

	Rural Training Center-Thailand Mobile Emergency Weather Station: Technical Paper	
<div data-bbox="537 218 1081 354"><h1>Sparky, the Batt-mobile</h1><h2>MEWS Capabilities</h2><p>© 2011, All rights reserved.</p></div>		
<div data-bbox="358 394 716 422">www.neighborhoodlink.com/org/rtcth</div> <div data-bbox="1003 394 1260 422">E-mail: rtc2k5@gmail.com</div>		
<div data-bbox="574 424 1044 451">Ready to Serve and Sustain Our Community.</div>		

You may post questions / comments to the Discussion area of our website

Sparky is the RTC-TH alternative energy demonstration vehicle and EmComm (emergency communications) vehicle. Part of Sparky's EmComm capability is MEWS (the Mobile Emergency Weather Station). This paper describes those capabilities.

Conceptually, Sparky would be deployed within a round-trip operating radius of 20 km from the main RTC-TH base of operations. This allows for about 50% reserve battery capacity to operate Emcomm equipment and still have enough battery power to return to base for recharging. The plan would be to deploy Sparky to pre-determined portable operating sites that are considered "safe sites", emergency shelter sites, or emergency helicopter landing zones. Provisioning plans call for 2 days for 2 people before returning to base for re-supply.



Sparky, the Batt-mobile



Most of Sparky's primary MEWS equipment is mounted on the above dash bracket.

Redundancy is part of the planning for MEWS. Often advanced instruments require power from batteries or other electrical supply source. Backup systems begin with replacement power supply or manual systems using no electrical power. The aim is to select systems and backups enabling Sparky to continue providing Advanced level MEWS reports if a primary equipment item fails or is damaged. The bottom line, worst case scenario is to fall back to Basic level MEWS observations and reports which are capable of providing minimal emergency flight weather data.

Sparky's Advanced level MEWS primary and back-up systems				
Observation / Measurement		Primary		Back-up
1	Location	GPS	Seiko WF 100	Topographic Map
	Date / Time			Calendar, mechanical wrist watch
2	2.1 Air Temp (dry)	Kestrel 4500NV		Hygrometer
	2.2 Wet Bulb Temp			
	2.3 Temp difference			
	2.4 Relative Humidity			
	2.5 Dew Point Temp.			Hygrometer, Dew Pt. chart
	2.6 Heat Stress Index			Hygrometer, reference charts
	2.7Wind Chill Index			Dwyer wind gauge, Wind-chill chart
	3			3.1
Gusts				
3.2		Wind direction	Sparky roof mounted wind vane, magnetic compass	
		Gust direction		
4	4.1 Cloud cover	Direct observation and Cloud cover reference chart		
	4.2 Cloud base height	Dew point calculation method	Cloud reference chart	
	4.3 Cloud type	Direct observation and Cloud cover reference chart		
	4.4 Rainfall	Sparky roof mounted gauge	Ground/post mounted gauge	
	4.5 Visual range	Pre-determined from map study		
	4.6 Severe weather	Strike Alert Lightning Detector	Flash / Boom estimation method	
Direct observation and Cloud type reference chart				
Summary of MEWS Advanced Equipment and Power Supply				
Equipment		Primary Power	Secondary Power	Manual Back-up
Garmin II GPS		(4) AA batteries	Spare batteries 12 VDC vehicle power	Map and Compass
Kestrel 4500NV		(2) AA batteries	Spare batteries	Dwyer Wind gauge, hygrometer, sling psychrometer
Seiko WF110 Forecaster		(4) AA batteries		Thermometer, hygrometer, altimeter, sundial, calendar, mechanical watch
Strike Alert Lightning Detector		(2) AAA batteries		Flash / Boom method

MEWS observations are not truly mobile (i.e. on the move). RTC-TH MEWS is actually a stop 'n park operation. The ability to relocate Sparky / MEWS gives flexibility to provide on-site weather data from a variety of sites in a disaster area. If Sparky cannot access the area, Basic MEWS observers could go in by foot, bicycle, and motorbike or even by raft or boat if needed.

