

Rural Training Center – Thailand (RTC-TH)



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

Basic MEWS Weather Observing Lesson B6: Identifying Cloud Types



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 hs0zhm@gmail.com

www.neighborhoodlink.com/org/rtcth

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.



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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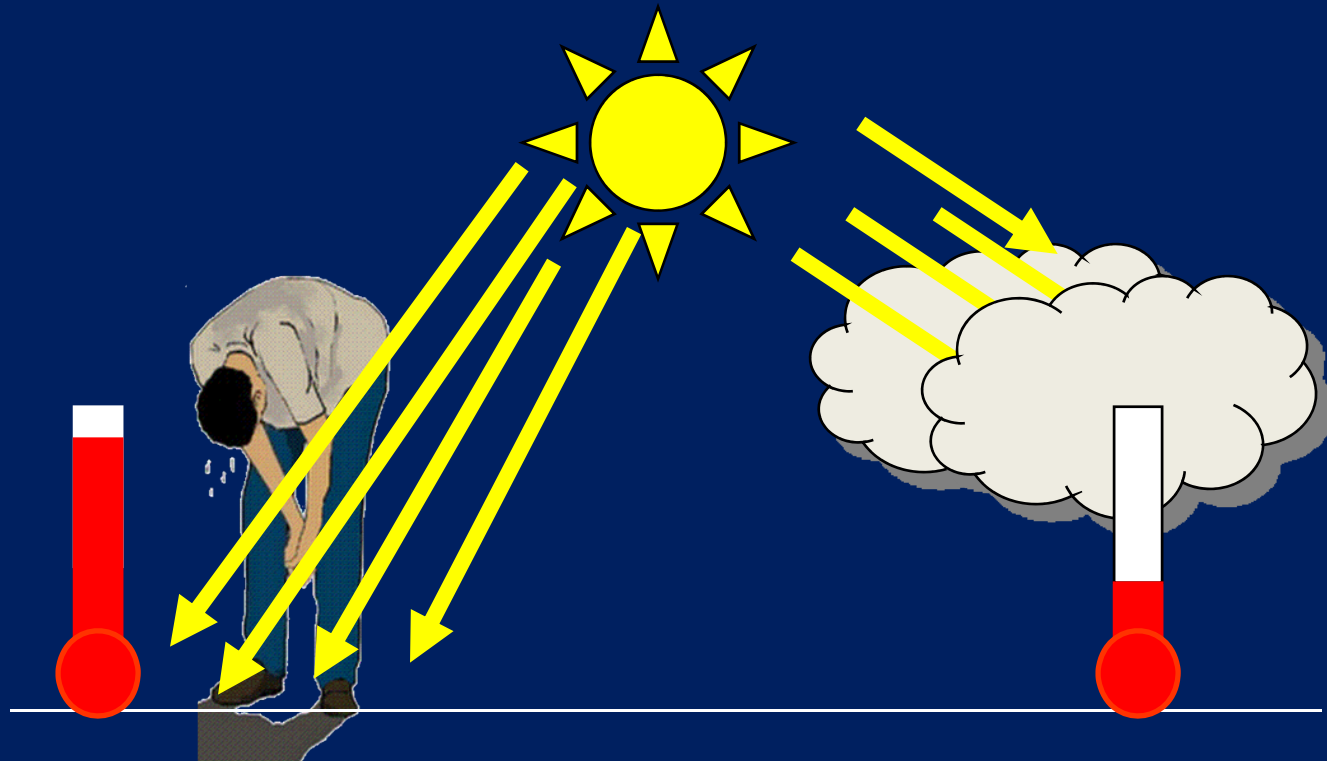
www.neighborhoodlink.com/RTCTH_Tech/pages



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.



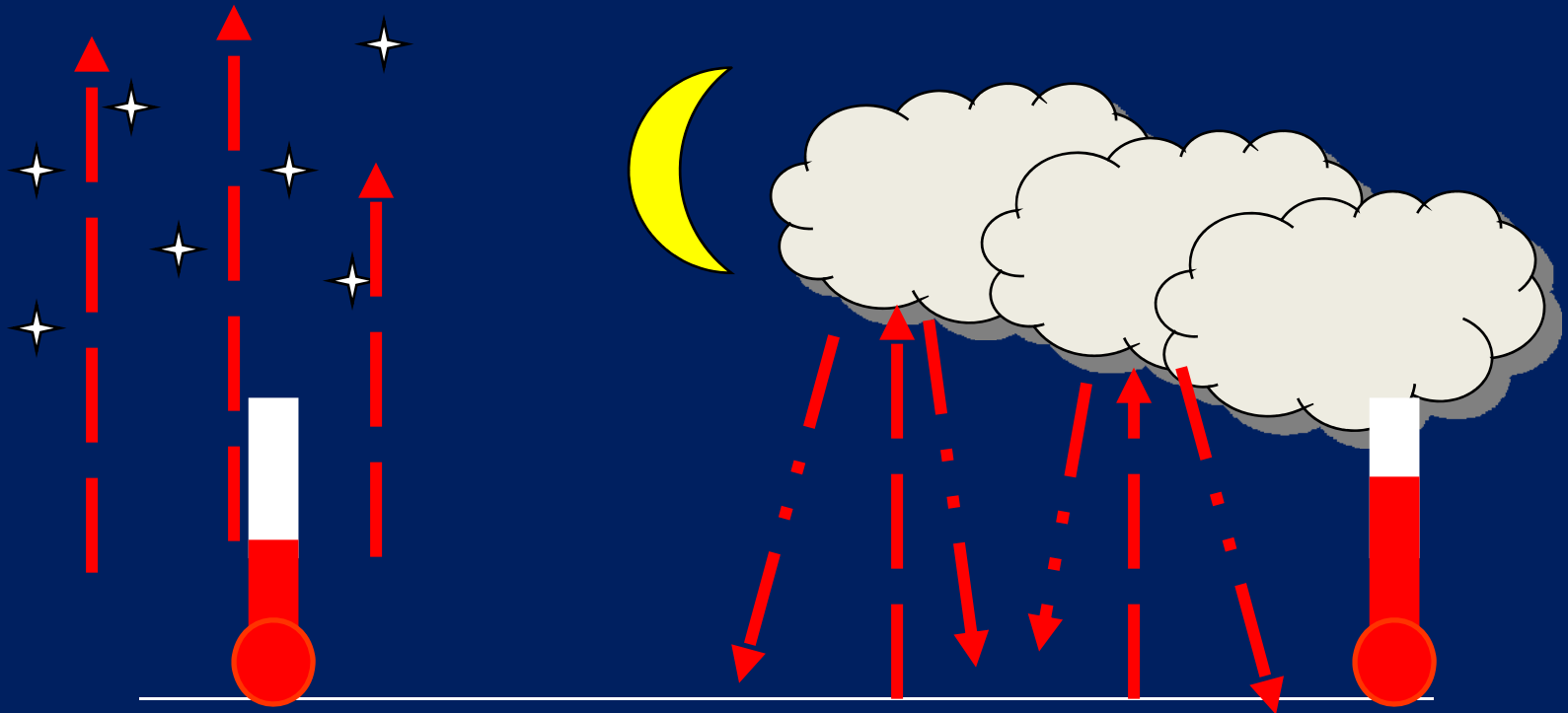
Clouds can reduce the daytime surface temperature.



Clear skies, hotter;
survivors need more
water and shelter

Cloudy skies, cooler;
survivors may not need as
much water and shelter

Clouds can increase the surface temperature at night.



Clear skies, cooler. Survivors may need more clothing, fuel and shelter; morning dew possible

Cloudy skies, warmer. Survivors may need less clothing, fuel, and shelter



Clouds can bring relief to survivors with
rain for much needed water.



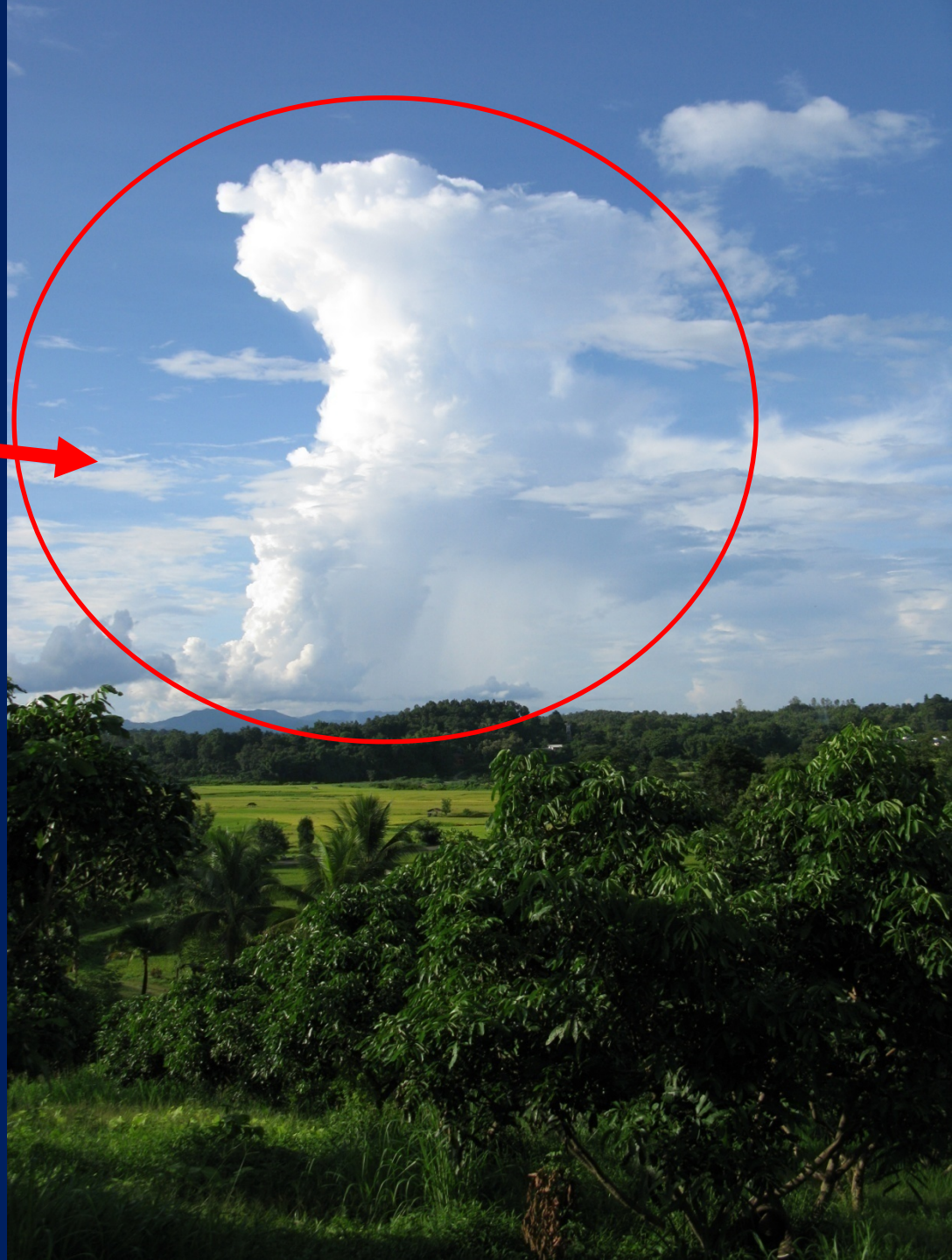


Storm clouds can bring strong winds and heavy rain that adds their misery if they lack shelter.



