GLOBAL AMATEUR RADIO EMERGENCY COMMUNICATIONS CONFERENCE

The 8th GAREC Conference

12 – 14 November 2012 Port Dickson, Malaysia

[MEWS: Mobile Emergency Weather Station

Enhancing Hams and Empowering Community Emergency Response Capabilities]

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Abstract: Training EmComm hams to make systematic weather observations pertinent to planning relief operations and supplies increases the value of amateur radio operators in times of emergencies. MEWS lessons are easy and fast to learn by hams and community members. MEWS trained survivors are empowered to be active in the relief effort thus helping to overcome the psychology of being a helpless victim.

1.0 Introduction: Natural disasters in developing countries require emergency relief efforts to go to poorly mapped and often uncharted areas. Weather stations may not be available in these areas. A natural disaster can damage or destroy existing weather stations. Getting basic weather data (e.g. temperature, winds, rainfall, etc.) have a direct bearing on the relief aid and supplies the survivors need. A mismatch of aid supplies can mean life or death to the survivors.

Helicopters are a vital tool in relief efforts and are often the first help to arrive from outside the area. Helicopter flight operations are even more risky when going into unfamiliar areas with no weather data. Helicopters bring vital supplies and outside expertise to and evacuate severely injured victims from the disaster area. Weather conditions directly affect flight safety.

The Mobile Emergency Weather Station (MEWS) is an integrated system enabling radio amateurs and community members to make local weather observations from within a disaster area. MEWS is not a substitute for formal government authorized flight weather services. Providing local weather conditions in the disaster area to helicopter flight crews helps to improve flight safety and overall operations. MEWS provides “local on-site weather reports” from the disaster area. Remember, the use of the MEWS weather data is up to the pilot in command.

MEWS came from proven classroom and outdoor lessons used by students from elementary school to college level. Adult community education programs used MEWS lesson components. The MEWS lessons are derived from GROW (Getting Real On-farm Weather), an RTC-TH program for sustainable agriculture. Added benefits of MEWS in rural areas are the improvement of rural school education and helping sustainable agriculture. Student using MEWS have practical use for the math and science they learn in the classroom. Students and adults can use MEWS to gather local weather data that can help their efforts in rainwater harvesting, water resources

management, and soil erosion management. If hams become MEWS trainers, they can also serve their communities in emergencies and non-emergency situations. If they emphasize EmComm, they could introduce amateur radio to the schools combined with MEWS and prepare the next generation of ham EmComm operators.

MEWS was designed with amateur radio EmComm in mind. The system had to be:

- **Low cost** (to match the impoverished conditions of rural developing countries or a post-disaster resource limited situation): Keep in mind, natural disasters can make a highly developed city into the conditions of a developing country. Low cost also means it is easier for hams and community members to get the equipment needed to prepare to implement MEWS.
- **Low tech:** this makes MEWS easier to implement in impoverished or the immediate post disaster conditions.
- **Robust:** MEWS components must be able to perform under harsh or sparse post disaster environmental conditions.
- **Easy to Learn / Easy to Use:** The lessons must be easy to learn and quickly implemented for first time users. This is especially true for first time and inexperienced users trained by a MEWS ham in the disaster area.

1.1 The MEWS Lessons

The lessons are for classroom/group or for self-study. Studying MEWS is also possible via internet, Skype, etc. Your imagination is your only limit. MEWS lessons are available free for Basic and Advanced Levels when used for educational / non-commercial purposes. Basic level lessons require only a thermometer and observation reference cards (all included in the free MEWS Handbook). This is the bare bones, low cost, low tech / no tech, crawl out from under the wreckage, and start collecting weather data mode.

1.1.1 Basic MEWS uses systematic relative / subjective observations using reference charts. Only temperature is measured. All other Basic MEWS observations are reported as estimates so flight crews are aware of the limitations of the data.

The Basic MEWS Kit: All that are needed are a thermometer and the set of observation reference cards (e.g. wind speed, cloud cover, cloud base height, cloud type, estimating visual range, and severe storms). A magnetic compass is optional. You can use local knowledge to find north, south, east, and west. Other optional equipment are: an umbrella and a small flag. The Basic MEWS kit is suitable for pedestrian, bicycle, mobile, or portable ham radio EmComm operations.

1.1.2 Advanced MEWS relies on direct measurements and some calculations. This requires more equipment and cost. It builds on the foundation of the Basic lessons. The use of measurements / calculations provides a higher degree of reliability for Advanced MEWS observations. However, the use of all MEWS data is at the discretion of the pilot in command.

The Advanced MEWS Kit: Advanced observations rely on measurements. Some of the equipment can be homemade or purchased. Although crude, the home made instruments provide refined relative measurements rather than subjective observations.

The measurements also allow for more sophisticated wind speeds and calculations of cloud base height. A minimal Advanced MEWS Kit consists of:

- a thermometer and / or hygrometer,
- an anemometer / wind speed gauge,
- a rain gauge,
- a set of Advanced MEWS Reference Tables (e.g. Dew Point Temperature, Relative Humidity, Heat Stress Index, Wind Chill Index, wind velocity conversion table, etc. included in the MEWS Handbook). Of course, like ham radio, there is no upper limit as to what you can spend on weather instrumentation. However, many of these more advanced high-tech systems may not be readily available in a post disaster scenario. This kit is more suitable for mobile or portable operations. [Note: Advanced MEWS can be done in pedestrian and bicycle mode if using more expensive, compact, portable weather instruments.]
- Optional Equipment: umbrella, small flag, calculator, binoculars, and GPS. [Note: APRS could be used with GPS & MEWS to enable mobile units to quickly provide weather data from multiple points within the disaster area.]