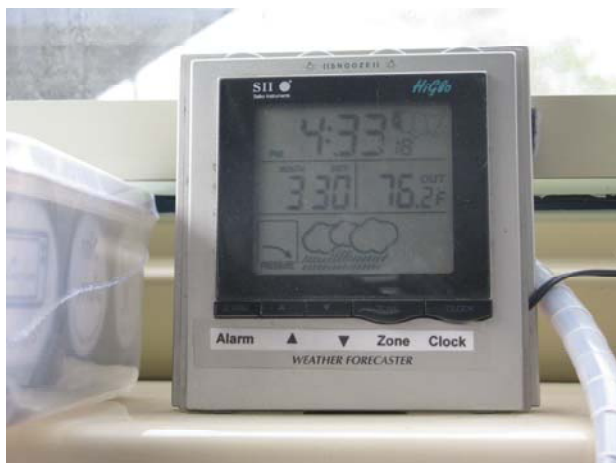


*Garmin II GPS Unit
Latitude, Longitude, Altitude, Date, Time, Azimuth*

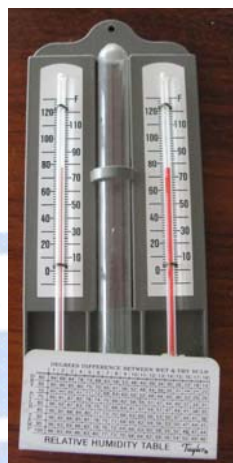


Back up: topographic maps, mechanical wristwatch, magnetic compass

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MEWS by Sparky, the Batt-mobile



*Seiko WX station
Time, Date, Dry Air Temp, Barometric trend, forecast
graphic icons*



*Back up: hygrometer, altimeter
Dry and Wet bulb temperatures, relative barometric
pressure changes, and reference charts*



*Kestrel 4500, a handheld portable fully integrated weather
station*



*Back up: hygrometer, Dwyer wind gauge and various
reference charts*



Kestrel 4500 with wind vane accessory mounted



Back up: Roof mounted wind vane and compass



Roof mounted rain gauge



Back up: post mounted rain gauge or empty jar and ruler

Basic Vehicle Orientation for MEWS

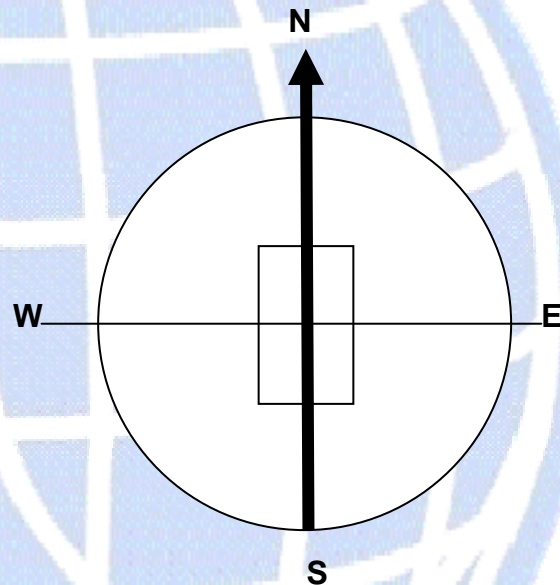
Whenever possible, park Sparky pointed to the north when preparing to make MEWS observations. This makes it easier to determine wind directions when using the roof mounted wind vane. **[Note:** For frequent stop 'n park recon work, this will be faster than setting up the Kestrel 4500NV wind vane.]

Where to Stop 'n Park:

In order for MEWS observations to conform as closely as possible to meteorological standards, use the guidelines in the table below. MEWS is not a replacement for official government weather stations. The data provided are a supplement to official weather reports. The key advantage of MEWS is being on-site in the disaster area.

It is especially important to follow the guidelines as much as possible if operating in support of an emergency helicopter landing zone LZ.

[Note: Rotor downwash can produce winds in excess of hurricane intensity. Be sure all equipment is secured for these high wind conditions. Position the MEWS operation outside the LZ and if possible, with a clear view of the approaching/landing pilot, the LZ and the LZ approaches and departure corridors.