Clouds can reveal air turbulence, a sign of unsafe flight conditions

Thunderstorms
can have strong
gusts, updrafts,
downdrafts,
heavy rain, hail,
and lightning
creating
dangerous flight
conditions.





Changes in wind direction, cloud types and other weather variables, are important local weather forecasting clues.

See the Addenda after this lesson for Basic Weather Forecasting

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

Sky Conditions	4.3	Cloud Type	High	Vertically Developed	<input checked="" type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim
			Middle		<input checked="" type="checkbox"/> Altostrat		<input type="checkbox"/> Altostrat	<input type="checkbox"/> Altostrat	<input type="checkbox"/> Altostrat	
			Low		<input checked="" type="checkbox"/> Altocum		<input type="checkbox"/> Altocum	<input type="checkbox"/> Altocum	<input type="checkbox"/> Altocum	
					<input checked="" type="checkbox"/> Stratus		<input type="checkbox"/> Stratus	<input type="checkbox"/> Stratus	<input type="checkbox"/> Stratus	
					<input checked="" type="checkbox"/> Cumul	<input type="checkbox"/> Cumul	<input type="checkbox"/> Cumul	<input type="checkbox"/> Cumul	<input type="checkbox"/> Cumul	
					<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Nimstrat	

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

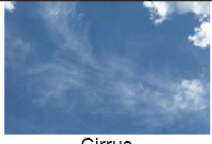











Remember the cloud base height (Line 4.2) is for the lowest cloud type you see.



RTC-TH M.E.W.S. Weather Observation Log									
 Ready to serve and sustain our community.		Location		Lat ° ' " N		Long ° ' " E		Elev m AMSL	
		Lat N		Long E					
		Date		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	°C	°C	°C
	2.2	Wet Bulb		°C	°C	°C	°C	°C	°C
	2.3	Difference	Subtract 2.2 from 2.1;	°C	°C	°C	°C	°C	°C
	2.4	Rel. Humidity	Use 2.1, 2.3; R H Table	%RH	%RH	%RH	%RH	%RH	%RH
	2.5	Dew Point	Use 2.1, 2.3; Dew Pt Table	°C	°C	°C	°C	°C	°C
	2.6	Heat Stress	Use 2.1, 2.4; HSI Table	Heat Stress °C	Heat Stress °C	Heat Stress °C	Heat Stress °C	Heat Stress °C	Heat Stress °C
		Danger Level (if any from Heat Stress Index table)		<input type="checkbox"/> Caution <input type="checkbox"/> Danger <input type="checkbox"/> Extreme Danger	<input type="checkbox"/> Caution <input type="checkbox"/> Danger <input type="checkbox"/> Extreme Danger	<input type="checkbox"/> Caution <input type="checkbox"/> Danger <input type="checkbox"/> Extreme Danger	<input type="checkbox"/> Caution <input type="checkbox"/> Danger <input type="checkbox"/> Extreme Danger	<input type="checkbox"/> Caution <input type="checkbox"/> Danger <input type="checkbox"/> Extreme Danger	

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 < 15 knots / 27 km/h; No flights		Max tailwind 5 knots / 6 km/hr; No take off					
3. Wind	3.1	Steady Wind Direction	Steady wind direction 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	N NE S SW E SE W NW	N NE S SW E SE W NW	
	3.2	Variable Wind Direction	Variable wind direction 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	N NE S SW E SE W NW	N NE S SW E SE W NW	
	4.1	Cloud Cover	Cloud cover in Cloud	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken
	4.2	Cloud Base Ht (Loo Rel)	Cloud Base Ht (Loo Rel)	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn
		Min. flight altitudes: Day - 160m AGL; Night - 500 m AGL; Low cloud ceiling - No flights.							
4. Sky Condition	4.3	Cloud Type	High Middle Low	Vertically Developed	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum <input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	<input type="checkbox"/> CuNim <input type="checkbox"/> Cumul	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum <input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	<input type="checkbox"/> CuNim <input type="checkbox"/> Cumul	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum <input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat
	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	<input type="checkbox"/> more <input type="checkbox"/> less than	<input type="checkbox"/> more <input type="checkbox"/> less than	<input type="checkbox"/> more <input type="checkbox"/> less than	<input type="checkbox"/> more <input type="checkbox"/> less than	<input type="checkbox"/> more <input type="checkbox"/> less than	<input type="checkbox"/> more <input type="checkbox"/> less than
	4.6	Severe Weather	Thunderstorms	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

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

MEWS Simplified Cloud Identification Chart			
High 12,000m to 6,000m	 Cirrus	 Cirrostratus	Vertically Developed 12,000m to 500m  Cumulonimbus
	 Cirrocumulus	 Contrails	
Middle 6,000m to 2,000 m	 Altostratus	 Alto cumulus	
	 Stratus	 Stratocumulus	 Cumulus
Low 2,000m to Surface	 Nimbostratus	 Fog (ground level)	

High	Vertically Developed	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim <input type="checkbox"/> Cumul
Middle		<input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	
Low		<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	

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.




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

Sky Conditions	4.3	Cloud Type	High	Vertically Developed	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim
			Middle		<input type="checkbox"/> Altostrat		<input type="checkbox"/> Altostrat		<input type="checkbox"/> Altostrat	
			Low		<input type="checkbox"/> Altocum		<input type="checkbox"/> Altocum		<input type="checkbox"/> Altocum	
					<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat		<input type="checkbox"/> Cumul		<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	

Low clouds can limit flight altitude and visibility.

Vertically developed clouds can mean turbulence or severe weather.

Reporting this information helps increase flight safety.



Ready to serve and sustain our community.

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

Location

Lat ° ' " N Long ° ' " E

Lat N Long E Elev m AMSL

Date

Local time 24-hr format Hour →

Observer (initial; see back)

Weather Observations Time

Sunrise Mid-Afternoon Sunset

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

us	☐ CuNim	☐ Cirrus	☐ CuNim	☐ Cirrus	☐ CuNim
strat		☐ Altostrat		☐ Altostrat	
cum		☐ Altocum		☐ Altocum	
tus	☐ Cumul	☐ Stratus	☐ Cumul	☐ Stratus	☐ Cumul
strat		☐ Nimstrat		☐ Nimstrat	

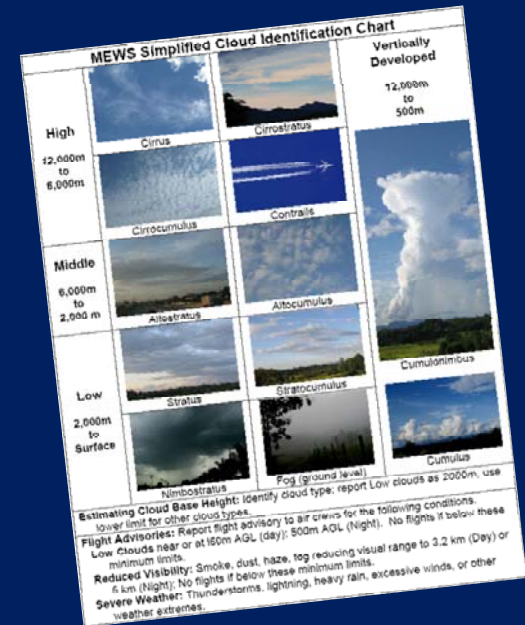
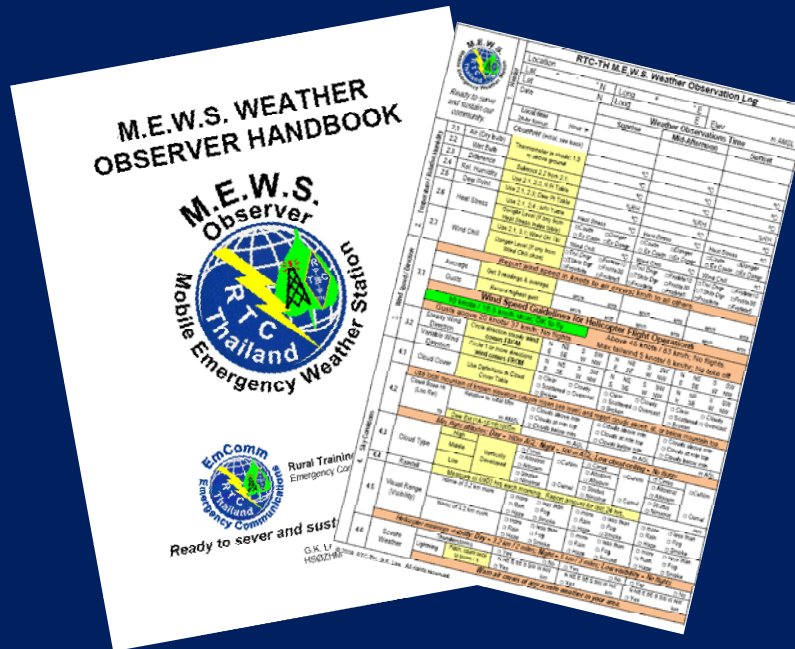
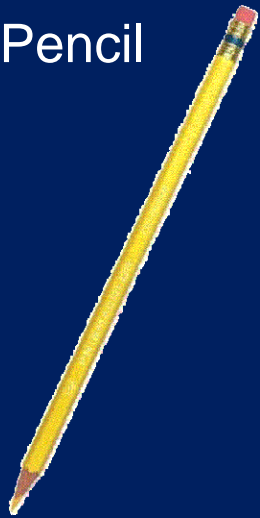
3. Wind Speed/ Direction	3.1	Gusts	Record highest gust	km/h	knts	km/h	knts	km/h	knts						
		Wind Speed Guidelines for Helicopter Flight Operations													
		10 knots / 18.5 km/h ideal; OK to fly				Above 45 knots / 83 km/h; No flights.									
		Gusts > 37 knots / 37 km/h; No flights				Max tailwind 5 knots/ 6 km/hr; No take off									
3.2	3.2	Steady Wind Direction	Steady wind comes FROM	N	NE	S	SW	N	NE	S	SW	N	NE	S	SW
		Variable Direction	More directions comes FROM	E	SE	W	NW	E	SE	W	NW	E	SE	W	NW
				N	NE	S	SW	N	NE	S	SW	N	NE	S	SW
				E	SE	W	NW	E	SE	W	NW	E	SE	W	NW
4.1	4.1	Cloud Cover	in Cloud	<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken				<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken				<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken			
		Use local mountain station data (above mean sea level) and report clouds above, at, or below mountain top.													
		Cloud Base Ht (Loc Rel)	Clouds above mtn	<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn				<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn				<input type="checkbox"/> Clouds above mtn <input type="checkbox"/> Clouds at mtn top <input type="checkbox"/> Clouds below mtn			
		m	Dew Est. 1000m	m AGL				m AGL				m AGL			
Min. flight altitudes: Day - 160m AGL; Night - 500 m AGL; Low cloud ceiling - No flights.															

