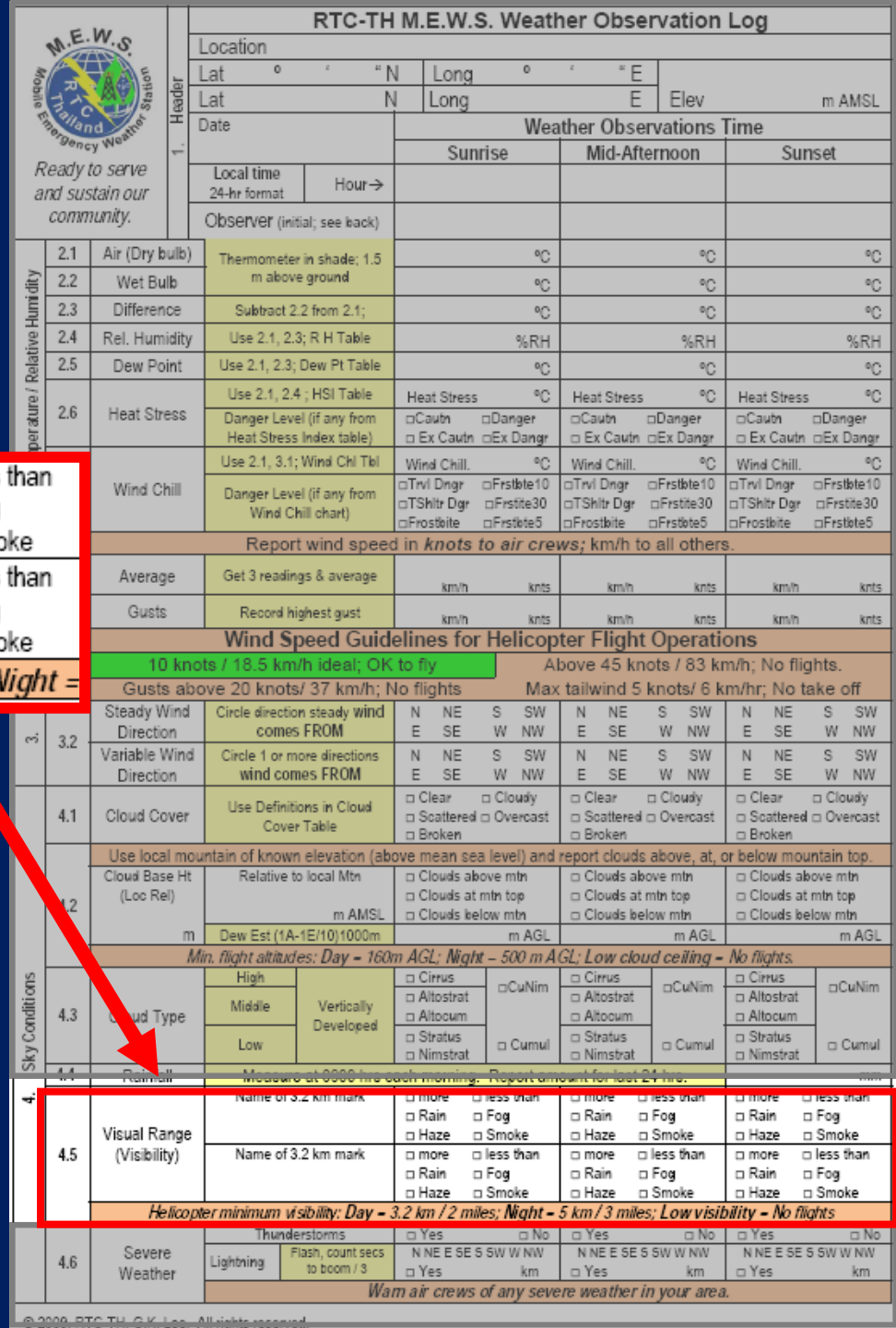
Record the Visual Range in Section 4.5

4.				
	4.5	Visual Range (Visibility)	Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
			Name of 3.2 km mark	□ more □ less than □ Rain □ Fog □ Haze □ Smoke
		*Helicopter minimum visibility: **Day** = 3.2 km / 2 miles; **Night** =*		

It is best if you can make a minimum of 3 observations / day.



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

Ready to serve and sustain our community.

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)				

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
	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 □Frstbte5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5	□Trvl Dngr □Frstbite10 □TShltr Dgr □Frstite30 □Frostbite □Frstbte5
	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.					
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

