What is the “AC-100”?

Presentation Outline

- Speaker introduction
- “Angeles Crest 100 Mile Endurance Race”
- Foot race over mountain trails through the San Gabriel Mountains of the Angeles National Forest and designated wilderness areas including remote areas accessible only by foot or helicopter between the checkpoints.
- This years race for 2008 to be held over the weekend of September 13-14, 2008
- 33 hours to complete the course starting at 5 am PDT Saturday morning in Wrightwood Ca. to complete by 2 pm PDT Sunday afternoon in Pasadena, South of the famous ”Jet Propulsion Laboratory”.
- Participants must qualify before registration in the race to demonstrate their fitness, capability and experience to deal with the extreme conditions of the race and lack of support between checkpoints in remote areas of the race.
- 48,310 total feet gained and lost over the length of the race course
- International in scope
- Internationally one of the premier ultra marathons
- Considered amongst the toughest “ultras”
- 150-200 participants each year
- 21 years running with only one break due to forest fire (2002).
- Normal winning time is around 19 hours. Record time is 17:35:48 (1989)
- Awards are given by age and gender categories. The awards given out are trophies, belt buckles and a handshake.
- Race is run day and night continuously from start to finish.
- Conditions can range from 90 degree plus temperatures to freezing. From clear skies, ferocious winds, to cloudy / fog, rain and in some cases snow.
- There are natural dangers present with wild animals, rattlesnakes, ticks, poison oak and narrow trails along steep cliffs sometimes covered in ice and snow.
- Some statistics of the race:
    - Race started in 1986
    - 63% of the runners on average finish the race
    - 21,610 feet of elevation gain
    - 26,700 feet of elevation loss
    - 92 miles of trails
    - 6 miles of dirt road
    - 2 miles of paved road
    - Highest point on course, 9,210 feet (Mt. Baden Powell)
    - Lowest point on course, 800 feet (Finish Line)
    - Starting elevation, 5,890 feet (Wrightwood)

What is the “role” of Amateur Radio?

- Track the runners from check point to check point, start to finish
- Provide communications over entire length of course
    - Using voice and packet communications
- Provide runner data to the Race Directors to track the progress of the race
- Provide identification and notification of late or missing runners

- Coordinate search and rescue efforts
- Provide notification of official runner drops from the race, place and time
- Provide information and inquiry messages to and from the Race Medical Director
- Provide runner status / position for support teams
- Provide health and safety status for each runner to family and friends
- Provide communications for checkpoint support requests during the race
- Each checkpoint is to remain staffed until the last runner leaving has been verified to reach the next checkpoint. The release of the checkpoint comes from the approval of Net Control only after all data has been reviewed and accepted and verification of last runner status.
- There are 15 checkpoints, Finish Line and Net Control that are staffed by radio operators. Of the 15 checkpoints, five (5) are not accessible to runner support crews and are considered "remote" checkpoints sometimes only accessible by dirt forest service roads behind locked "Forest Service" gates and with no or limited facilities.
- Provide all power, lights, support facilities such as tables / chairs, awnings / shelter, food, water and personal requirements as necessary to support our role independently. Of course this also includes all communication equipment and back-up equipment.
- The Amateur radio leadership group supporting the AC-100 is comprised of the Radio Directors, Secretary, Coordinators and the Leaders of each checkpoint, Net Control and Finish line. This group coordinates the efforts of the communication support for the race as well as interfaces with the AC-100 Race Directors and their support staff. They also provide training, technical support and volunteer recruiting and coordination.

Voice Radio Communication

- Provide secondary tracking and logging of each runner using voice communications
    - Log runner leaving the previous checkpoint, date and time
    - Log runner entering checkpoint, date and time
    - Notifying previous checkpoint of runner's arrival time
    - Keeping track of runners time in checkpoint
    - Log runner exit time from checkpoint, date and time
    - Notify next checkpoint that runner has left for their checkpoint and time
- Provide runner log data as backup in case of packet failure
- Provide primary communication with Net Control
- Provide primary communication between checkpoints
- Provide confirmation of any late or missing runners to Net Control
- Provide confirmation of any dropped runners at checkpoint
- Provide primary communication to support search and rescue operations as required or requested.
- Provide status of checkpoint to Net Control
- Provide any support requests for the checkpoint

Voice communication utilizes various UHF and VHF frequencies using simplex frequencies and repeaters to communicate with Net Control as well as between checkpoints. The frequencies used are coordinated by the AC-100 Frequency

Coordinator. The frequencies used as well as the repeaters used are changed as the race progresses depending on the conditions as warranted.
Equipment ranges from mobile radios to handy talkies (HT). Antennas range from HT antennas, simple J-poles, high gain vertical, mobile and beam antennas. Power is supplied by various means. Commercial AC is available at Net Control. Generators are used at the Finish Line and at a few checkpoints that have road access. But many checkpoints run on lead-acid batteries. The time that a checkpoint may be staffed can vary from as little as a few hours to longer than 24 hours depending on where on the race course that you are stationed at. Because of this power management is also an important part of our job.

Packet Radio Communication

- Provide primary tracking and logging of each runner using packet communications
- Provide primary runner status data to Net Control
- Provide secondary communication with Net Control
- Provide secondary communications between checkpoints
- Provide individual runner status upon inquiry
- Provide “lead” runner status on race course upon inquiry
- Provide “last” runner status on race course upon inquiry
- Provide time on trail for each runner between checkpoints and “bib” numbers
- Provide number of runners on trail between checkpoints
- Provide average runner time elapsed between checkpoints
- Provide time in checkpoint for each runner and “bib” numbers
- Provide average time spent in checkpoint for all runners
- Provide number of runners in checkpoint
- Provide primary warnings of late or overdue runners between checkpoints and within checkpoints
- Provide “drop” status if runner drops out of race at checkpoint
- Provide list of all dropped runners in the race
- All checkpoints are slaved to the master clock at Net Control for accurate timing purposes.