Sky Condition	4.3	Cloud Type	High	Vertically Developed	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	<input type="checkbox"/> Cirrus	<input type="checkbox"/> CuNim	
			Middle		<input type="checkbox"/> Altostrat	<input type="checkbox"/> Altocum	<input type="checkbox"/> Altostrat	<input type="checkbox"/> Altocum	<input type="checkbox"/> Altostrat	<input type="checkbox"/> Altocum	
			Low		<input type="checkbox"/> Stratus	<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Cumul	<input type="checkbox"/> Stratus	<input type="checkbox"/> Nimstrat	<input type="checkbox"/> Cumul	<input type="checkbox"/> Stratus
4.	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	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than
				<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog
				<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke
			Name of 3.2 km mark	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than	<input type="checkbox"/> more	<input type="checkbox"/> less than
	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog	<input type="checkbox"/> Rain	<input type="checkbox"/> Fog			
	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	<input type="checkbox"/> Haze	<input type="checkbox"/> Smoke	
	Helicopter minimum visibility: Day - 3.2 km / 2 miles; Night - 5 km / 3 miles; Low visibility - No flights										
4.6	Severe Weather	Thunderstorms	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
		Lightning	Flash, count secs to boom / 3	N NE E SE S SW W NW	N NE E SE S SW W NW	N NE E SE S SW W NW	N NE E SE S SW W NW	N NE E SE S SW W NW	N NE E SE S SW W NW		
				<input type="checkbox"/> Yes	<input type="checkbox"/> No	km	<input type="checkbox"/> Yes	<input type="checkbox"/> No	km	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Warn air crews of any severe weather in your area.										



What you need to make a Basic Cloud Type Identification

Pencil



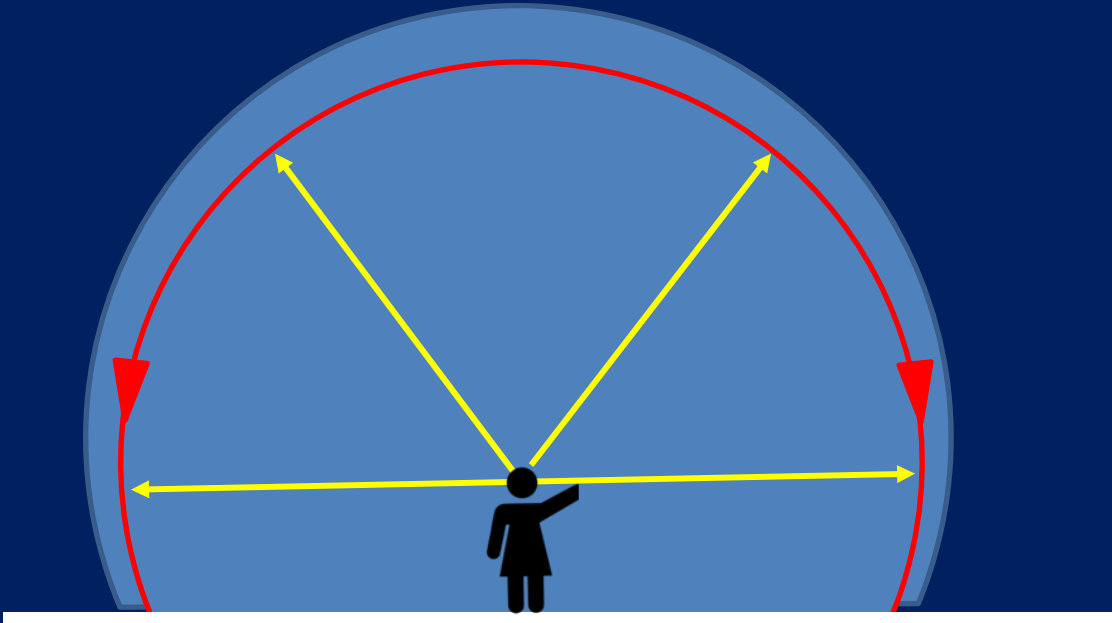
MEWS Handbook,
Cloud Identification
Chart, and Log Form

Cloud Identification
Chart



To identify the clouds...

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



You should also notice the wind direction and pay particular attention to clouds approaching your area. Changes in wind direction and cloud types can help to forecast local weather changes.

Advanced MEWS Lesson A6 is Rudimentary Weather Forecasting



Basic Cloud Forms

- Cirroform (curly)
- Stratiform (flat)
- Cumuloform (lumpy)
- Fog (no shape)

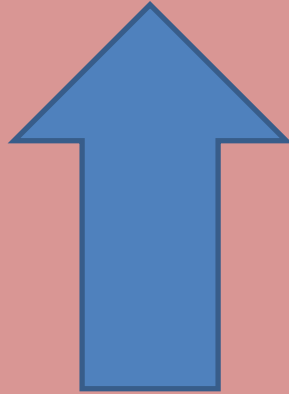


The cloud shape is a clue to its height and type.



Cloud Height Groups

Clouds are grouped by the relative altitude where they occur and their shape.

High 12,000m to 6,000m	Cirrus Cirrostratus Cirrocumulus Contrails	Vertically Developed Clouds 12,000m to 500m  Cumulonimbus Cumulus
Middle 6,000m to 2,000m	Altostratus Alto cumulus	
Low 2,000m to surface	Nimbostratus Stratocumulus Stratus Fog	

MEWS observers in Nan Province supporting flight operations should pay attention to these cloud groups.

In Nan Province, helicopters operating from 3,000m to 6,000m are safely above Doi Phu Kha (the tallest mountain in Nan).



High Clouds





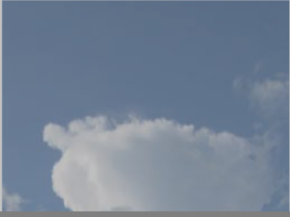
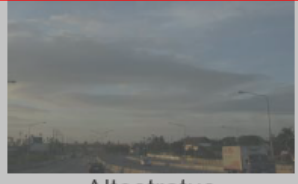
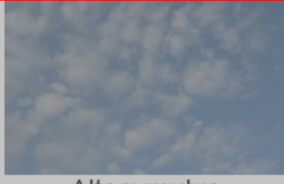






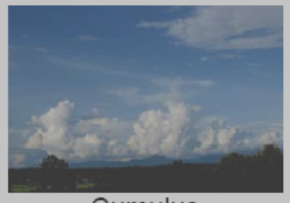
are found from 6,000m to 12,000m AGL (above ground level)

High Cloud Types

Cirrus
Cirrostratus
Cirrocumulus
Contrails

High Clouds usually do not affect helicopter flight operations

MEWS Simplified Cloud Identification Chart

High 12,000m to 6,000m			Vertically Developed 12,000m to 500m
	Cirrus	Cirrostratus	
Middle 6,000m to 2,000 m			
	Cirrocumulus	Contrails	
Low 2,000m to Surface			
	Altostratus	Altostratus	
Low 2,000m to Surface			
	Stratus	Stratocumulus	
Low 2,000m to Surface			
	Nimbostratus	Fog (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 160m 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.



High Cloud Names

High 12,000m to 6,000m		
	Cirrus	Cirrostratus
		
	Cirrocumulus	Contrails

Cirrus = high curly clouds

Cirrostratus = high flat clouds

Cirrocumulus = high lumpy clouds

Contrails = condensation clouds from high flying aircraft



Clouds and Flight Operations

High Clouds are usually not a factor affecting emergency helicopter flight operations.

High

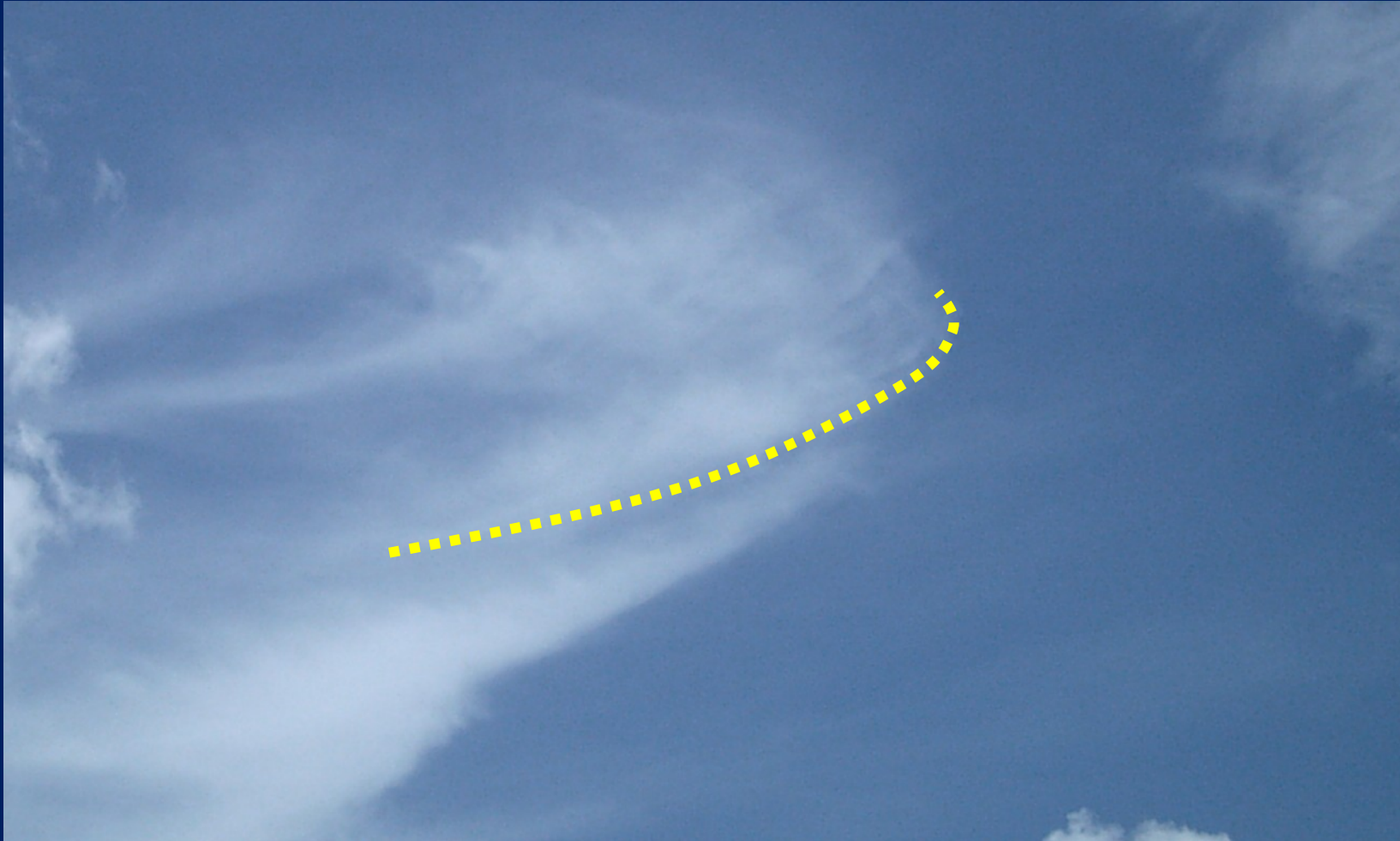
12,000 m
6,000 m

High Clouds indicate fair weather or a change in weather may be occurring in the next 12 - 24 hrs

The direction High Clouds move gives you an idea of the direction from which a storm will be approaching your area.