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	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. 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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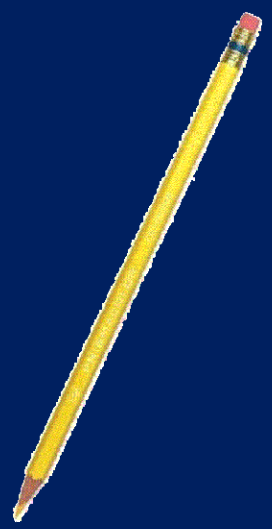
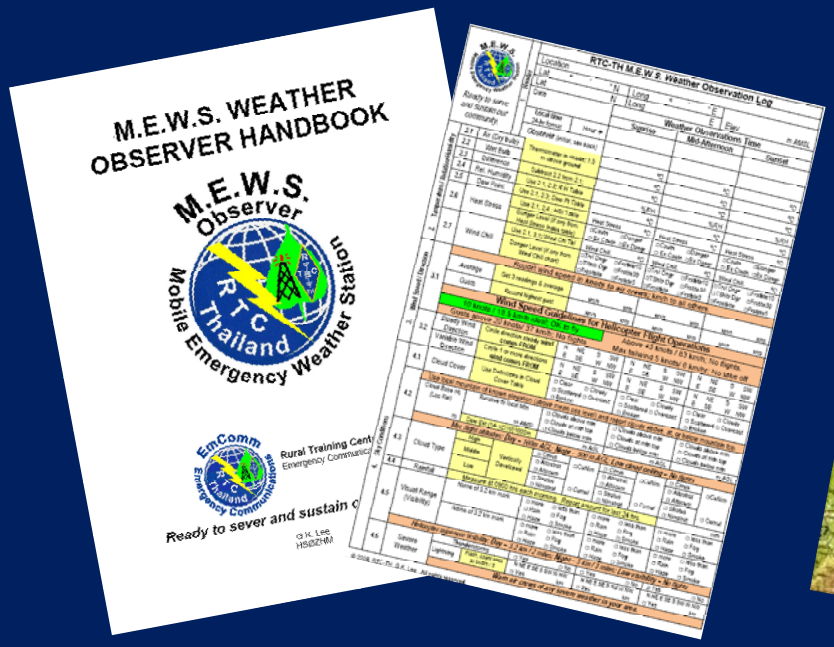
To make a Visual Range observation and report you can use local knowledge or a local topographic map





Find easily seen landmarks 3.2 km and 5 km away from your observation post.

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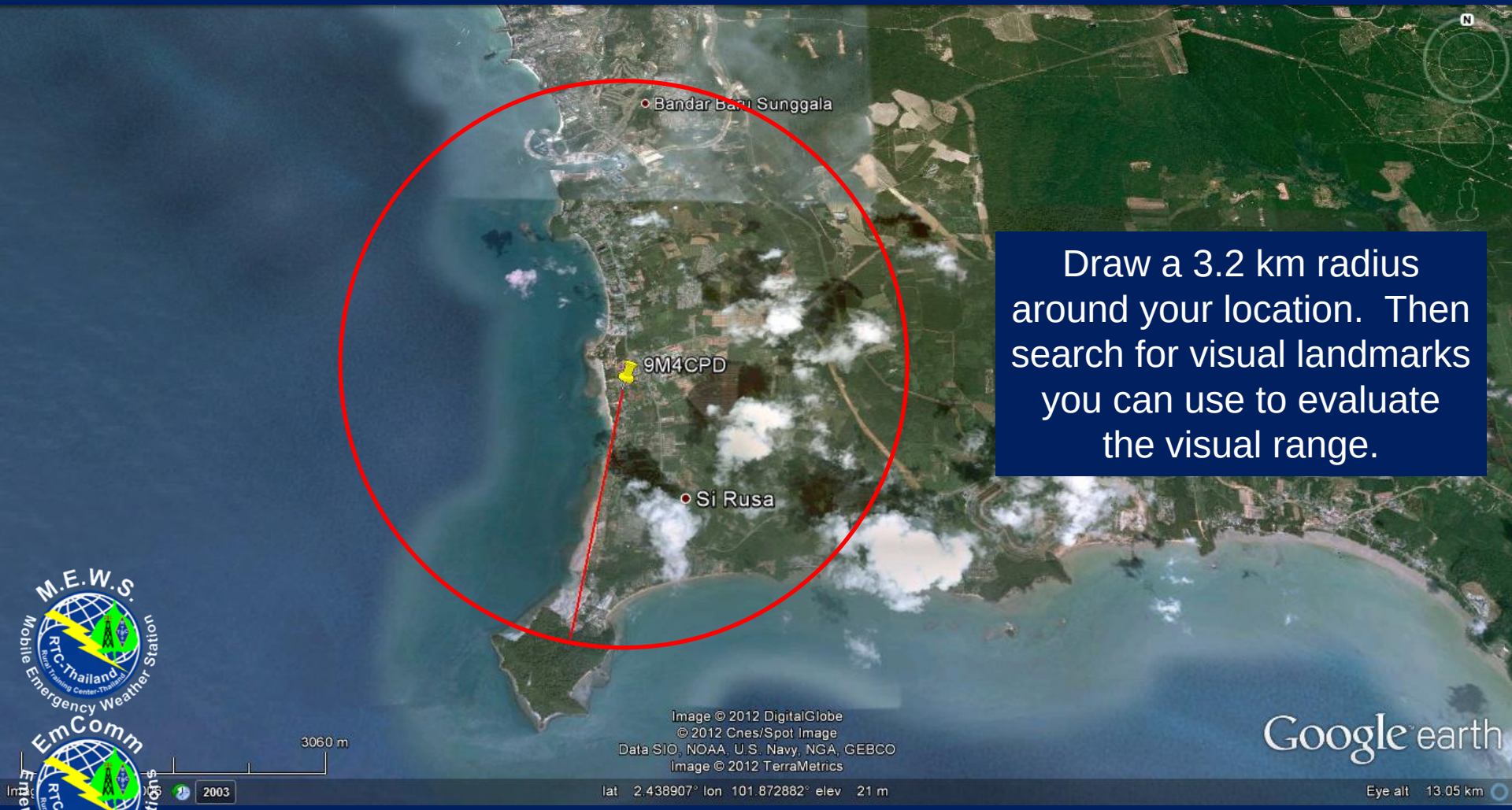
3 Km Range Ring for Thistle Port Resort



Draw a 3.2 km radius around your location. Then search for visual landmarks you can use to evaluate the visual range.

