

K2BSA Amateur Radio Operation 2013 Jamboree, The Summit

Version 5

K2BSA RADIO SCOUTING

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Executive Overview

Purpose

The purpose of the Jamboree amateur radio operation is to introduce the science, technology, and fun of amateur radio operation to Scouts and Scout leaders. It is also the amateur radio voice of the Jamboree via two-way radio contacts with others who are not able to attend the Jamboree. It further facilitates earning the Radio Merit Badge.

Goals

Provide amateur radio demonstrations to at least 10% of the Jamboree participants. Provide Radio Merit Badge training, counseling, and activities sufficient to allow a Scout to earn the badge within a four-hour time commitment.

Facilities & Staffing

The primary location will require one 40' x 20' and one 20' x 20' tents along with substantial traffic-free areas for antennas. VHF-UHF repeaters will be installed in coordination with local amateur radio repeaters to provide coverage of the entire Jamboree footprint. Where possible, all installations will remain in place for future operations at the Summit. For example, the VHF-UHF repeaters will remain for 365/24/7 operation to support the Summit and the local community.

Staffing is currently limited to 30 positions. All will be licensed radio amateurs with substantial involvement in Scouting and, in particular, experience with Radio Scouting activities such as Jamboree on the Air. A key criteria will be the ability to work with youth.

Costs & Funding

A high-level cost estimate has been provided in this report that takes into account all items needed for the operation as proposed. The estimate comes to \$130,000, which would be a reasonable place to start discussions with potential Jamboree sponsors. This estimate is based on purchase prices generally available by Internet inquiry. Savings could be achieved through rental arrangements and equipment loaner arrangements. It is proposed that a substantial portion of this investment could remain at the Summit for future operations and/or permanently transferred to councils for their use in Radio Scouting activities.

Changes from Previous Jamborees

Based on experience at previous Jamborees, we've elected to focus only on the amateur radio portion of the Radio Merit Badge. This is because shortwave listening and radio broadcasting options were not pursued by Scouts at the last Jamboree. The appendix has a chart showing how the Radio Merit Badge has experienced a rapidly growing level of interest from Scouts over the past two decades, demonstrated by a 600% increase in the number of badges earned annually from 1990 (954 badges) to 2010 (6,994 badges). Other changes are the consolidation of all Radio Merit Badge activities at the main location, since the Merit Badge Midway will not be in operation at the 2013 Jamboree. Note that staffing is down from 50 in 2010 to 30 in 2013. An optional plan is provided in the Appendices should additional staff be made available.

Jamboree Action Plan

Amateur radio has been a part of the Jamboree experience since 1973 when KJ7BSA operated in Farragut State Park, ID, and KJ3BSA operated in Moraine State Park, PA, the two sites for the Jamboree that year. The 2013 Jamboree will see K2BSA in operation for the first time from The Summit in West Virginia. The full history of Jamboree operation is available at www.k2bsa.net

Purpose

The purpose of the Jamboree amateur radio operation is to introduce the science, technology, and fun of amateur radio operations to Scouts and Scout leaders. It is also the amateur radio voice of the Jamboree via two-way radio contacts with other amateur radio operators including Scouts and Scout leaders world-wide that are not able to attend the Jamboree. It will also provide support for Scouts to earn the Radio Merit Badge while at the Jamboree. It further serves as a method of communication for sending messages from participants to those back home and vice versa. Finally, when all else fails, amateur radio can take up a substantial role as an emergency communication channel.

Key Goals

- Provide amateur radio demonstrations to at least 10% of the Jamboree participants (4,000). This will include HF SSB and PSK, VHF/UHF FM, and Echolink.
- Provide Radio Merit Badge training, counseling, and activities sufficient to allow a Scout to earn the badge within a four-hour time commitment. Target 500 badges earned during the Jamboree. The 2010 Jamboree awarded 210 Radio Merit Badges.