The packet network uses multiple nodes on multiple frequencies providing a meshed network architecture that provides redundant paths to the Server computer. This provides access to Server from the various checkpoints across the entire racecourse using no more than a one-node hop to the Server and redundant paths if there is a node failure. The Server site was selected because of its visibility to the various remote packet nodes and to some of the checkpoints, accessibility, facilities and security. The design of the network was accomplished by many days and hours of topographic map study, knowledge of accessibility to the remote node locations and by field-testing. The design of the packet network, supporting hardware and the software that supports it, is always in the process of continuing evolution and testing to ensure reliability and flexibility.

Equipment used are various mobile radios, “HT’s”, TNC’s and various antennas depending on the location. Transmit power is never more than 5 watts output as power is a premium at most checkpoints and at the remote node locations.
Laptop computers are used at the checkpoints and desktop computers are used at the Server / Net Control site.

The software used is a custom “Windows” supported program written by one of our members that provides a number of unique features that support our ability to track the runners and provide that data to the Server at Net Control.

- Basic runner tracking data between checkpoints
- Master clock
- Software screen at the checkpoints has four (4) basic fields
    1. Previous checkpoint
    2. Current checkpoint
    3. Next checkpoint
    4. Communication status

- Runner arriving, leaving and drop data are input on a pop-up window
- Automatic time stamp when data is input
- Automatic data transmission including retries until acknowledgement from Server.
- Automatic saving of all data input in local computer in case of packet equipment or network failure
- Automatic connection with Server using selected node or direct when first logging onto Server or if packet link fails.
- Automatic alarm when packet link fails
- Ability to manually connect to Server using alternative packet paths.
- Automatic notification of runner leaving checkpoint to the next checkpoint.
- Automatic notification of runner arriving at next checkpoint
- Automatic average time between checkpoints and within checkpoints
- Automatic alarm notification of late and overdue runners.
- Lists of runners bib numbers and names
- Upon inquiry, status of any runner by bib number
- Upon inquiry, status of lead runner
- Upon inquiry, status of last runner
- Text communication with Net Control as well as any checkpoint currently logged onto the Server computer system is on a pop-up window when requested
- Software allows multiple windows to monitor status of previous checkpoint as well as next checkpoint
- Ability to edit any input and retransmit
- Automatic posting of the runner data using the Internet for the Race Directors to track the progress of the race as well as for health and safety information to the families and friends of the runners in almost real time.
- The Server software allows monitoring of total race data traffic, monitoring of individual checkpoints, data editing, text messaging and review of data quality.

Amateur Television

- ATV is used between two of the checkpoints on the course. Newcombs Pass and Chantry Flats. To allow runner support crews to see and communicate with their runners that arrive at the remote checkpoint, Newcombs Pass.
- We would like to expand this capability for more of the remote sites but again power and capabilities are limited.

Need for volunteers

In Conclusion

We always need help. We need individual operators, non- Ham individuals as well as teams or clubs to staff the various checkpoints because as in any organization of this size there are always changes from year to year. This need includes non-Ham volunteers that can help too, spouses, families and friends. Many in the group have participated for at least 5 years and most 10 years or more. We conduct seminars to help train new groups about what equipment that they will need, what to expect and if they are new to packet radio, instruction on packet operation and equipment setup. There is also on the air packet practice availability before the race as well as a voice net conducted some months before the race. Individuals and Leaders of the AC-100 radio group also communicate year-round using a group site on the Internet by invitation only. Groups taking over the responsibility of a checkpoint are usually teamed with an experienced leader when going out for the first time as a "Mentor". Individuals are assigned to their checkpoint and the checkpoint Ham leader will advise what to bring before the event as well as instruction when you arrive. We have 17 sites staffed by radio operators that need your help. If you are new to Ham radio or a seasoned operator, from short 3-4 hour time commitments in the early part of the race, to long 24-hour commitments in the later stages of the race at remote checkpoints. We also have "shifts" at most of the accessible sites that can be as short as 2 hours. We have checkpoints that are a challenge because of their remoteness and lack of facilities but offer the unique opportunity to see parts of the forest not easily accessible to the public. The majority of the checkpoints are at road crossings with some facilities and Forest Service campgrounds that have easy access and full facilities. Not to forget the need at the Finish Line and indoors at Net Control. Whatever level of participation or time that you can commit to we can find a place for you. If you enjoy the challenge of providing radio communication in the outdoor environment or if you just want to participate we need your help. The challenge to us all is that here is a service event where we are truly necessary. The life of each individual runner is our responsibility. Our ability to track the runners and not lose any runners over the 100 miles of mountain trails by our effective use of voice and packet communications is unique in the ultra-marathon community. We have been told many times that we are the "safety net" that allows the runners the confidence to participate in one of the most challenging ultra marathons in the world. Please join our team, add your unique capabilities and enjoy the experience with us.

For More Information Please Contact:

- John Minger
  - 323-256-0046 Phone
  - E-mail: ac100hams@pacbell.net

Or see the "Angeles Crest 100 Mile Endurance Run" web site: www.ac100.com