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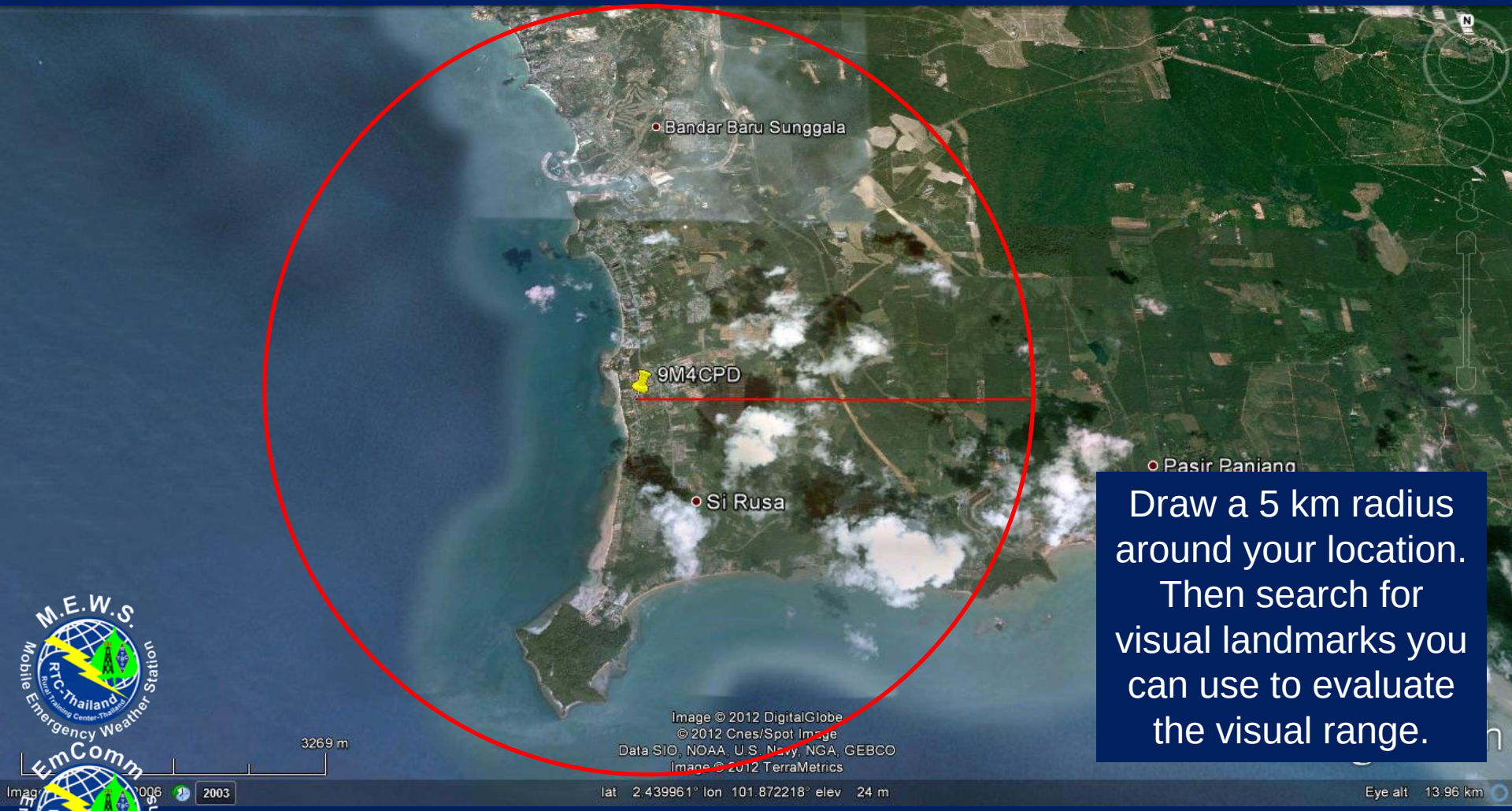
5 km Range Ring for Thistle Port Resort



Draw a 5 km radius around your location. Then search for visual landmarks you can use to evaluate the visual range.