1.1.3 The MEWS Observation Log & Handbook:
MEWS observations (Basic and Advanced) are recorded on a single Observation Log form. A standard MEWS report is made by simply reading the data off the log from top to bottom. The back of the form has quick reference notes about the observations / measurements needed to complete the front of the form. Full explanations are in the MEWS Observer Handbook.

The MEWS Observation log differs from most weather logs. The MEWS log has notes about wind speeds, cloud and sky conditions that affect VFR (visual flight rules) for helicopter flight operations. These notes alert MEWS Observers when a particular weather item reaches a critical limit for helicopter flight operations.

Routine observations are made 3 times a day: local dawn, noon, and dusk. Supplementary observations are made immediate before helicopter landings and take-offs. Other supplementary reports are made when severe weather conditions arise.

2.0 Using MEWS: MEWS has three goals:

- Enhance the value of Amateur radio EmComm operations;
- Empower community members to help in their own disaster relief preparedness;
- Empower survivors to actively participate in relief efforts to overcome the psychology of being a helpless victim

2.1 MEWS and Amateur Radio EmComm Operations: It seems many ham radio operators are interested in weather. However, most hams lack any training in weather science. Certainly, severe weather (e.g. hurricanes / typhoons, strong winds, heavy rains) cause of many natural disasters that affect people. As a professional educator, I am well aware that making systematic weather observations takes minimal formal instruction. Using the RTC-TH Community-based education method, people can learn MEWS quickly and become proficient without spending hours of classroom time and taking written exams. Remember, in an emergency, getting weather observations from

the disaster area can make the difference between life and death for relief helicopter crews especially when flying into unfamiliar terrain. The main difference with having a ham operator MEWS trained is the ability to transmit the weather data to the outside world and relief organizations.

2.2 MEWS and Relief Operations: Weather conditions also affect the disaster survivors need for water, food, shelter and all sorts of supplies. Since not all disasters are alike, weather information from the disaster area helps authorities better plan and set priorities for their response. Advanced MEWS trained hams in a disaster area can provide on-site Heat Stress or Wind Chill data, which may not be part of daily weather reports.

2.3 MEWS and Community Participation: Survivors of a natural disaster often feel and act as helpless victims. MEWS trained hams can organize survivors to quickly learn to make MEWS observations and help in the EmComm effort. This is a positive action to help in relief operations. This helps overcome the psychology of helplessness. It is an important step on the road to recovery.

3.0 MEWS is Free: in the greatest spirit of ham radio and humanitarianism, MEWS is available online free for personal, educational, and non-commercial use. We only ask credited for creating the lessons and making them available in our effort to make the world a better place for all people. The lessons are available in English. If you would like to help us translate them to other languages, please feel free to volunteer your time and effort. We will give appropriate credit for your translation efforts.

The lessons are found at http://www.neighborhoodlink.com/RTC-TH_Tech/pages
Once on the page, scroll down the left column to the "RTC-TH EmComm / MEWS" section.

3.1 The Suggested Sequential Use of the MEWS Materials:
MEWS Lesson Directory: This shows the relationship of the Basic and Advanced Lessons to the specific weather data needed to complete the Observation Log.

- If you are new to MEWS and weather observations, start with the three orientation lessons.
- If you have some weather observing background, start with the three orientation lessons, and then review each of the eight Basic lessons. MEWS is an integrated system following logical building blocks from Basic to Advanced. Advanced MEWS assumes you are familiar with Basic MEWS methods.
- After the Basic lessons, go on to the six advanced lessons.

3.2 Studying / Learning MEWS: The lessons are for individual study. All lessons are in illustrated PDF format. [Note: If doing group study, projecting the lessons in a classroom may pose a problem. Some slides are text intensive and are not suitable for large group viewing. A narrator needs to read off the "fine print" on the screen.].

You are limited only by your imagination if you want to study MEWS. Get a group of local hams together. Assign each one a lesson to learn and to teach back to others. Use the internet (email or VOIP) or use a local radio net to for a study group.

Get students and the community involved. For students, MEWS is a chance to use the math and science taught in the classroom. Now the students can put their lessons to practical use serving the community. In rural areas, the MEWS lessons can be valuable for sustainable agriculture. Most farmers rely on rainfall to grow their crops. But official government weather stations may be too far from the farms and do not accurately portray the local weather. Global warming and climate change are big issues. However, they can show up in records of local rainfall and temperature data; and that affects crops and livelihoods.

4.0 Conclusion: In the RTC-TH EmComm, our slogan is "Ready to Serve and Sustain Our Community". MEWS began as an EmComm activity to enable hams to give weather reports for relief authorities and helicopter flight crews. However, is also serves communities as a way to improve rural public education. It can also benefit rural farm families to monitor weather conditions that affect their farms and crops. MEWS is a great tool for hams all over the world. They can better serve their communities in both times of need and ordinary times.