Cirrus = high curly clouds



Cirrostratus = high flat clouds

Seen from
an airplane
at about
11,000 m
above the
ground

Cirrus

Altostratus

Alto cumulus



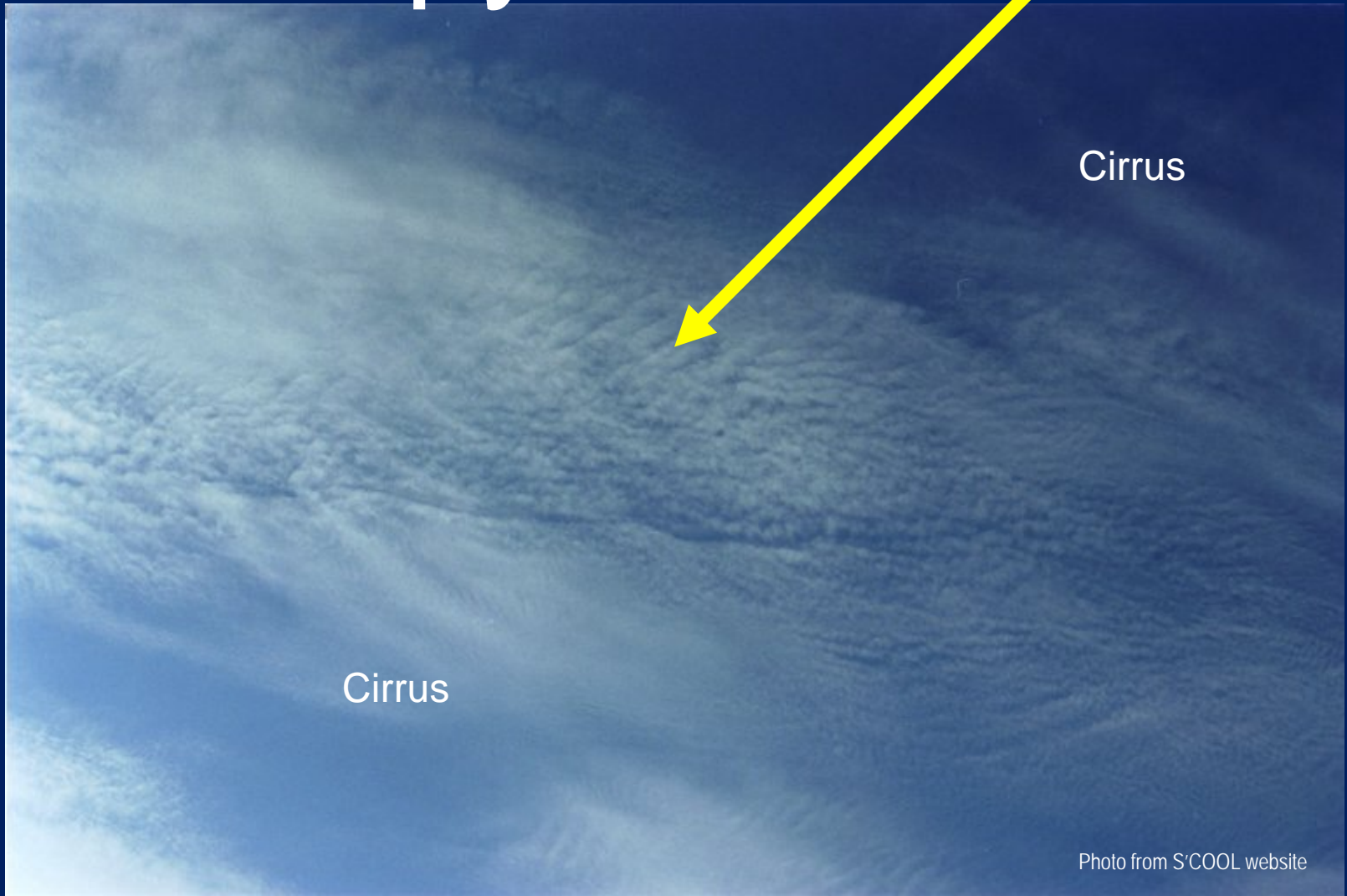
Cirrostratus = high flat clouds



Contrails =
artificial
clouds made
by high flying
aircraft



Cirrocumulus = high lumpy clouds



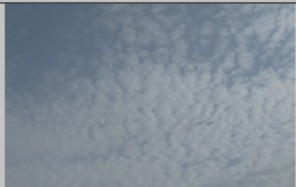





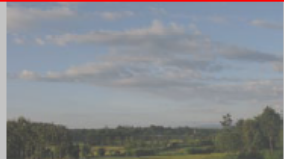
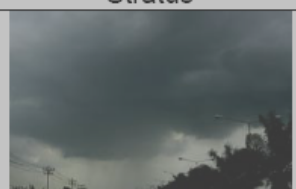

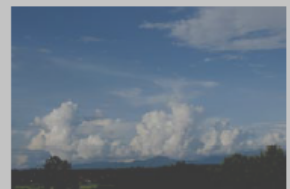


Middle Clouds

are found from 2,000m to 6,000m AGL

Middle Clouds Types
 Altostratus
 Altocumulus

Middle Clouds usually do not affect helicopter flight operations (unless there are high mountains in the area)

MEWS Simplified Cloud Identification Chart				
High 12,000m to 6,000m			Vertically Developed 12,000m to 500m	
				
Middle 6,000m to 2,000 m				
Low 2,000m to Surface				
				
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 160m 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.				

Middle Cloud Names

Middle

**6,000m
to
2,000 m**



Altostratus



Alto cumulus

Altostratus = middle flat clouds

Alto cumulus = middle lumpy clouds



Clouds and Flight Operations

Middle Clouds generally do not affect emergency flight operations unless there are high mountains in your area at those altitudes.

Middle Clouds tend to indicate air stability (little or no turbulence)

Middle

6,000 m
2,000 m

Middle clouds can also mean overcast skies and light rain.

Middle Clouds are high enough NOT to limit flight altitude, and if there are “holes” in the cloud layers, do not limit flight operations



Altostratus = middle flat clouds

Seen from
an airplane
at about
11,000 m
above the
ground

Cirrus

Cirrostratus



Altostratus



Alto cumulus = middle lumpy clouds

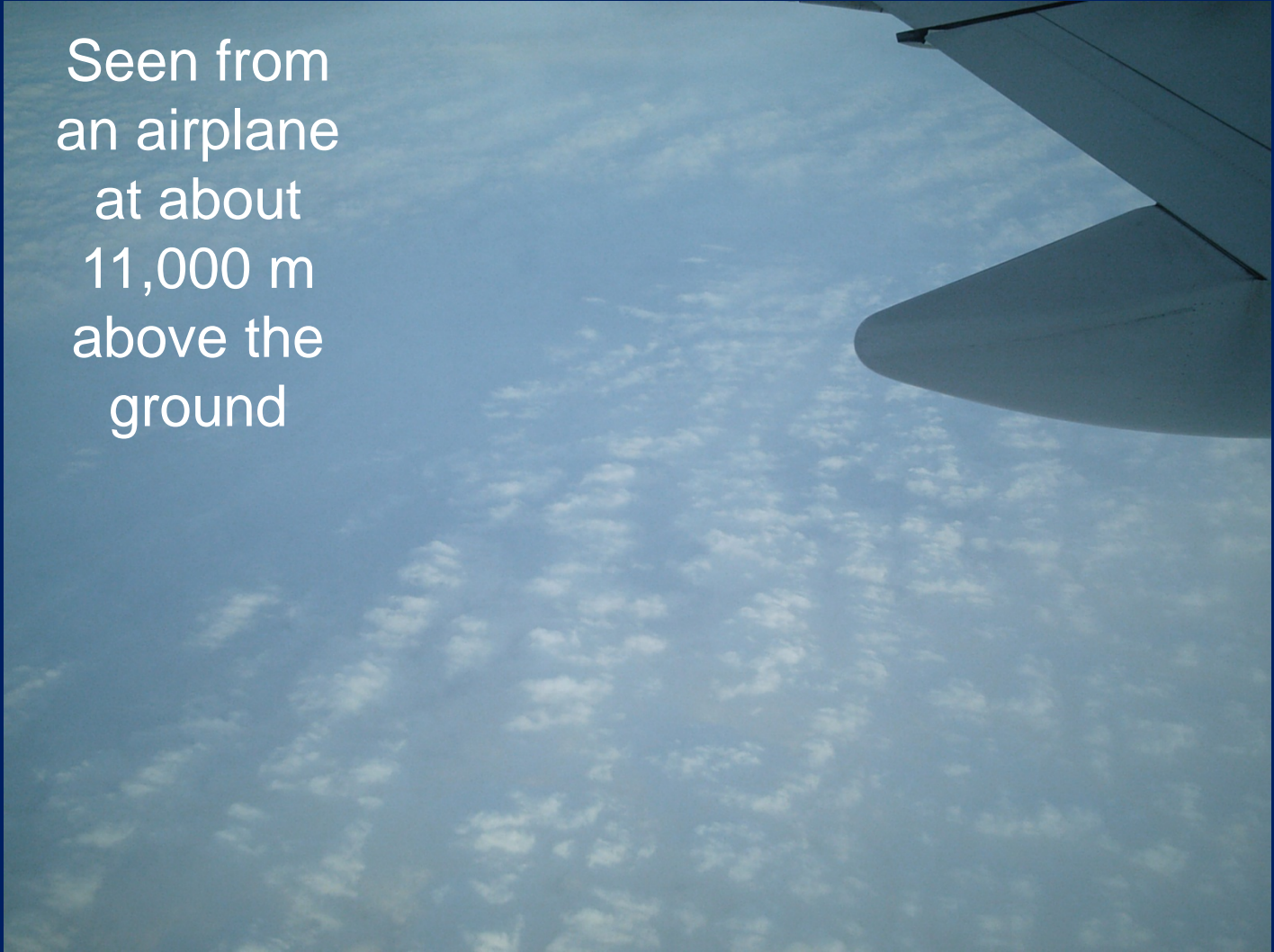


Looking up from the ground.