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Basic MEWS Weather Observing Lesson B8: Severe Weather Conditions

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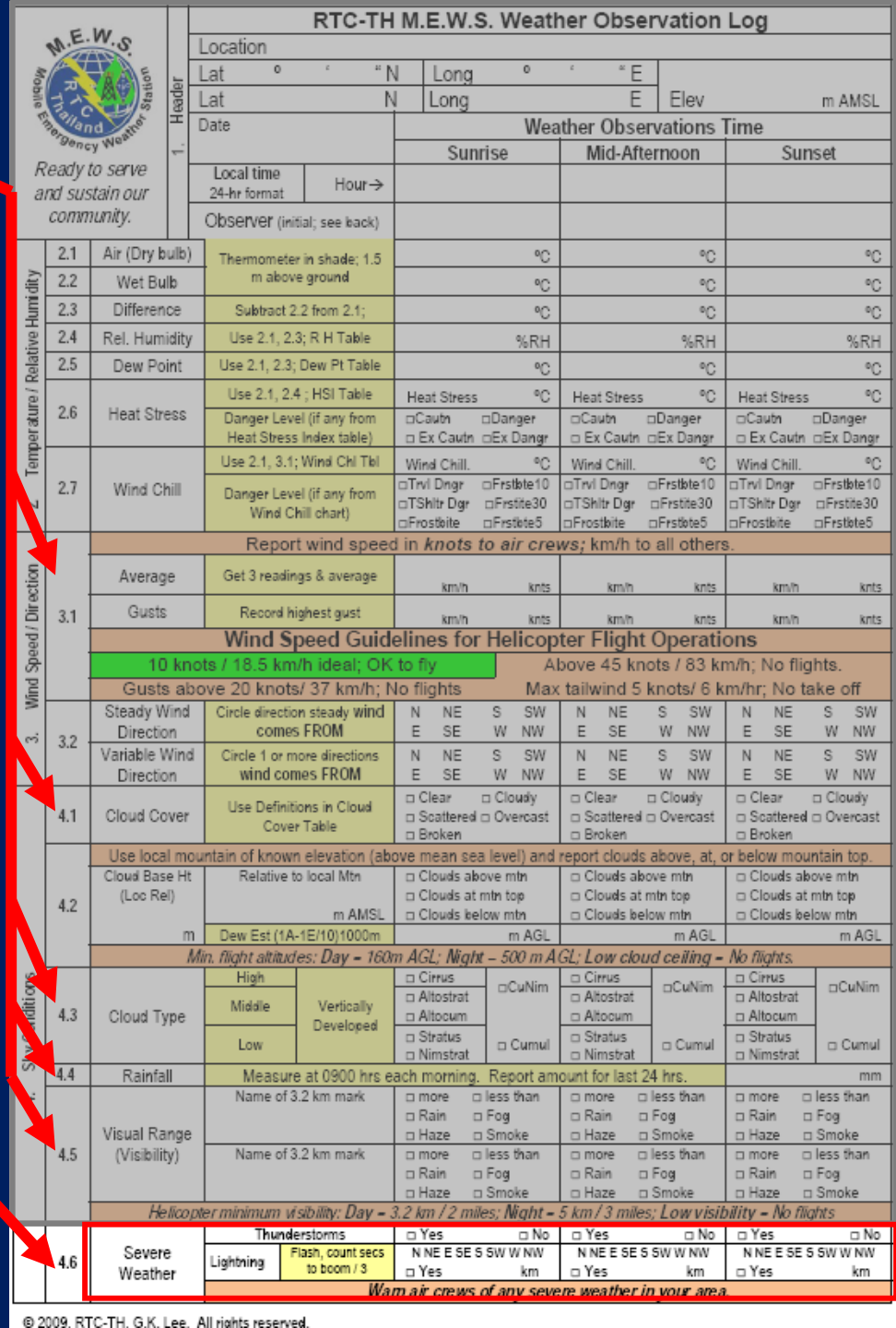
Severe storm

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

Report Thunderstorms & Lightning hazards in Section 4.6

Section 4.6 is specifically for Thunderstorms and Lightning.