Activities

- Amateur radio demonstrations that energize Scouts in communicating with others around the country and around the world. Use communication modes that resonate with Scouts such as PSK digital modes that mimic their favorite mode of communication --- texting.
- VHF/UHF FM to include staff and other licensed operators using repeater(s) to fully cover the Jamboree area. This would facilitate network communication and emergency communication.
- Facilitate earning the Radio Merit Badge via onsite training and testing, providing Scouts with a visible goal to achieve that not only introduces amateur radio but provides them a merit badge as part of their advancement program. Do this within a relatively low impact time commitment of four hours.

Facilities

Two large tents with walls, stable flooring (ideally concrete slabs, asphalt, or plywood secured on pallets or some other method to get them above ground level), waterproof wiring, Internet connections, grounding system, and computer networking. Must be lighted to facilitate station operation and merit badge training at night and during inclement weather. The station will be in operation 24 hours a day.

Main Station

Main Station for demonstrations and communication operations

- Four identical demonstration stations with low-cost HF transceiver (Yaesu FT-450, Kenwood TS-480, or ICOM IC-7200) feeding multi-band vertical and/or dipole/inverted vee antennas. Computer with logging software (networked) and set up for PSK and Echolink. Set up with two operating chairs and four observing chairs --- one K2BSA operator with one Scout for operation, swap Scout operating with each of the four observers.
- Two VHF/UHF stations for demonstrations, repeater monitoring, and emergency communication.
- Two satellite communication systems for demonstrating communication via satellite.
- One high power HF station for maximizing worldwide coverage of the Jamboree to ham radio operators and Scouting stations. Would include one or two transceivers, amplifiers, tower with directional antenna.

Radio Merit Badge Classroom

Provide computer-assisted independent learning and scheduled instructor led classroom training. Consider multipurpose setting to be reconfigured for FCC license testing.

- Seating for number of Scouts to be determined (estimated 36 at this stage)
- Partitions to divide the space into four class areas
- Consider using computer based training for several merit badge requirements as suitable (estimated 18 computers at this time).
- Provide classroom discussion and presentation of more difficult concepts
- Large display television screen for slides, videos, etc.
- Large whiteboard for classroom presentations
- Flipcharts as needed

VHF-UHF Repeaters

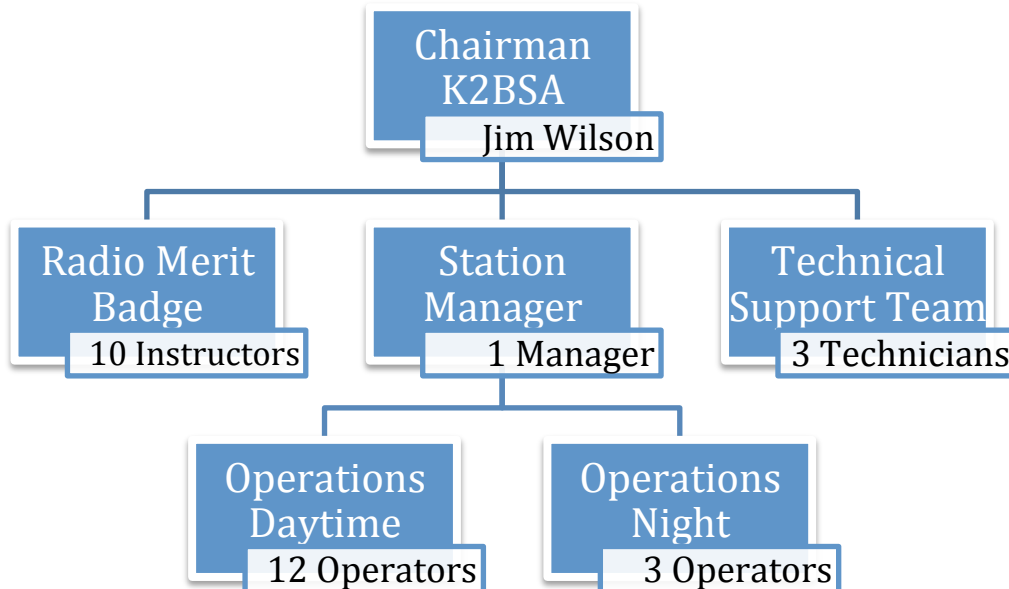
Working with the local amateur radio club and their existing network of VHF-UHF repeaters, K2BSA will put in operation one or more VHF-UHF repeaters to optimize communication throughout the Jamboree footprint. This will facilitate communication within all operational areas and support emergency communication requirements. This will also be installed with the intent of leaving the repeaters in operation 365/24/7 between Jamboree operations to facilitate Summit communication and to support the local community. At this point, repeater installation is being considered on an existing 450 foot tower at the National Guard property just off site.