Alto cumulus = middle lumpy clouds

Seen from
an airplane
at about
11,000 m
above the
ground



Low Clouds



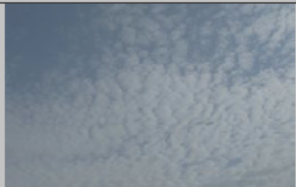


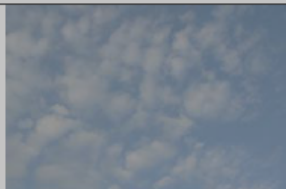
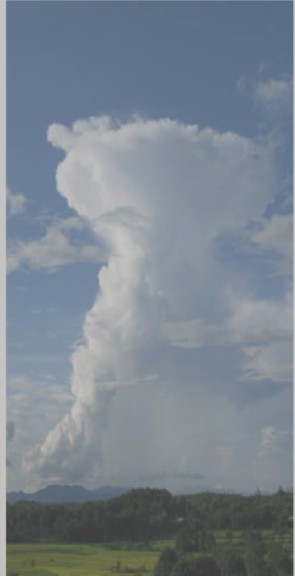
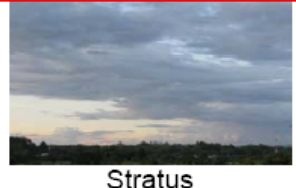




are found from the surface to 6,000m AGL

Low Clouds Types

Nimbostratus
Stratocumulus
Stratus
Fog
(Cumulus)

Low Clouds usually affect helicopter flight operations

MEWS Simplified Cloud Identification Chart

High 12,000m to 6,000m	 Cirrus	 Cirrostratus	Vertically Developed 12,000m to 500m
	 Cirrocumulus	 Contrails	
Middle 6,000m to 2,000 m	 Altostratus	 Altostratus	 Cumulonimbus
Low 2,000m to Surface	 Stratus	 Stratocumulus	
	 Nimbostratus	 Fog (ground level)	 Cumulus

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

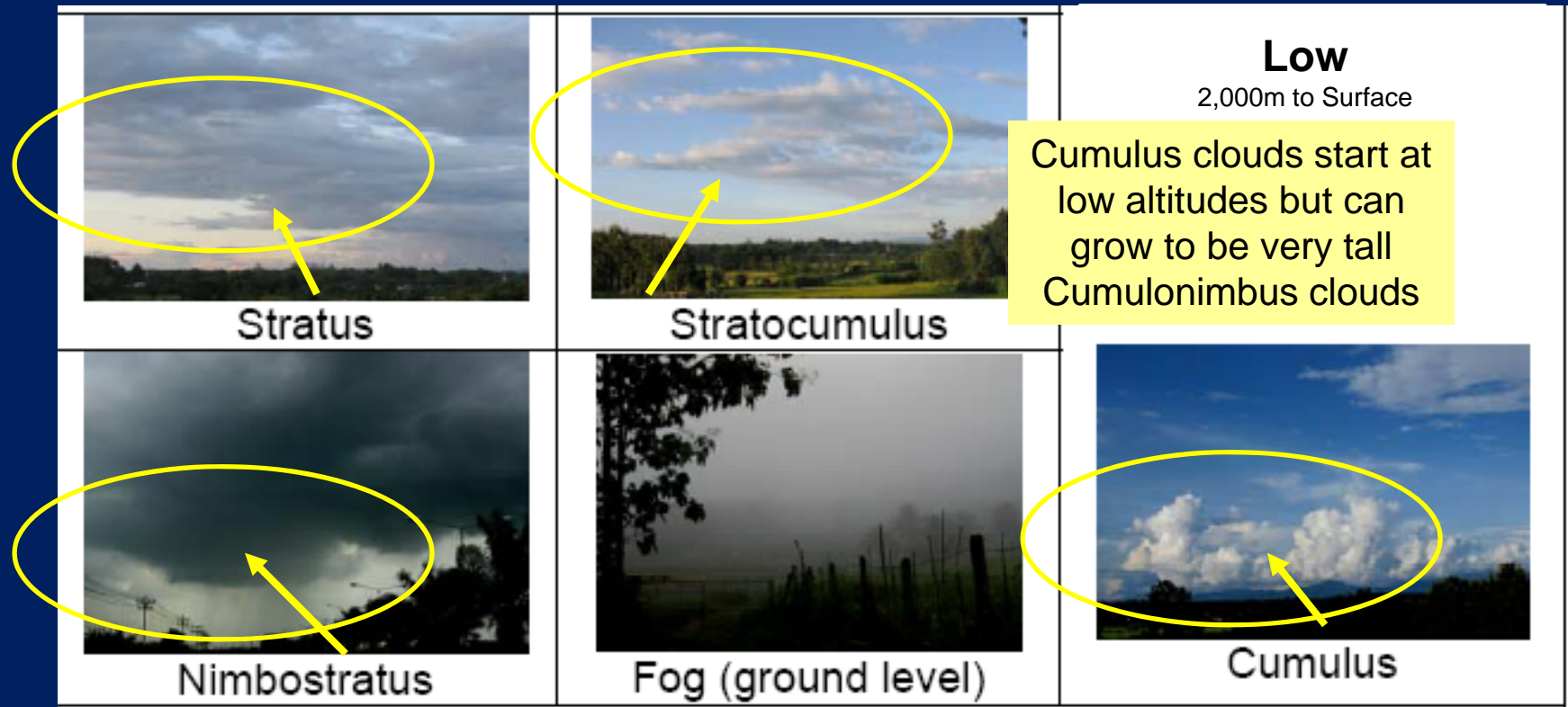
Flight Adv Low Cloud minimum Reduced 5 km

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

Cumulus clouds are a low altitude type of vertically developed cloud.



Low Cloud Names



Nimbostratus = low flat clouds with rain

Cumulus = low lumpy clouds

Stratus = low flat clouds

Stratocumulus = low flat clouds with some lumps

Fog = a flat cloud at ground level



Clouds and Flight Operations

Low Clouds and Vertically Developed Clouds can seriously affect helicopter flight operations.

For flight operations, **Low** and **Vertically Developed** clouds are very significant.

Low clouds set the altitude limit for VFR helicopter operations.

Low	2,000 m surface
-----	--------------------

Vertically
Developed
Clouds

12,000 m

500 m

Vertically Developed Clouds are associated with air turbulence and can bring severe winds, heavy rain, hail, and lightning.



Stratus = low flat clouds



Stratus = low flat clouds



Stratus clouds seen from the side and from above

This photo was taken from an airplane about 5,500 m above the ground.



Stratocumulus



Nimbostratus = flat clouds with rain



Fog is a special kind of low cloud.



It is at
ground
level,
so it
has no
shape
we can
easily
see.

Fog is a flight safety hazard.

It reduces horizontal visibility and keeps the flight crew from seeing the ground. Even a very thin fog layer just a few centimeters thick at ground level can make landings difficult.

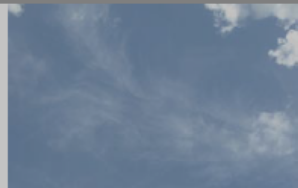



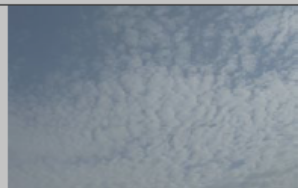

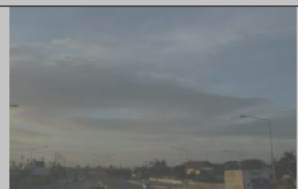
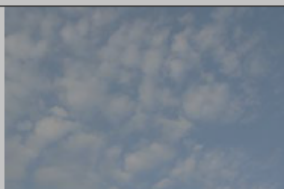
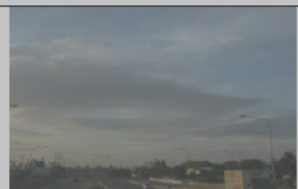
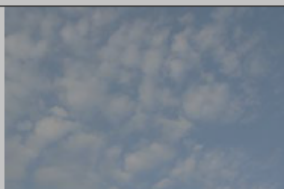
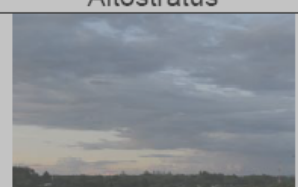

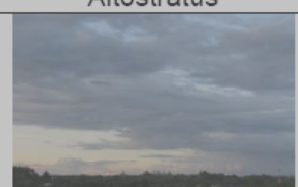

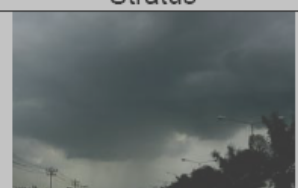
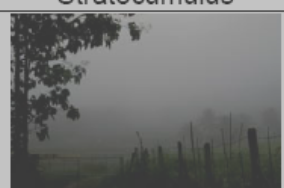


Vertically Developed Clouds

are found from the
500m to 12,000m
AGL

**Vertically Developed
Clouds Types**
Cumulonimbus
Cumulus

Vertically Developed
Clouds can produce
very hazardous
conditions for
helicopter flight
operations

MEWS Simplified Cloud Identification Chart			
High 12,000m to 6,000m			<div>Vertically Developed</div> <div>12,000m to 500m</div>  <div>Cumulonimbus</div>  <div>Cumulus</div>
			
Middle 6,000m to 2,000 m			
			
Low 2,000m to Surface			
			
			
Estimating Cloud Base Height: Identify cloud type; report Low clouds as 2000m, use lower limit for other cloud types.			
Cumulonimbus clouds create thunderstorms which can have strong gusts, turbulence,, heavy rain, hail, and lightning			
weather extremes.			



Vertically Developed Clouds

Cumulonimbus =
towering lumpy clouds
with heavy rain

Cumulus = towering lumpy
clouds; they start off
as low clouds but can
develop into
Cumulonimbus clouds

These clouds can be associated with air
turbulence and severe weather conditions
(e.g. lightning, strong gusts, etc.)

Vertically
Developed

12,000m
to
500m



Cumulonimbus



Cumulus



Cumulus clouds
start low and some
can grow quite tall.



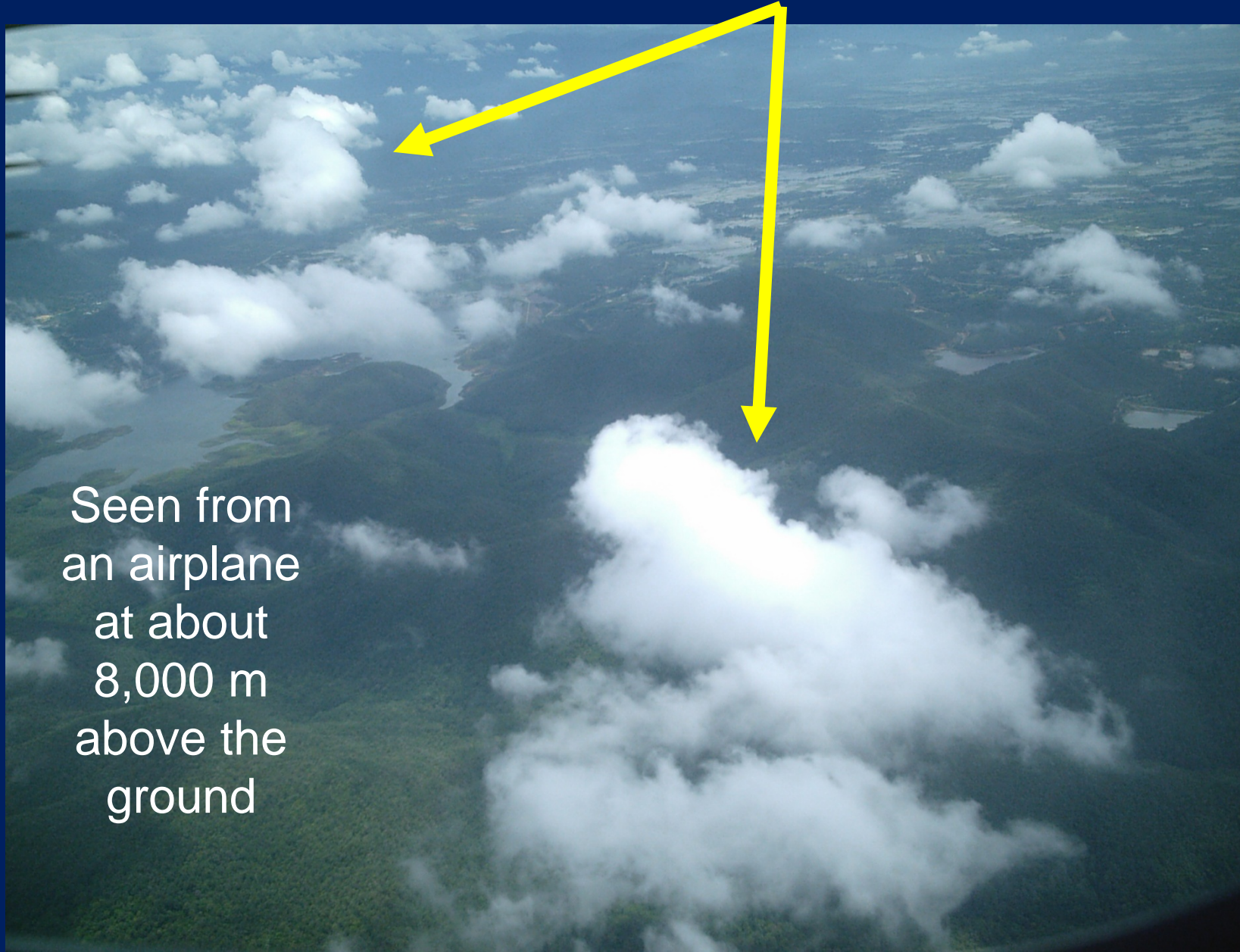
These clouds
are listed as
low clouds
because they
start low
(500m) and
can develop
vertically to
12,000m