See Handbook: 4.6 Severe Weather, p. 29-30



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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 ☐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.				
	3.1 Average	Get 3 readings & average	km/h knts	km/h knts	km/h knts
	3.1 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
	3.2 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 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	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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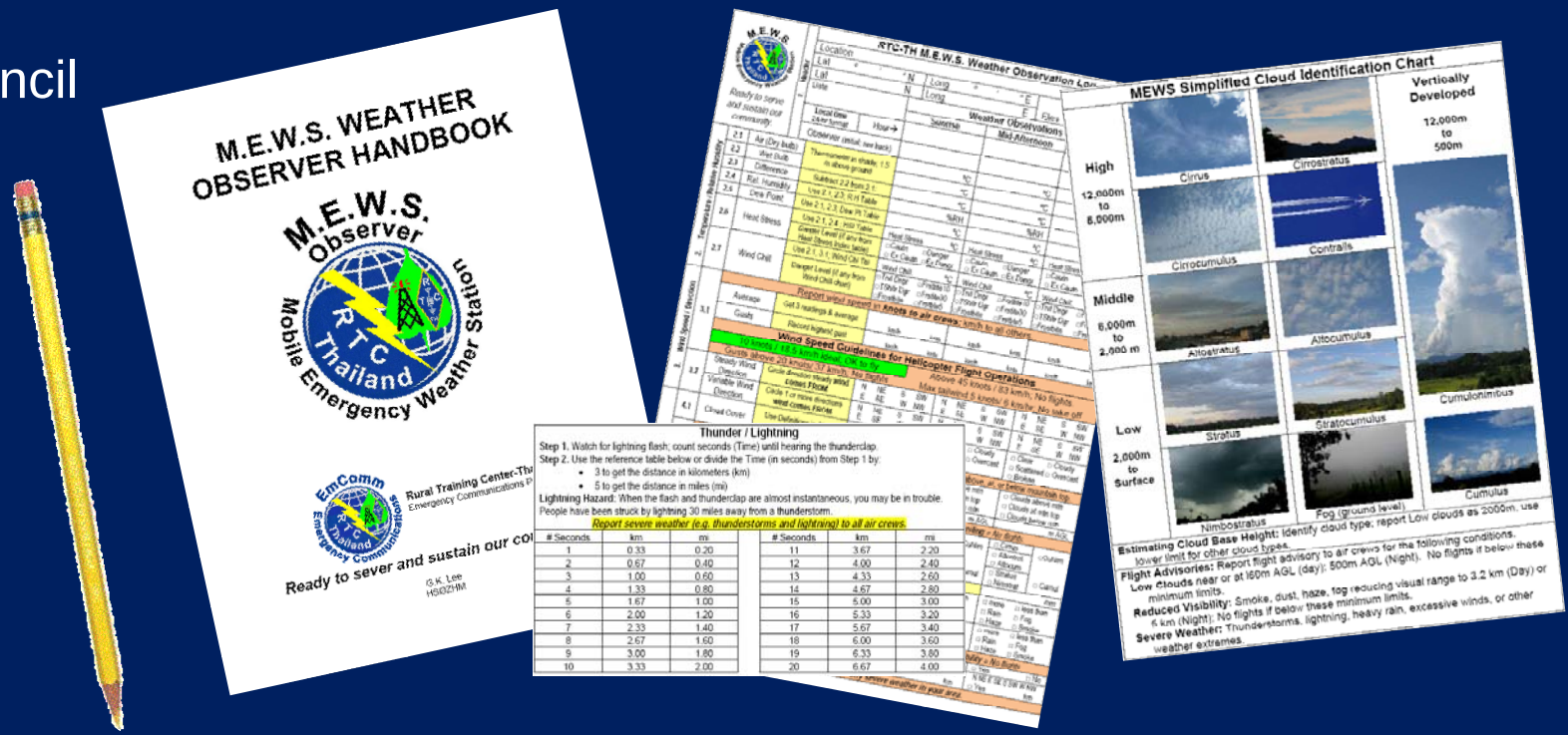
What you need to have to report severe weather conditions

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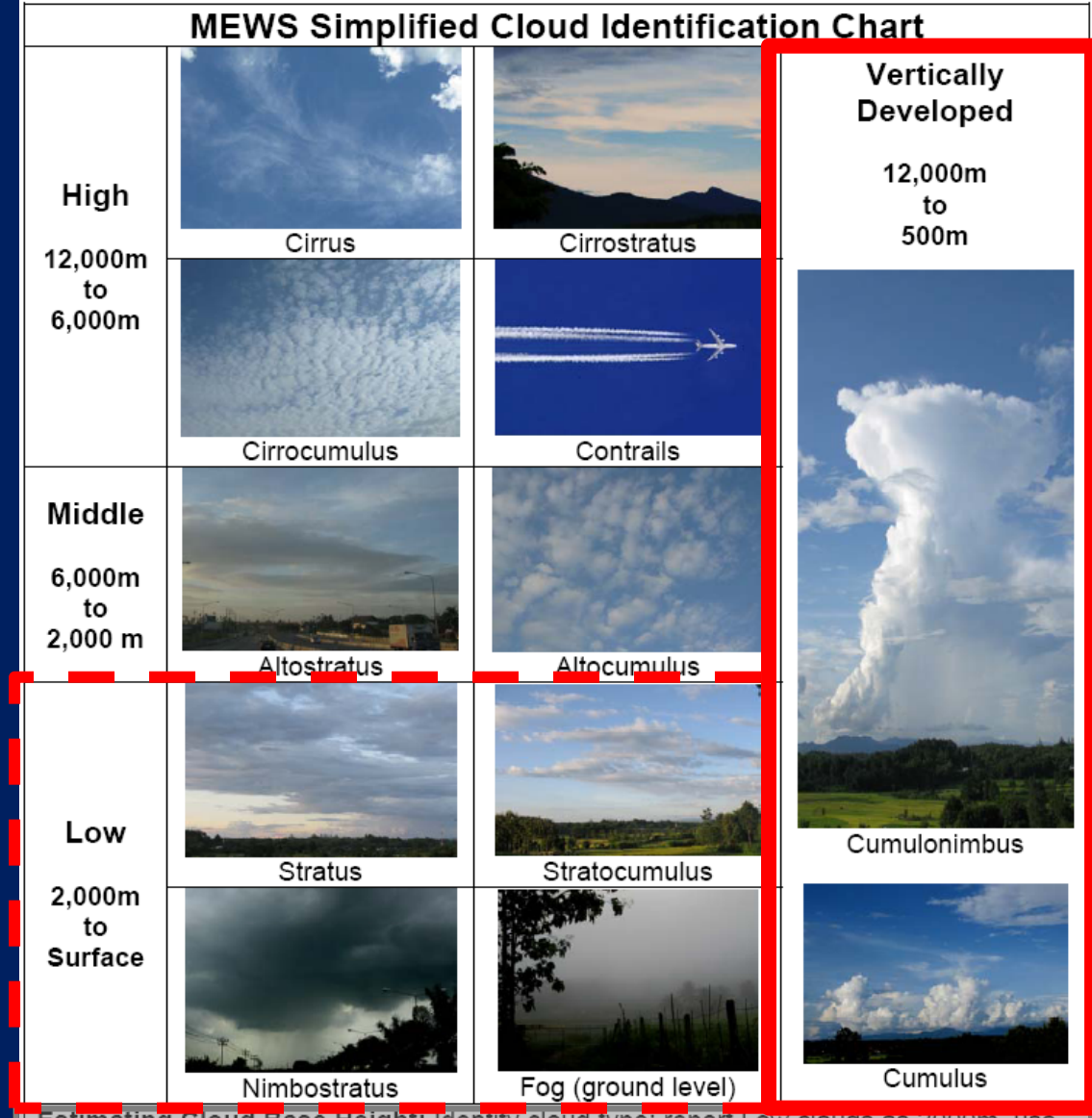
The main concern are clouds affecting helicopter flight operations (low and thunderstorm clouds)