Staffing

Previous Jamborees have required 40 to 50 or more staff members for all operations. At the Summit 2013 Jamboree staffing will be restricted to 25 to 30 staff members. This means that only a substantially pared back operation can be staged. However, should more staff become available, an optional plan is provided in the appendices.

Staff members will be needed to build and set up the station as well as take down the station at the end of the Jamboree. Here is our current estimate for staff members and their locations with a total of 30 staff positions. A high-level organization chart is also shown.

Staff Position	Number
Demonstration station operators	15
Radio Merit Badge instructors	10
Technical system operation and repair (RF transmission, antennas, networking, etc.)	3
Chairman and Station Manager	2



Costs

A moderately detailed cost estimate is included in the appendix of the document. This cost estimate was built with the activities noted above in mind and with prices generally available via web search in Fall 2011. These costs are for new items and do not presently consider any materials already in possession of the K2BSA Jamboree operation or items that could be loaned or rented. It takes into account all elements required for the operation.

The cost estimate comes in at roughly \$130,000.

Funding

Sponsorship for the cost of the entire operation will be sought. This will include all facilities and equipment --- either through donations in kind or through direct funding. An additional thought is to permanently move the equipment at the close of the Jamboree to councils with limited to no radio scouting installations in their camps or facilities. Ideally, this would be done with the support of the local amateur radio club. This would offer the sponsor an ongoing impact after the Jamboree with local council use of the equipment.

Notes

Missing from previous Jamborees are FCC license training and testing (although we will explore offering FCC testing only), SWL receivers and robot rovers with television. Kit building was discussed in previous versions of this plan, but is not included here. See the optional plan in the Appendices for consideration of adding foxhunting, a Visitor/Summit Center station, FCC license training/testing, and emergency communications.

Appendix A --- Cost Estimate

This cost estimate was prepared based on generally available pricing in Fall 2011 as determined by web search. All is considered to be new equipment. Cost could be reduced via loans, rentals, or donations. It is felt that this is a good starting point for determining what's needed and from there determine all the options for acquisition. This currently shows pricing for ICOM Radios, which serves as a good model for other manufacturer's comparable options.

Item	List Price	Quantity	Total Costs	Notes
Amateur Radio Demonstration Station				
Demonstration Station HF Transceiver	\$1,396	4	\$5,584	ICOM 7200
Automatic Antenna Tuner	\$536	4	\$2,144	ICOM AT-180
Power Supply Unit	\$446	4	\$1,784	ICOM PS-126
Desk Microphone	\$195	4	\$780	ICOM SM-30
External Speaker	\$80	4	\$320	ICOM SP-10
Demonstration Station VHF/UHF Transceiver	\$812	2	\$1,624	ICOM IC-2820H
D-STAR Upgrade	\$500	2	\$1,000	ICOM UT-123
Power Supply Unit	\$446	2	\$892	ICOM PS-126
Demonstration Station HF Antennas and Coax	\$500	4	\$2,000	Vertical antennas and coax, switches, etc.
Demonstration Station VHF/UHF Antennas	\$500	2	\$1,000	Verticals, beams, rotators, and coax
Demonstration Station Computers & Software	\$800	6	\$4,800	Laptop computers, logging software, rig control software, digital mode
Large Computer Monitor	\$500	6	\$3,000	For visually displaying station operation to observers
Demonstration Station operating chairs	\$100	12	\$1,200	Swivel chairs on rollers with side arms
Demonstration Station observing chairs	\$100	28	\$2,800	High stools with backs
Demonstration Station Antenna Support Structures	\$2,000	1	\$2,000	1 tower and beam, dipole supports
Demonstration Station Servers	\$1,000	2	\$2,000	Networked logging systems
Operating Tables	\$100	7	\$700	
Partitions	\$150	14	\$2,100	
Welcome Counter	\$250	1	\$250	
Dxing station HF transceiver	\$4,976	1	\$4,976	ICOM 7600
Dxing station HF power supply	\$446	1	\$446	ICOM PS-126
Desk Microphone	\$195	1	\$195	ICOM SM-30
External Speaker	\$80	1	\$80	ICOM SP-10