Stop 'n Park Guidelines	
Weather variable	Observation Site Guideline
Temperature	• Level area
Relative Humidity	• standoff 4X height of tall trees/buildings
Heat Stress	• 30 m away from paved surfaces
Rain	• Be surrounded by 9m of short grass or bare soil
Wind speed	• Thermometer must be shaded
Wind direction	

MEWS Observations:

MEWS observations are done 3 times a day (e.g. local sunrise, Mid-afternoon, usually between 3-4pm, and local sunset). When directly supporting helicopter LZ operations, additional observations would be made and reported before landings and take-offs, or when severe weather conditions arise. Helicopter flight operations are difficult in mountainous terrain or when pilots fly in unfamiliar areas. Part of the reason for MEWS is to try to improve flight safety during emergency operations



Photo from the internet: educational use clause

MEWS can support emergency helicopter flight ops with relevant flight weather reports.

MEWS can also provide other useful weather data. Heat stress indices and windchill data can be important in coordinating relief supplies to meet the needs of survivors.

Other Equipment:

In addition to an amateur VHF radio and MEWS equipment, Sparky has other emergency signaling equipment:



Magnetic roof mounted halogen rotating yellow beacon.



Public Address system.



Signal mirror and CD backup reflector



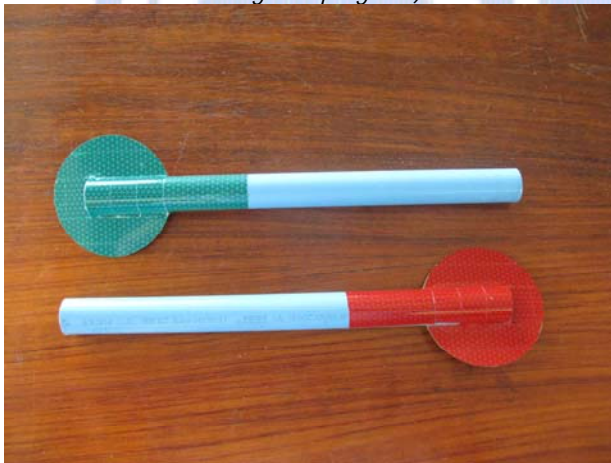
2-color high visibility ground signal panels



High intensity xenon strobe LZ marker (turned off once landing is in progress).



Orange wind streamer (for use at an LZ) to be located upwind of LZ touchdown spot.



PVC reflector wands for night traffic control or LZ aircraft marshalling (each wand has a red and a green face)



Safety vests for MEWS operators (orange for day, reflector vest for night)


In its commitment to community-based education and community service, the RTC-TH is willing to provide MEWS training to any interested Ham radio operators free of charge via e-tutoring (e.g. email or Skype). Small group instruction is available at cost either at RTC-TH facilities or at a host group site. If training off-site, we ask that room and board be provided in addition to any materials costs associated with the training. Contact us at rtc2k5@gmail.com to arrange for MEWS training.

The reference tables used for MEWS observing and reporting are found at the end of this paper.

MEWS is part of the RTC-TH EmComm program. The slogan of the EmComm program is "Ready to Serve and Sustain Our Community." Keeping Sparky, MEWS capable and ready to go is another tangible measure of our commitment to supporting our local community. 🌐

[Note: The reference charts used in MEWS observations are included in this paper.

Rural Training Center-Thailand Mobile Emergency Weather Station: Technical Paper
MEWS by Sparky, the Batt-mobile