Severe weather is often associated with Cumulonimbus cloud formations.



Estimating Cloud Base Height: Identify cloud type; report Low clouds as 2000m, use

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.

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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 hear the thunder “**Boom**” of the.	3. Divide the number of seconds by 3 = the estimated distance in km.

Note the direction the “Flash” came from.

Report to flight crews the estimated distance and direction of lightning / thunderstorms to your station.

Seek safety any time you see lightning.

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

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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 is present, check "Yes" and indicate distance and direction from your position.

See Handbook: 4.6 Severe Weather (Flash / Boom method) p. 30

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

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Location				
Lat ° ' " N	Long ° ' " E			
Lat N	Long E	Elev m AMSL		
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		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
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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
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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

4. Sky Conditions

			S SW W NW N NE E SE S SW W NW	S SW W NW N NE E SE S SW W NW	
		Cover Table	☐ Broken	☐ Broken	☐ Cloudy ☐ Clear ☐ Cloudy ☐ Overcast ☐ 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 (Abo 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	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
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		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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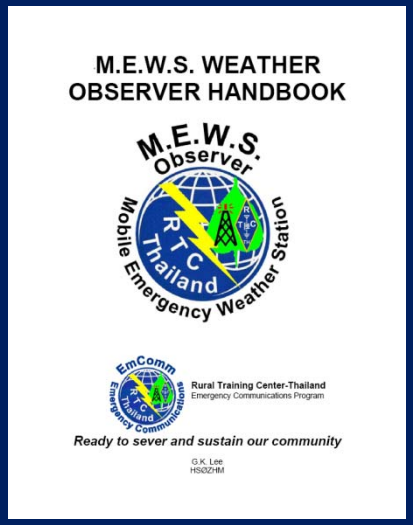
Free Self-Study Materials by Internet

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

www.neighborhoodlink.com/RTC-TH_Tech/pages



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 translation to other languages is welcomed and will be acknowledged and cited.

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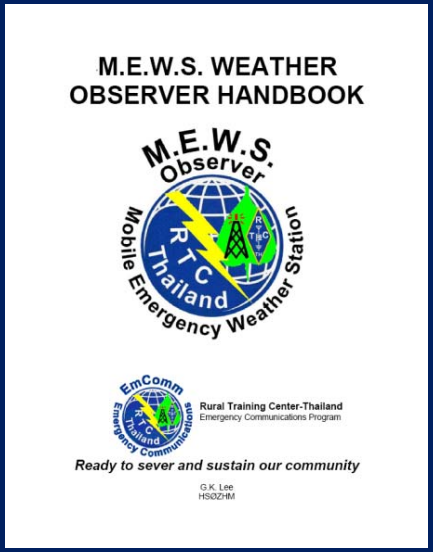
Questions or Comments

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:
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We are always trying to improve our lessons. Your comments and suggestions are welcomed.

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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