Cumulus = low lumpy clouds



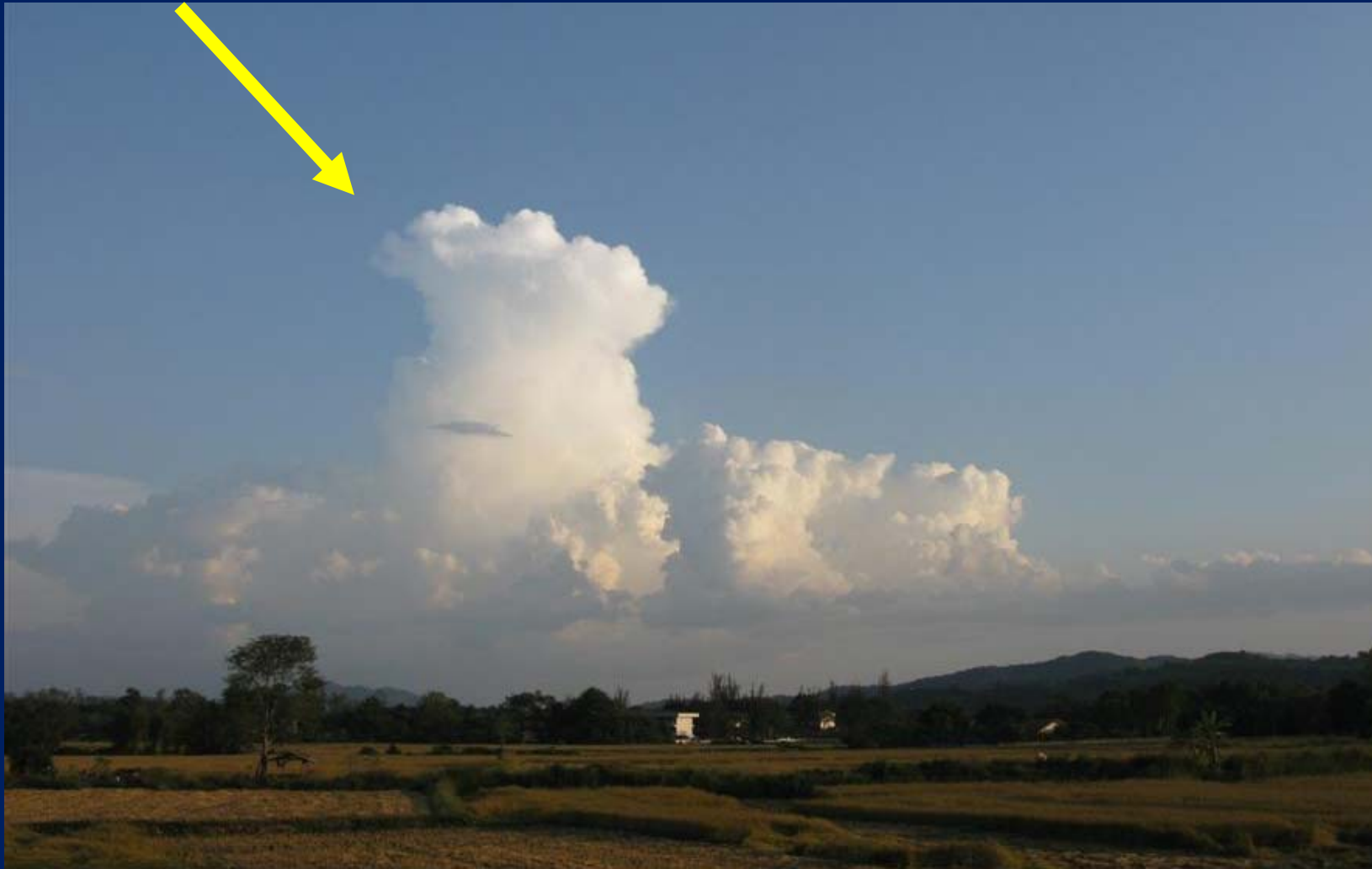
Cumulus clouds seen from above



Seen from
an airplane
at about
8,000 m
above the
ground



Cumulonimbus = towering lumpy clouds; heavy rain



Cumulonimbus = towering lumpy clouds; heavy rain



Seen from an airplane at about
13,000 m above the ground

Photo by T. O'Leary from S'COOL website



Clouds and Flight Operations

Low Clouds and Vertically Developed Clouds can seriously affect helicopter flight operations.

For flight operations, **Low** and **Vertically Developed** clouds are very significant.

Low clouds set the altitude limit for VFR helicopter operations.

Low

2,000 m
surface

Vertically
Developed
Clouds

12,000 m

500 m









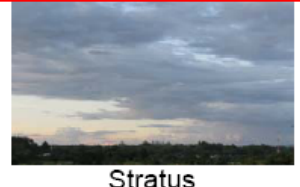



Vertically Developed Clouds are associated with air turbulence and can bring severe winds, heavy rain, hail, and lightning.



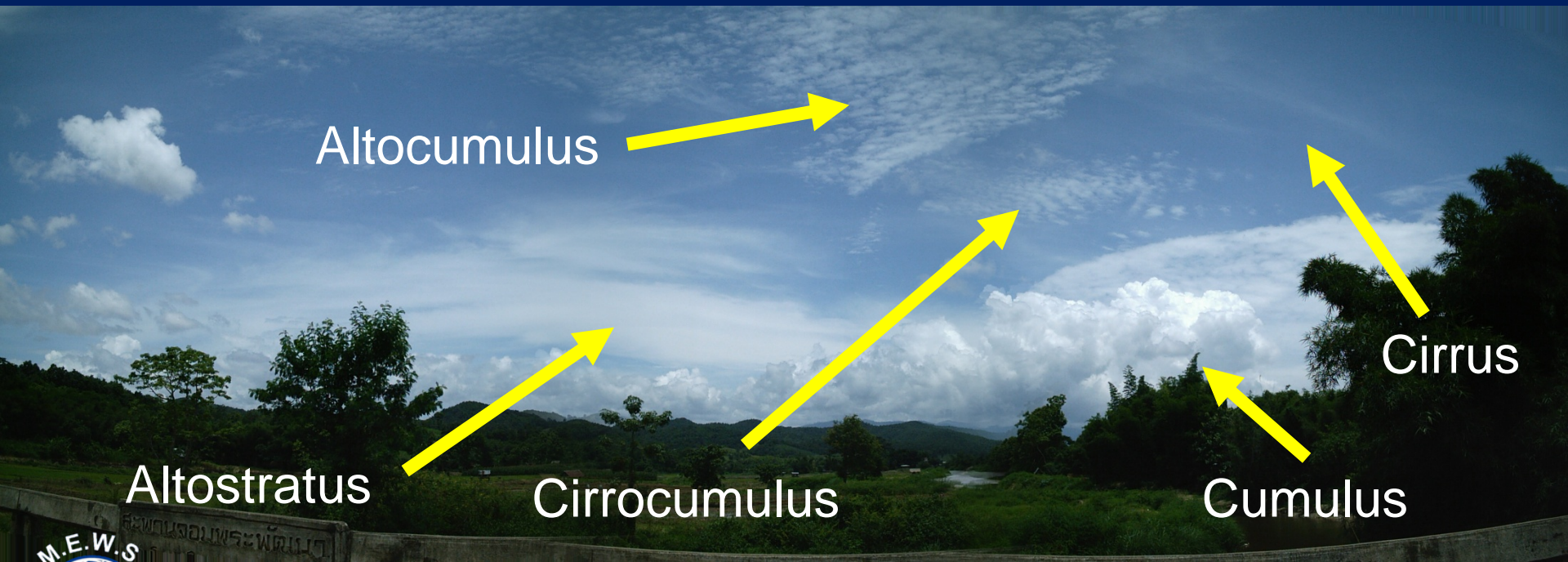
For helicopter flight operations, the Low and Vertically Developed Clouds are very important.

For helicopters
 High clouds = **OK**
 Middle clouds = **OK**
 (unless high mountains are present)
 Low = **Dangerous**
 conditions could exist; **give flight advisories when necessary** →



MEWS Simplified Cloud Identification Chart				
High 12,000m to 6,000m	 Cirrus	 Cirrostratus	Vertically Developed 12,000m to 500m	 Cumulonimbus
	 Altostratus	 Altostratus		
Middle 6,000m to 2,000 m	 Altostratus	 Altostratus		 Cumulus
	 Stratus	 Stratocumulus		
Low 2,000m to Surface	 Nimbostratus	 Fog (ground level)		
Estimating Cloud Base Height: Identify cloud type; report Low clouds as 2000m, use lower limit for other cloud types.				
Low Clouds near or at 160m AGL (day); 500m AGL (Night). No flights if below these minimum limits.				
Severe Weather: Thunderstorms, lightning, heavy rain, excessive winds, or other weather extremes.				

There may be more than type of cloud in the sky at the same time.















For emergency flight operations, the main concern are Low Clouds (they can limit flying altitude) and Vertically Developed clouds (indicating turbulence or possible severe weather).



Use the Cloud Identification Chart in the MEWS Weather Observer Handbook. Then check the appropriate boxes on the MEWS log form.

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

MEWS Simplified Cloud Identification Chart

High 12,000m to 6,000m	 Cirrus	 Cirrostratus	Vertically Developed 12,000m to 500m  Cumulonimbus
	 Cirrocumulus	 Contrails	
Middle 6,000m to 2,000 m	 Altostratus	 Altocumulus	 Cumulus
Low 2,000m to Surface	 Stratus	 Stratocumulus	
	 Nimbostratus	 Fog (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 160m 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.



Possible Flight Advisories

Low clouds in your area. Be alert to possible Low Cloud conditions in your area that may require reporting flight advisories:

- Low cloud base heights
- Rain reducing visibility
- Fog reducing visibility or making it hard for air crews to see the ground

See the VFR flight minimums are listed on the MEWS Log form

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



Severe Weather Hazards

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

See the VFR flight minimums are 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.