 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		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"/> Frstbite10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstbite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbite5	<input type="checkbox"/> Trvl Dngr <input type="checkbox"/> Frstbite10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstbite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbite5	<input type="checkbox"/> Trvl Dngr <input type="checkbox"/> Frstbite10 <input type="checkbox"/> TShltr Dgr <input type="checkbox"/> Frstbite30 <input type="checkbox"/> Frostbite <input type="checkbox"/> Frstbite5							
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	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	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	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	<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)	Relative to local 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 AMSL									
			m	Dew Est (1A-1E/10)1000m	m AGL	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	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	<input type="checkbox"/> CuNim <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	<input type="checkbox"/> CuNim <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	<input type="checkbox"/> Cirrus <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum	<input type="checkbox"/> CuNim <input type="checkbox"/> Altostrat <input type="checkbox"/> Altocum			
			Middle	Vertically Developed	<input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	<input type="checkbox"/> Cumul <input type="checkbox"/> Stratus <input type="checkbox"/> Nimstrat	<input type="checkbox"/> Stratus <input type="checkbox"/> Cumul <input type="checkbox"/> Nimstrat	<input type="checkbox"/> Stratus <input type="checkbox"/> Cumul <input type="checkbox"/> Nimstrat				
			Low									
	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"/> 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					
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						
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	<input type="checkbox"/> Yes <input type="checkbox"/> No N NE E SE S SW W NW km	<input type="checkbox"/> Yes <input type="checkbox"/> No N NE E SE S SW W NW km	<input type="checkbox"/> Yes <input type="checkbox"/> No N NE E SE S SW W NW km	<input type="checkbox"/> Yes <input type="checkbox"/> No N NE E SE S SW W NW km					
Warn air crews of any severe weather in your area.												

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Relative Humidity Chart for °C Temperatures																				
		Dry Bulb Temperature minus Wet Bulb Temperature in °C																		
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	
Dry Bulb Temperature (Air Temperature) °C	-20	70	41	11																
	-17.5	75	51	26	2															
	-15	79	58	38	18															
	-12.5	82	65	47	30	13														
	-10	85	69	54	39	24	10													
	-7.5	87	73	60	48	35	22	10												
	-5	88	77	66	54	43	32	21	11	1										
	-2.5	90	80	70	60	50	42	37	22	12	3									
	0	91	82	73	65	56	47	39	31	23	15									
	2.5	92	84	76	68	61	53	46	38	31	24									
	5	93	86	78	71	65	58	51	45	38	32	1								
	7.5	93	87	80	74	68	62	56	50	44	38	11								
	10	94	88	82	76	71	65	60	54	49	44	19								
	12.5	94	89	84	78	73	68	63	58	53	48	25	4							
	15	95	90	85	80	75	70	66	61	57	52	31	12							
	17.5	95	90	86	81	77	72	68	64	60	55	36	18	2						
	20	95	91	87	82	78	74	70	66	62	58	40	24	8						
	22.5	96	92	87	83	80	76	72	68	64	61	44	28	14	1					
	25	96	92	88	84	81	77	73	70	66	63	47	32	19	7					
	27.5	96	92	89	85	82	78	75	71	68	65	50	36	23	12	1				
	30	96	93	89	86	82	79	76	73	70	67	52	39	27	16	6				
	32.5	97	93	90	86	83	80	77	74	71	68	54	42	30	20	11	1			
	35	97	93	90	87	84	81	78	75	72	69	56	44	33	23	14	6			
	37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26	18	10	3		
	40	97	94	91	88	85	82	79	77	74	72	59	48	38	29	21	13	6		
	42.5	97	94	91	88	86	83	80	78	75	72	61	50	40	31	23	16	9	2	
	45	97	94	91	89	86	83	81	78	76	73	62	51	42	33	26	18	12	6	
	47.5	97	94	92	89	86	84	81	79	76	74	63	53	44	35	28	21	15	9	
	50	97	95	92	89	87	84	82	79	77	75	64	54	45	37	30	23	17	11	


- Use the hygrometer to get the Dry Bulb and the Wet Bulb Temperature. Example, Dry Bulb = 30°C, Wet Bulb = 28°C.
- Subtract the Wet Bulb temperature from the Dry Bulb temperature. Example, 30°C – 28°C = 2°C. Find the column for 2°C across the top of the chart.
- Locate 30°C in the Air Temperature column at the left side of the chart.
- Find the intersection of the column and row to get the % relative humidity. For the example of 2°C and 30°C, the relative humidity is 86%.