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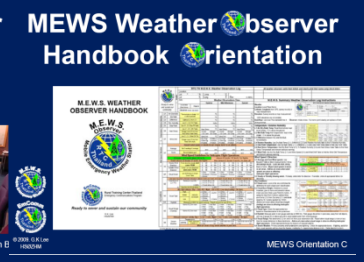
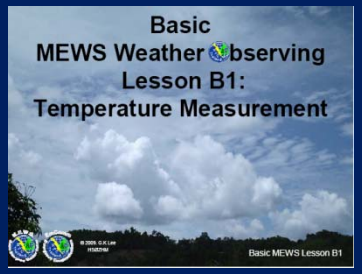
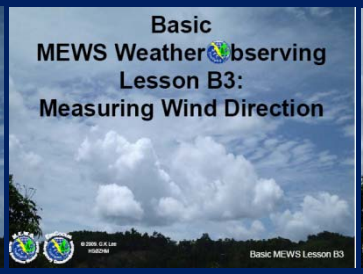
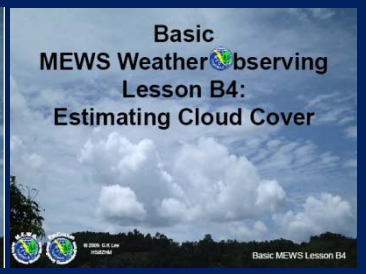
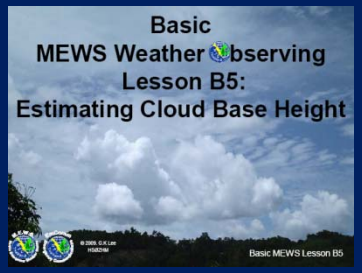
Basic MEWS PDF Lessons

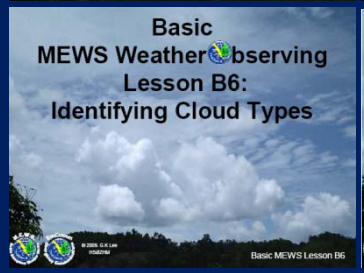


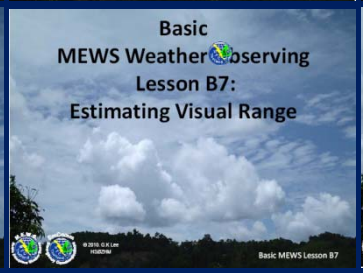












3 Orientation and 8 Basic lessons.
Some show how to build your own weather equipment.

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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

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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
hsØzhm@gmail.com

Via Skype video
conference call: rtc_th

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When you're at the end of your rope, it's too late to start EmComm planning!

Start today and prepare before it is too late.

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Community-based Environmental Education for

Self-Sufficiency and Sustainability for Small Rural Family Farms

RTC Thailand
Rural Training Center Thailand

The End

Continue to see the Addenda on Basic Weather Forecasting

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Something Extra (if you are interested)

Quick look at weather forecasting

This topic is covered in more detail in Lesson A6

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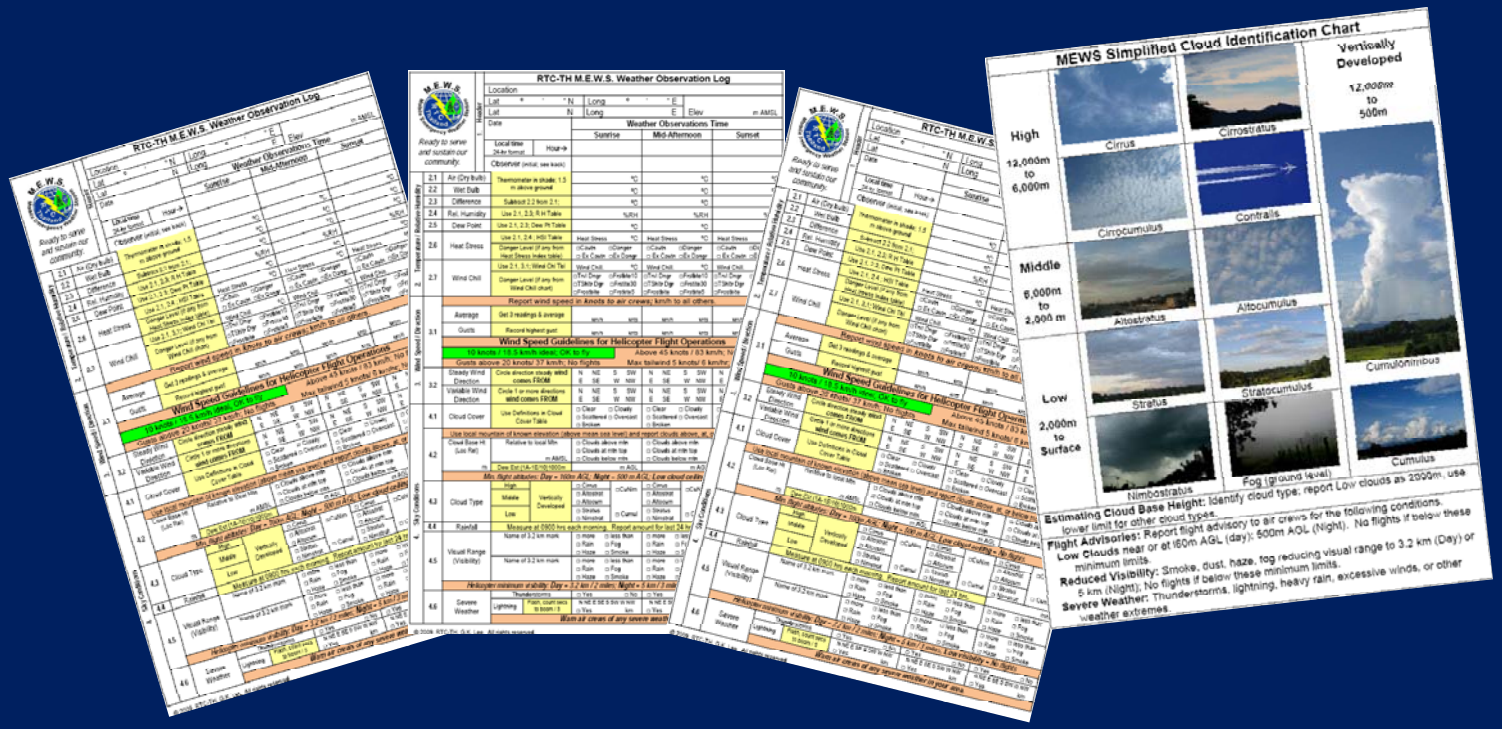
Basic Weather Forecasting by Cloud Observation