DXing station HF power amplifier	\$6,299	1	\$6,299	ICOM PW-1
DXing station HF beam antenna, tower, coax	\$10,000	1	\$10,000	
Dxing Station Computer and software	\$800	1	\$800	Logging and Digital mode software
Large Computer Monitor	\$500	1	\$500	For visually displaying station operation to observers
Dxing Station Operating Tables	\$100	3	\$300	
Dxing Station Operating chairs	\$100	2	\$200	
Dxing Station Welcome Counter	\$250	1	\$250	
Portable satellite stations	\$750	3	\$2,250	VHF/UHF transceivers and antennas
Tent at 20 x 40 feet, walls with windows	TBD	1	\$-	Tents to be placed on concrete slabs with power and internet outlets
Concrete slabs or other solid flooring, electrical, Internet wiring	\$3,500	1	\$3,500	Flooring must be above grade to prevent standing in water while operating high power equipment
Lighting systems for tent	\$1,000	1	\$1,000	24 hour operation of stations will require lighting during nighttime and inclement weather
K2BSA Operation Sign	TBD	1	\$-	
Radio Merit Badge Classroom				
Tables	\$100	12	\$1,200	
Folding Chairs	\$100	36	\$3,600	
White Board on wheels	\$700	2	\$1,400	
Large screen television for presentations	\$2,500	1	\$2,500	55" LED TV
Computer and display software	\$800	1	\$800	
Partitions	\$250	4	\$1,000	
Computers for individual training	\$800	18	\$14,400	Use computer based training
Tent at 20 x 20 feet, walls with windows	TBD	1	\$-	Tents to be placed on concrete slabs with power and internet outlets
Concrete slabs or other solid flooring, electrical, Internet wiring	\$3,500	1	\$3,500	Flooring must be above grade to prevent standing in water while operating high power equipment
Lighting systems for tent	\$1,000	1	\$1,000	Evening operation of classes and potential for license testing will require lighting

Radio Merit Badge Sign	TBD	1	\$-
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Overall Requirements