DEW POINT TEMPERATURE CHART (°C)																	
		Dry Bulb temperature minus Wet Bulb temperature in °C															
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0
Dry Bulb Temperature (Air Temperature °C)	-20	-25	-33														
	-17.5	-21	-27	-38													
	-15	-19	-23	-28													
	-12.5	-15	-18	-22	-29												
	-10	-12	-14	-18	-21	-27	-36										
	-7.5	-9	-11	-14	-17	-20	-26	-34									
	-5	-7	-8	-10	-13	-16	-19	-24	-31								
	-2.5	-4	-6	-7	-9	-11	-14	-17	-22	-28	-41						
	0	-1	-3	-4	-6	-8	-10	-12	-15	-19	-24						
	2.5	1	0	-1	-3	-4	-6	-8	-10	-13	-16						
	5	4	3	2	0	-1	-3	-4	-6	-8	-10	-48					
	7.5	6	6	4	3	2	1	-1	-2	-4	-6	-22					
	10	9	8	7	6	5	4	2	1	0	-2	-13					
	12.5	12	11	10	9	8	7	6	4	3	2	-7	-28				
	15	14	13	12	12	11	10	9	8	7	5	-2	-14				
	17.5	17	16	15	14	13	12	12	11	10	8	2	-7	-35			
	20	19	18	18	17	16	15	14	14	13	12	6	-1	-15			
	22.5	22	21	20	20	19	18	17	16	16	5	10	3	-6	-38		
	25	24	24	23	22	21	21	20	19	18	18	3	7	0	-14		
	27.5	27	26	26	25	24	23	23	22	21	20	16	11	5	-5	-32	
	30	29	29	28	27	27	26	25	25	24	23	19	14	9	2	-11	
	32.5	32	31	31	30	29	29	28	27	26	26	22	18	13	7	-2	
	35	34	34	33	32	32	31	31	30	29	28	25	21	16	11	4	
	37.5	37	36	36	35	34	34	33	32	32	31	28	24	20	15	9	0
	40	39	39	38	38	37	36	36	35	34	34	30	27	23	18	13	6
	42.5	42	41	41	40	40	39	38	38	37	36	33	30	26	22	17	11
	45	44	44	43	43	42	42	41	40	40	39	36	33	29	25	21	15
	47.5	47	46	46	45	45	44	44	43	42	42	39	35	32	28	24	19
	50	49	49	48	48	47	47	46	45	45	44	41	38	35	31	28	23

- Use the hygrometer to get the Dry Bulb and the Wet Bulb Temperature. Example, Dry Bulb = 30°C, Wet Bulb = 28°C.
- Subtract the Wet Bulb temperature from the Dry Bulb temperature. Example, 30°C – 28°C = 2°C.
- Find the column for 2°C across the top of the chart. Locate 30°C in the Air Temperature column at the left side of the chart. Find the intersection of the column and row to get the Dew Point Temperature. For the example of 2°C and 30°C, the Dew Point Temperature is 27°C.
- Divide 27°C by 10°C = 2.7 X 1000 m = 2700 m (the altitude of the bottom of the clouds)

Heat Stress Index (Sensible Temperature)									
Air Temp	Relative Humidity								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
46°C	44°C	49°C	57°C	66°C					
43°C	41°C	44°C	51°C	58°C	56°C				
41°C	38°C	41°C	45°C	51°C	57°C	65°C			
38°C	35°C	37°C	40°C	43°C	49°C	56°C	62°C		
35°C	32°C	34°C	36°C	38°C	42°C	46°C	51°C	58°C	
32°C	29°C	31°C	32°C	34°C	36°C	38°C	41°C	45°C	50°C
29°C	27°C	28°C	29°C	30°C	31°C	32°C	34°C	36°C	36°C
27°C	24°C	25°C	26°C	26°C	27°C	28°C	29°C	30°C	31°C
Danger Level	I Caution		II Extreme Caution		III Danger		IV Extreme Danger		---
Heat Index	27-32°C		32-40°C		40-54°C		Above 54°C		Relative humidity rarely observed
Heat Syndrome	Fatigue possible with prolonged exposure and/or physical activity		Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity		Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and/or physical activity		Heat / sunstroke highly likely with continued exposure		Generally not applicable but conditions would be extremely dangerous

- Use a hygrometer placed in a shaded position about 1.2 m / 5 ft above the ground.
- Air Temperature is read from the Dry Bulb Thermometer.
- Relative Humidity is calculated using the Relative Humidity Table. This requires the following data: Air Temperature and the Temperature Difference between the Dry and Wet Bulb readings.