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

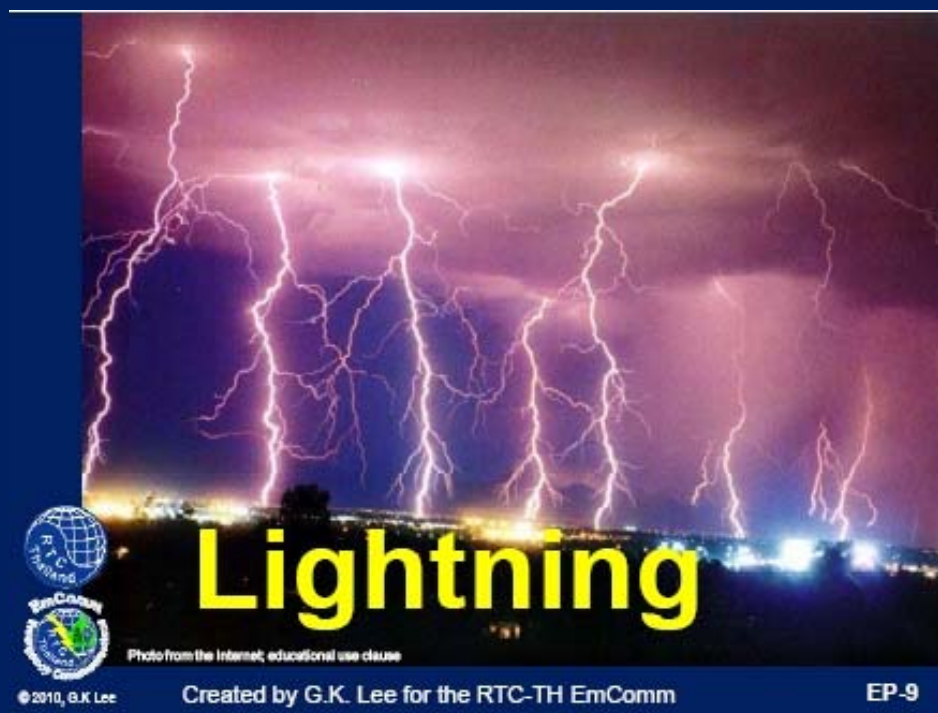




Lightning Hazards



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.

Lightning Hazard for Radio Operators

Lightning 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; disconnect antenna from radio.
- **Wait 30 min** after hearing the last thunder before resuming operations

See Basic MEWS Lesson B8 to learn to estimate distance to Lightning.

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



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 updates prior to landings and take-offs for flight safety.

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



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

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

Record the specific local time of your observations

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

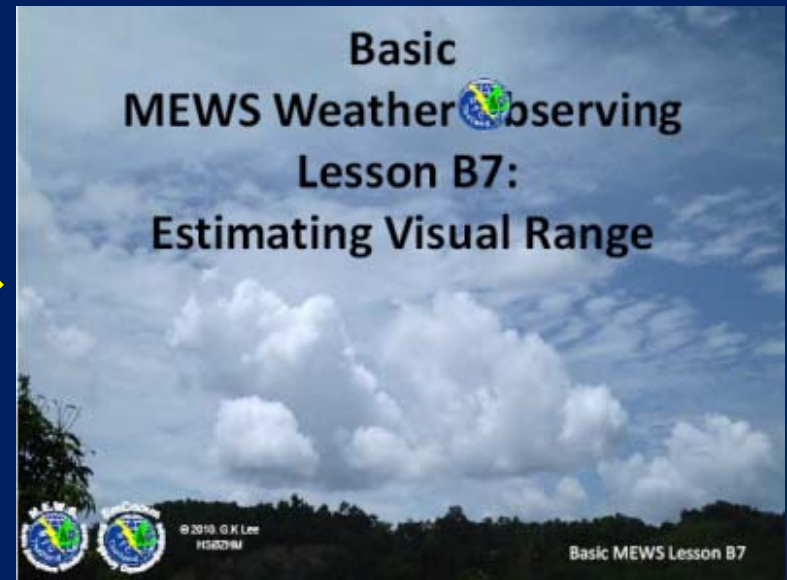
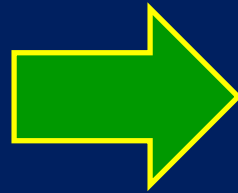
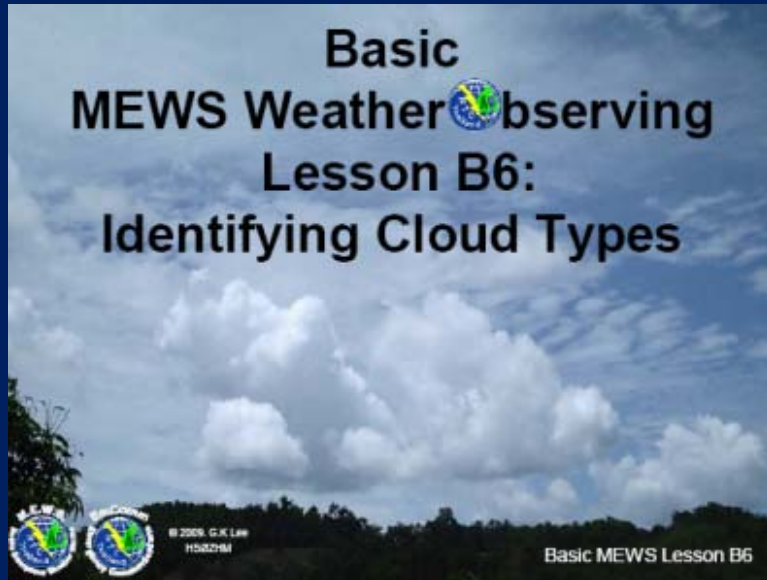
If a HAM, print your call sign (or name if no call sign)

Record the Cloud Types in Section 4.3

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



Now you know to make a Basic Cloud Type Identification



You are now ready for Basic MEWS
Lesson B7: Estimating Visual Range

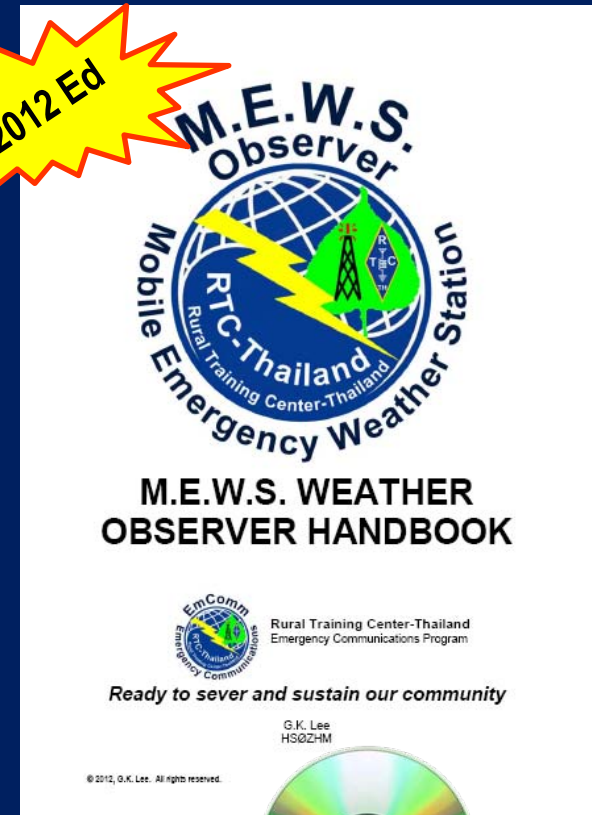
Free Self-Study Materials by Internet

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



All of the lessons have been classroom and field proven.

Send e-mail to
hs0zhm@gmail.com to request
free training materials for non-
commercial use only.

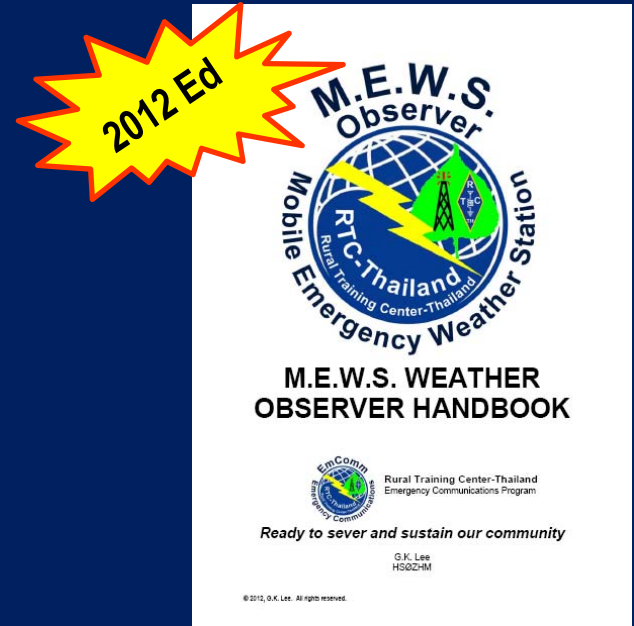


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HS0ZHM All rights reserved.

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:
hs0zhm@gmail.com
We are always trying to improve our
lessons. Your comments and
suggestions are welcomed.

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

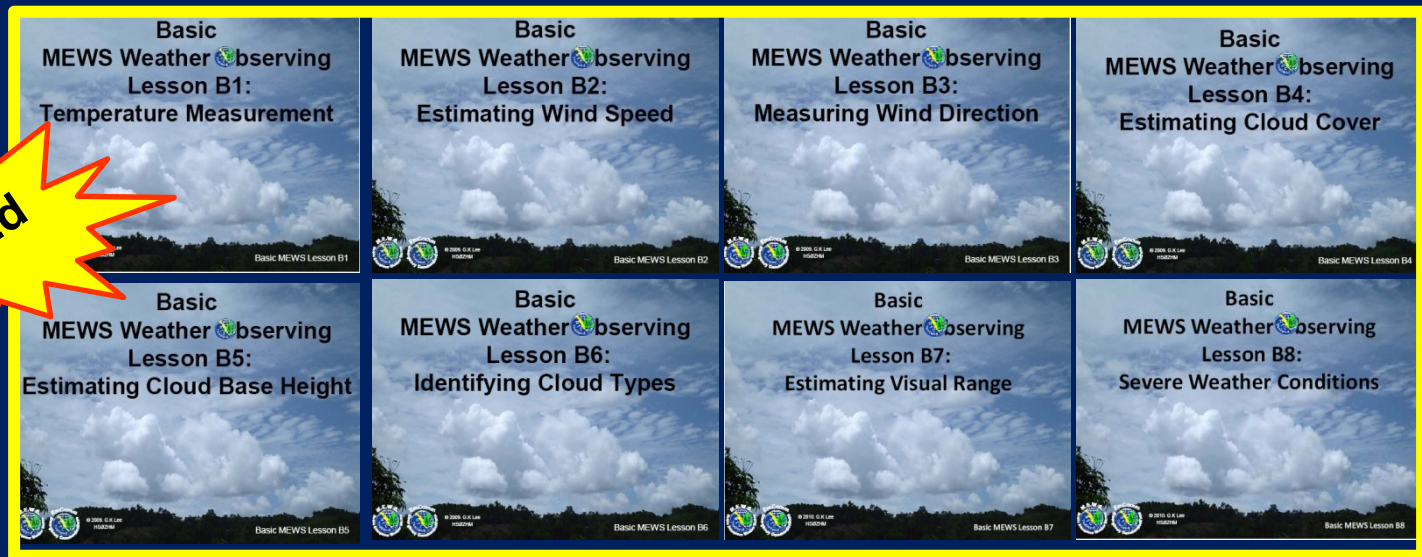
B 7: Estimating Visual Range

B 8: Severe Weather Conditions

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



Basic MEWS PDF Lessons



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

2012 Ed



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



Advanced MEWS PDF Lessons

Advanced MEWS Weather Observing Lesson A1: Measuring Relative Humidity and Heat Stress