Souvenirs for youth/leaders	\$3	7000	\$21,000	Some sort of tchotchke
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VHF Repeater with duplexer	\$2,500	1	\$2,500	ICOM CY5000-41 D
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UHF Repeater with duplexer	\$2,500	1	\$2,500	ICOM CY6000-41 D
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Repeater Antennas, Support, Etc.	\$5,000	1	\$5,000	To be determined
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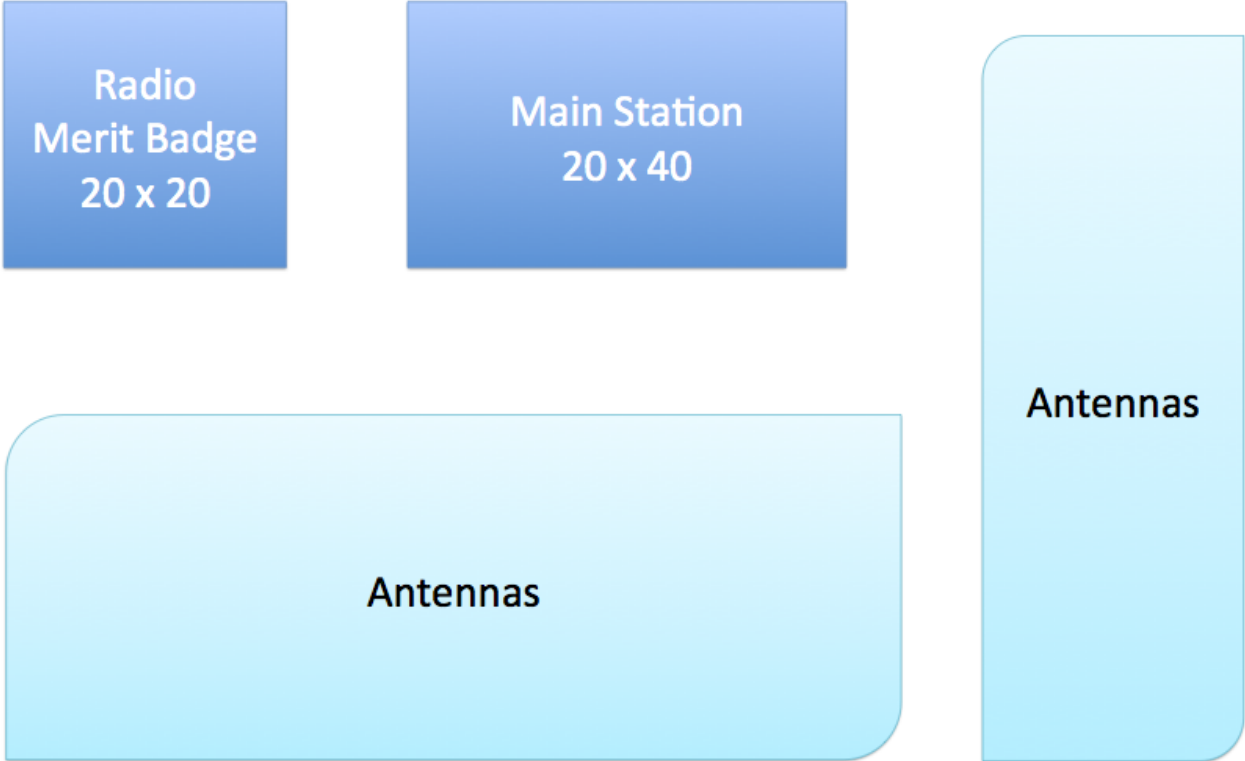
Grand Total			\$127,174	
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Appendix B --- Electrical & Internet Requirements

This estimate of electrical requirements was prepared using available specifications for the equipment specified above. It should serve as a good guideline for preparing electrical requirements (number of outlets, power ratings, etc.) for each of the operations.