Wind Chill											
Measured Air Temperature (°C)											
Wind Velocity (km/h)	0	5	0	-5	-10	-15	-20	-25	-30	-35	-40
	5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47
	10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51
	15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54
	20	1	-5	-12	-18	-24	-31	-37	-43	-49	-56
	25	1	-6	-12	-19	-25	-32	-38	-45	-51	-57
	30	0	-7	-13	-20	-26	-33	-39	-46	-52	-59
	35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60
	40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61
	45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62
	50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63
	55	-2	-9	-15	-22	-29	-36	-43	-50	-57	-63
	60	-2	-9	-16	-23	-30	-37	-43	-50	-57	-64
	65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65
	70	-2	-9	-16	-23	-30	-37	-44	-51	-59	-66
	75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66
	80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67
	Travel can be dangerous				Frostbite in 30 minutes			Frostbite in 10 minutes		Frostbite within 5 minutes	
	Use heated vehicles; temporary shelters unsuitable and dangerous.				Starts danger of frostbite and possible death.			Adapted by		G.K. Lee for RTC-TH M.E.W.S.	







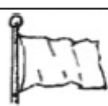











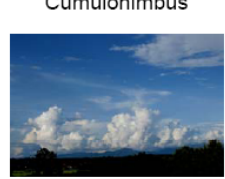
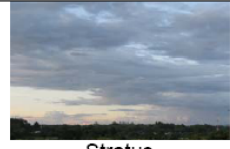





<div>  RTC-TH MEWS modified Beaufort Wind Table for Land Effects </div>							
MEWS weather observers should set up a wind sock or flag near their operating position. Use the Description and flag references to estimate the wind speed. Report the range of wind speeds from the chart rather than a specific number.							
Description	Flag	WMO term	MPH	Km/h	Knots	Force	Psu lbs/sq ft (Kg/sq m)
Report wind speed in knots to all 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 (0.01428)
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 Knts max 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 Knts 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)
22 Knts maximum winds for helicopter flight operations							
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)
Large branches move; wires whistle; umbrellas hard to use; Flag snaps		Strong breeze	25-31	40-50	22-27	6	2.485 (12.13)
Whole trees sway; hard to walk; Flag extended		Near gale	32-38	51-61	28-33	7	3.822 (18.66)
Twigs and small branches broken; cars veer on roads; Flag tatters		Gale	39-46	62-74	34-40	8	5.597 (27.33)
Slight structural damage occurs (roof shingles blow off)		Strong gale	47-54	75-87	41-47	9	7.769 (37.93)
45 Knts maximum winds for helicopter flight operations							
Trees broken or uprooted, considerable damage to buildings		Storm	55-63	88-101	48-55	10	10.53 (51.39)
Wide spread damage caused	---	Violent storm	64-72	102-114	56-63	11	13.78 (67.3)
	---	Hurricane	>73	>115	>63	12	>13.78 (>67.3)
Disclaimer: Wind pressure values are the upper limits for a wind category. Use of the wind pressure data to calculate tower/antenna wind loads are at your own risk. RTC-TH and HSØZHM assume no liability for the use of this data.							

Table of Cloud Cover Terms				Flash / Boom Storm Distance Estimation
Term	Amount of blue	Amount of cloud		<p>Use this method to estimate the distance to a thunderstorm.</p> <ul style="list-style-type: none"> Immediately upon seeing a flash of lightning, count the number of seconds until you hear the boom of the thunder. Divide the number of seconds by 3 = km estimated distance to the storm <p>When the flash and boom are almost instantaneous, you may be in big trouble.</p> <p>People have been struck by lightning 56+ km away from a thunderstorm.</p>
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		

MEWS Simplified Cloud Identification Chart				
High 12,000m to 6,000m			Vertically Developed 12,000m to 500m	
	Cirrus	Cirrostratus		
				
	Cirrocumulus	Contrails		
Middle 6,000m to 2,000 m				
	Altostratus	Altostratus		
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				