Advanced MEWS Weather Observing Lesson A2: Measuring Wind Speed and Wind Chill



Advanced MEWS Weather Observing Lesson A3: Using Dew Point Temperature to Calculate Cloud Base Height



Advanced MEWS Weather Observing Lesson A4: Measuring Rainfall



Advanced MEWS Weather Observing Lesson A5: Reporting Severe Weather



Advanced MEWS Weather Observing Lesson A6: Weather Forecasting



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



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](#)

Community-based Environmental Education for



The End

Continue to see the Addendum to learn about Hail and Basic Weather Forecasting Using Clouds



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



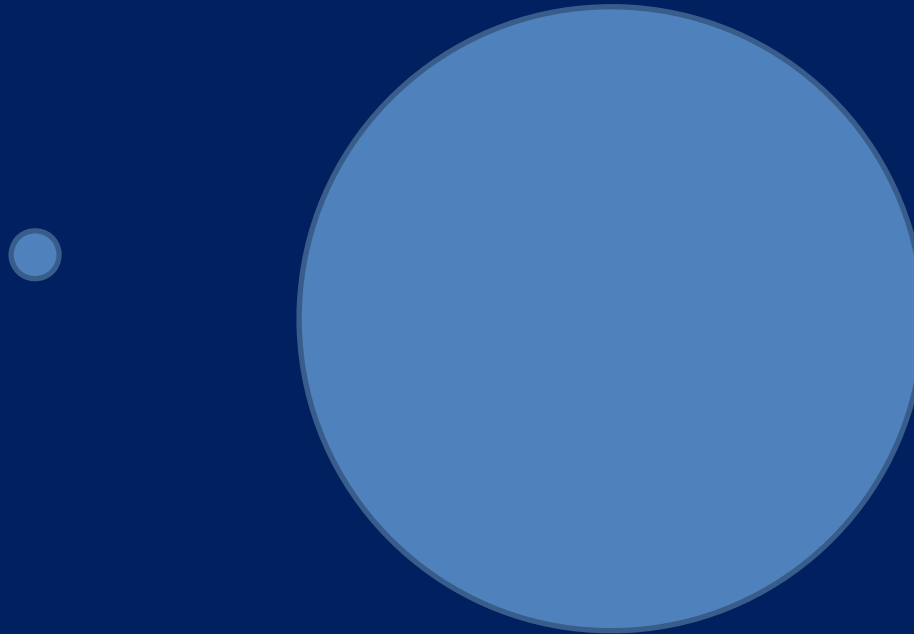
Photos from the Internet; educational fair use clause



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

How big is hail?

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



Relative sizes, not to scale.



Hail can be very damaging



Hail can be falling
about 90+ km/h!

Basic Weather Forecasting is Optional

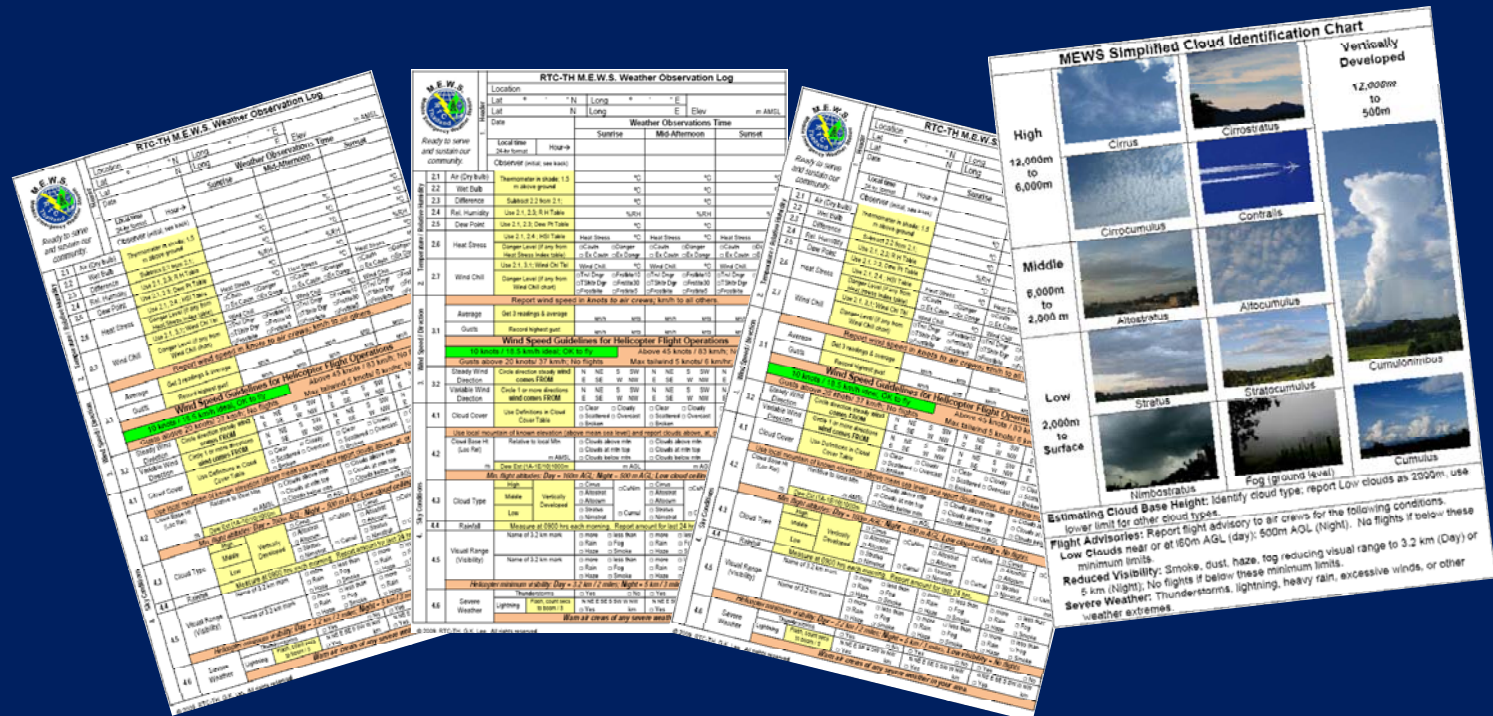


Images from the internet: educational fair use clause

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.

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.

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											
Header		Location		Lat		Long		Elev			
		°	'	" N	°	'	" E	m AMSL			
1.		Date		Weather Observations Time							
		Local time 24-hr format		Hour →		Sunrise		Mid-Afternoon		Sunset	
		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)		<input type="checkbox"/> Cautn <input type="checkbox"/> Danger <input type="checkbox"/> Ex Cautn <input type="checkbox"/> Ex Dangr		<input type="checkbox"/> Cautn <input type="checkbox"/> Danger <input type="checkbox"/> Ex Cautn <input type="checkbox"/> Ex Dangr		<input type="checkbox"/> Cautn <input type="checkbox"/> Danger <input type="checkbox"/> Ex Cautn <input type="checkbox"/> 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)		<input type="checkbox"/> Trvl Dngr <input type="checkbox"/> Frstbtle10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstsite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbtle5		<input type="checkbox"/> Trvl Dngr <input type="checkbox"/> Frstbtle10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstsite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbtle5		<input type="checkbox"/> Trvl Dngr <input type="checkbox"/> Frstbtle10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstsite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbtle5			
3. Wind Speed / Direction	Report wind speed in knots to air crews ; km/h to all others.										
	Average	Get 3 readings & average		km/h		knts		km/h		knts	
	Gusts	Record highest gust		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										
3.1	Steady Wind Direction	Circle direction steady wind comes FROM		N	NE	S	SW	N	NE	S	SW
				E	SE	W	NW	E	SE	W	NW
3.2	Variable Wind Direction	Circle 1 or more directions wind comes FROM		N	NE	S	SW	N	NE	S	SW
				E	SE	W	NW	E	SE	W	NW
4.1	Cloud Cover	Use Definitions in Cloud Cover Table		<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken		<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> Broken		<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Scattered <input type="checkbox"/> Overcast <input type="checkbox"/> 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.		Clouds above mtn		Clouds above mtn		Clouds above mtn			
		Relative to local Mtn		Clouds at mtn top		Clouds at mtn top		Clouds at mtn top			
		m AMSL		Clouds below mtn		Clouds below mtn		Clouds below mtn			
4.3	Cloud Type	DewCal (2.1-2.5)/9.8x1000m		m AGL		m AGL		m AGL			
		High	Vertically Developed	<input type="checkbox"/> Cirrus <input type="checkbox"/> CuNim		<input type="checkbox"/> Cirrus <input type="checkbox"/> CuNim		<input type="checkbox"/> Cirrus <input type="checkbox"/> CuNim			
		Middle		<input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum		<input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum		<input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum			
4.4	Rainfall	Low		<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat		<input type="checkbox"/> Cumul		<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat		<input type="checkbox"/> Cumul	
				<input type="checkbox"/> Cumul		<input type="checkbox"/> Cumul		<input type="checkbox"/> Cumul			
				<input type="checkbox"/> Cumul		<input type="checkbox"/> Cumul		<input type="checkbox"/> Cumul			
4.5	Visual Range (Visibility)	Measure at 0900 hrs each morning. Report amount for last 24 hrs.		mm		mm		mm			
		Name of 3.2 km mark		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke			
4.6	Severe Weather	Name of 3.2 km mark		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke			
				<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke		<input type="checkbox"/> more <input type="checkbox"/> less than <input type="checkbox"/> Rain <input type="checkbox"/> Fog <input type="checkbox"/> Haze <input type="checkbox"/> Smoke			
Helicopter minimum visibility: Day = 3.2 km / 2 miles; Night = 5 km / 3 miles; Low visibility = No flights											
4.6	Thunderstorms	Flash, count secs to boom / 3		N NE E SE S SW W NW		N NE E SE S SW W NW		N NE E SE S SW W NW			
				<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No					
Warn air crews of any severe weather in your area.											

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		

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.

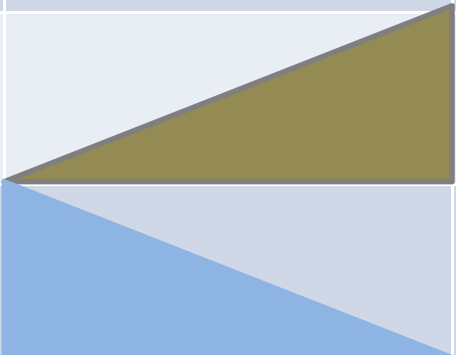
See Handbook: Appendix 2.
pp. 32-34 (Forecasting with clouds)
pp. 34-35 (Advanced Forecasting)

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



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	Alto cumulus 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



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



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

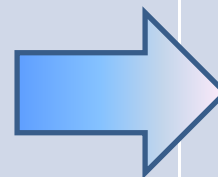


Cirrostratus



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



Weather Forecasting by Cloud Changes

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



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



Clouds of Fair Weather



Cumulus clouds



Altostratus clouds

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



Rainy Weather Clouds



Cumulonimbus

Cumulus

Nimbostratus

Stratocumulus

Stratus

Some images from
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educational fair use
clause

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.



Community-based Environmental Education for



The End

You may now go to Basic MEWS Lesson
B7: Estimating Visual Range