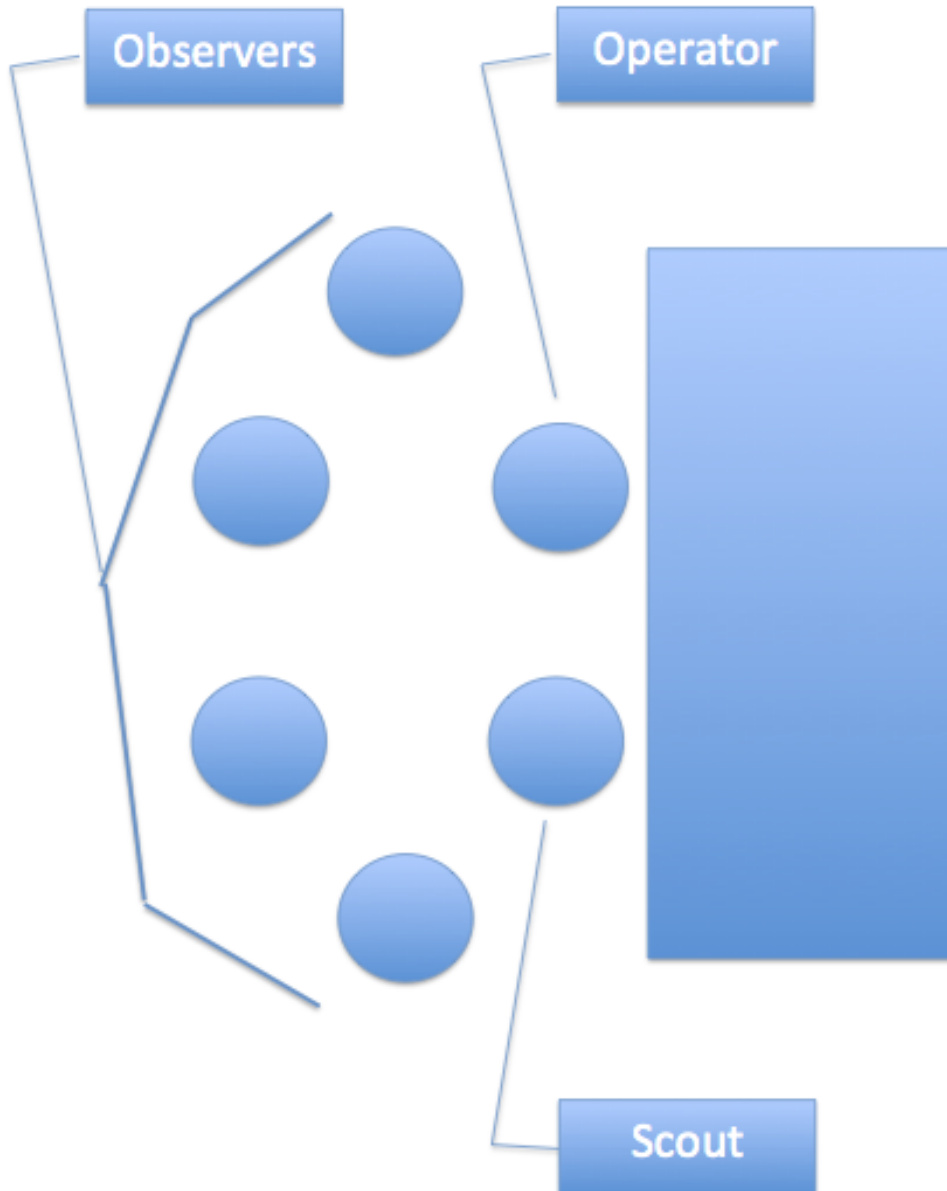
Item	VAC	Ampere Each	Quantity	Notes
Amateur Radio Demonstration Station				
Power Supply Unit, ICOM PS-126	120	7	7	4 HF, 2 VHF/UHF, and 1 DXing Transceivers
Demonstration Station Computers & Software	120	2	7	Laptop computers, logging software, rig control software, digital mode
Large Computer Monitor	120	2	7	For visually displaying station operation to observers
Demonstration Station Servers	120	2	2	Networked logging systems
DXing station HF power amplifier ICOM PW-1	240	15	1	Only requirement for 240 VAC
Portable satellite stations, charging supply	120	3	3	
Lighting systems for tent	120	15	1	24 hour operation of stations will require lighting during nighttime and inclement weather
Internet Connections			8	High speed Internet for connection with DX Clusters, Club Log, Logbook of the World, and website
Radio Merit Badge Classroom				
Large screen television for presentations	120	2	1	55" LED TV
Computer and display software	120	2	1	
Computers for individual training	120	2	18	Use computer based training
Lighting systems for tent	120	15	1	Evening operation of classes and potential for license testing will require lighting
Repeater Installation				
VHF Repeater with duplexer	120	7	1	ICOM CY5000-41 D
UHF Repeater with duplexer	120	7	1	ICOM CY6000-41 D
Internet Connections			2	High speed Internet for remote control and links to various voice/data modes via the web

Appendix C --- Facilities Diagram



Appendix D --- Demonstration Station Layout

This layout shows the arrangement of radio operating table and the supporting chairs for operation and demonstration purposes. The four observers chairs would be tall stools that would allow better sightlines over the backs of the ham radio operator and the Scout in the other operating chair. Both of these operating chairs would be standard height rolling office chairs.