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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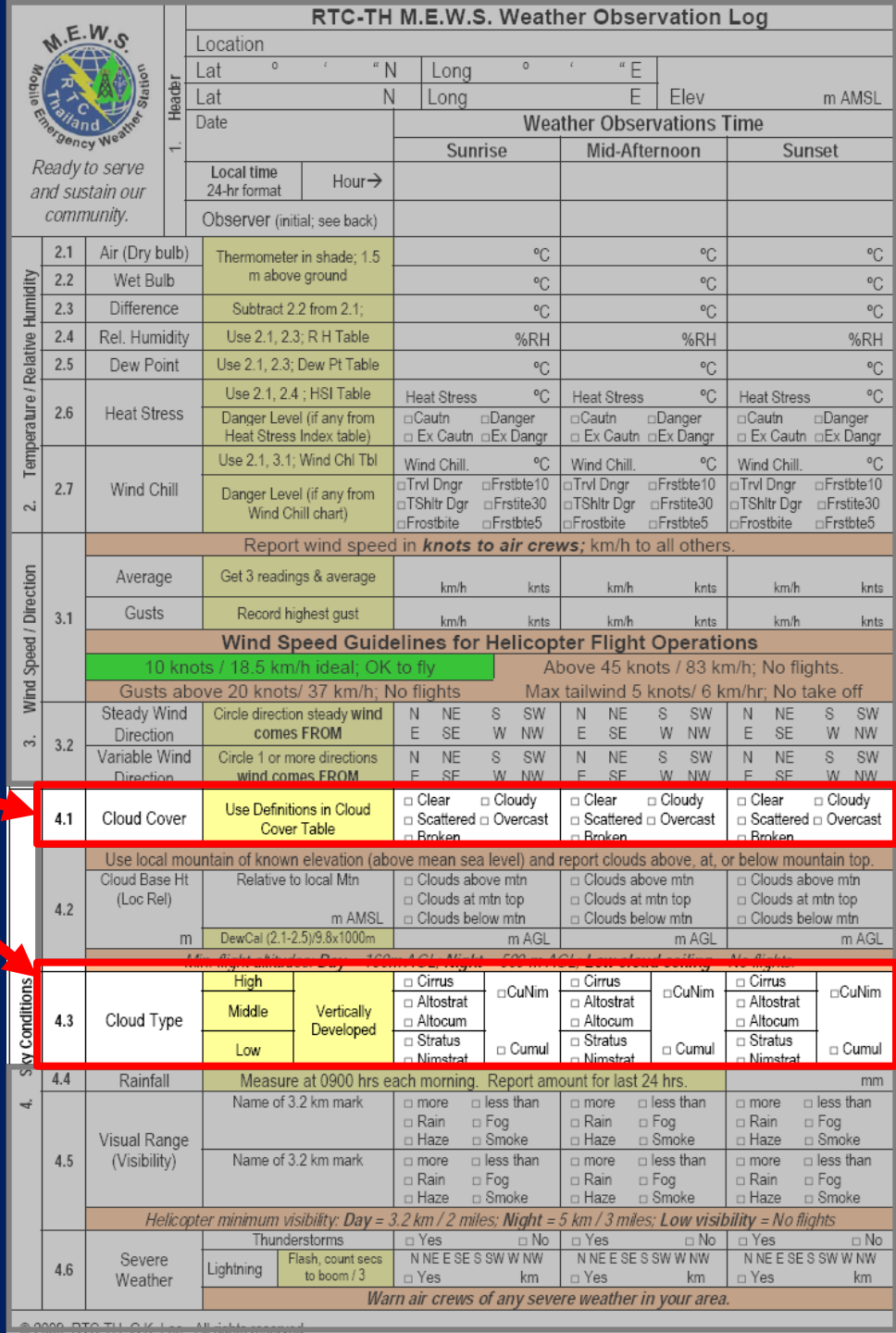
Start with completed log forms

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

Look at the data on Cloud Cover (4.1) and Cloud Type (4.3)

Watch for changes over time.

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



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

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	Gusts	Record highest gust	km/h knts	km/h knts	km/h knts

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Gusts above 20 knots/ 37 km/h; No flights — Max tailwind 5 knots/ 6 km/h; 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 / 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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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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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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I EmComm, therefore I am.

I didn't, therefore I am not

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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/RTC-TH_Tech/pages
E-mail: hsØzhm@gmail.com

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