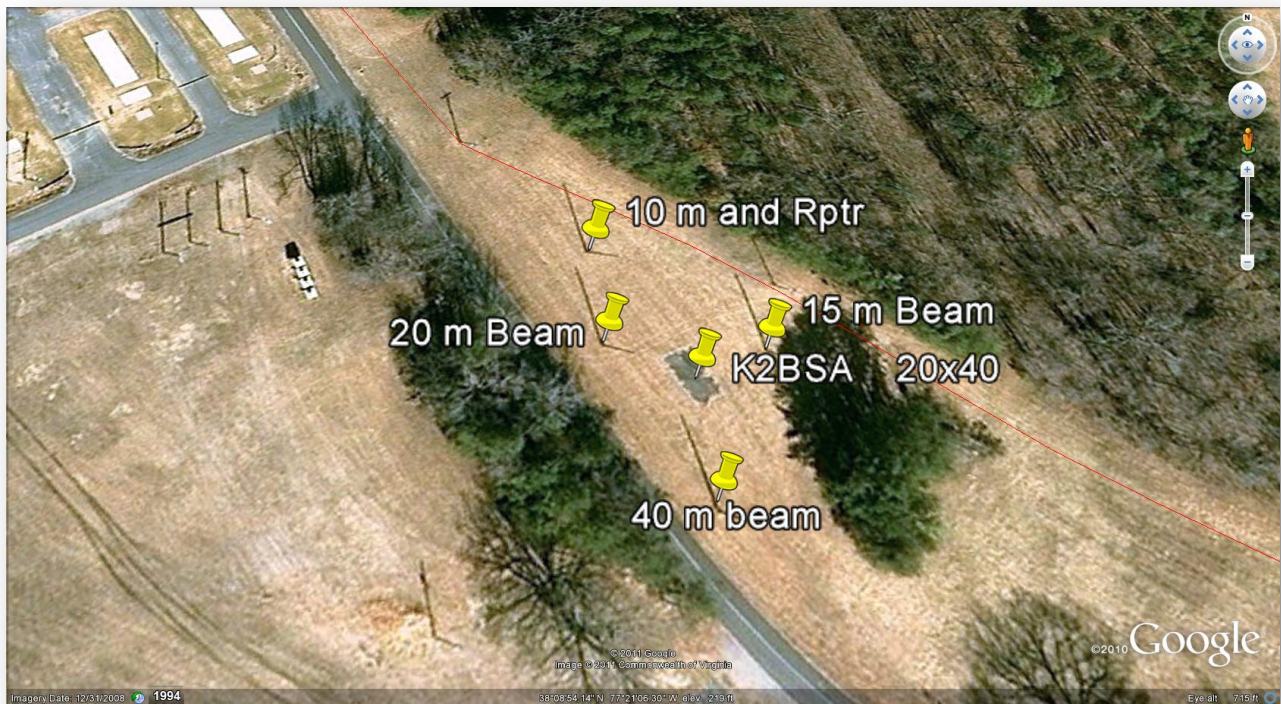
Appendix E --- Antenna Requirements

The photo below is of the K2BSA installation at Fort A.P. Hill for the 2010 Jamboree. This shows several telephone poles used for the rotatable beam antennas for 10 meters, 15 meters, 20 meters, and 40 meters. For the Summit 2013 Operation we are proposed just one tower for use by the DXing station, with a tri-band beam covering all bands from 20 meters to 6 meters. The HF demonstration stations would use multi-band vertical antennas that would be mounted on the ground. The VHF/UHF demonstration stations would use mast mounted vertical antennas.

The tower has been donated and at this point needs coordination of movement and installation. The donation includes installation of the tower. It is a 130 foot tower that would need guy lines of approximately the same length. This area under the tower would need to be traffic free.

The vertical antennas would also need to be arranged traffic free. They will have live RF energy on the antennas that could result in shock. In addition, ground radials will be installed around the antenna --- laying on top of the ground. These too would pose risks to passing traffic.

Finally, the antennas need some separation from one another to avoid receiver overload and interference. In addition, a strong grounding system is needed for all the antennas and transceivers in the main station tent.



Appendix F --- Top Level Position Descriptions

K2BSA Chairman

Duties Prior to Jamboree:

- Recruit key staff for each of the areas.
- Pursue sponsorships and donations.
- Working with staff leadership, build a comprehensive plan for Jamboree operations.
- Contact radio vendors for use of equipment.
- Prepare staff guides and other support materials
- Prepare all mailings to staff.
- Build needs list for both equipment that will be loaned and materials that will need to be purchased.
- Meet with communication/emergency associates.
- Develop training outline for staff.

Duties at the Jamboree:

- Interface with the Boy Scout organization.
- Supervise overall operation.
- Hold short staff meetings daily.
- Direct training program for staff.
- Be a floating alternate to fill in where needed.
- Work with the emergency/communications personnel to provide backup communications.

Duties after the Jamboree:

- See that all the borrowed equipment is returned and all sponsorship agreements are fulfilled.
- Prepare an after action report.
- Write thank-you notes to all staff and vendors.
- Prepare QSL cards for mailing
- Be available to the International Division for radio related questions.
- Staff evaluations

K2BSA Station Manager

Duties prior to Jamboree

- Finalize organization chart of K2BSA operations
- Review staff applications
- Recruit all operations staff members in consultation with chairman
- Develop station layouts and detailed bill of materials --- both main station and visitor/Summit center station
- Develop Fox Hunting course and operation
- Determine message handling requirements and establish process/staffing
- Build the operations plan including training for staff members
- Determine throughput of demonstrations and develop goals

Duties at the Jamboree

- Conduct installation of K2BSA operation
- Train staff members
- Develop staff into shifts
- Active problem solving
- Ensure QSL cards completed for each QSO
- Tear down of Jamboree facilities, packing of equipment and shipment to next location or storage

K2BSA Radio Merit Badge Manager

Duties prior to Jamboree

- Finalize organization chart of K2BSA education operation
- Review staff applications
- Recruit all education staff members in consultation with chairman
- Develop floor plan layouts for merit badge instruction and FCC licensing instruction and testing tents
- Build the training plans for merit badge and FCC licensing
- Evaluate, select, and implement training aids and computer based training tools
- Determine throughput of training/testing and develop goals

Duties at the Jamboree

- Conduct installation of merit badge and FCC licensing tents
- Train staff members
- Develop staff into shifts
- Active problem solving
- Tear down of Jamboree facilities, packing of equipment and shipment to next location or storage

K2BSA Support Coordinator

Duties prior to Jamboree

- Prepare station design, site plan, requirements list, antenna requirements
- Working with Operations Coordinator develop operating procedures
- Prepare operations guide for use by all operators
- Prepare installation plan and with Operations Coordinator and Education Coordinator build detailed bill of materials for all K2BSA equipment and facilities needs
- Develop an emergency system that involves all K2BSA staff members and other amateur radio operators on the Jamboree property

Duties at the Jamboree

- Install all equipment and ensure its operation throughout the Jamboree
- Monitor repeater operation and ensure trouble free operation
- Establish computer networks for logging software
- Supervise and control on site computers and software
- Upload logs in real time or at a minimum daily to Club Log and Logbook of the World
- Capture photos/videos of Jamboree operations
- Keep world-wide audiences informed of K2BSA operations via social media and website
- Operate the emergency communications network in times of emergency, conduct tests to ensure it is ready for operation
- Tear down of Jamboree facilities, packing of equipment and shipment to next location or storage

Appendix G --- 2010 Jamboree Results

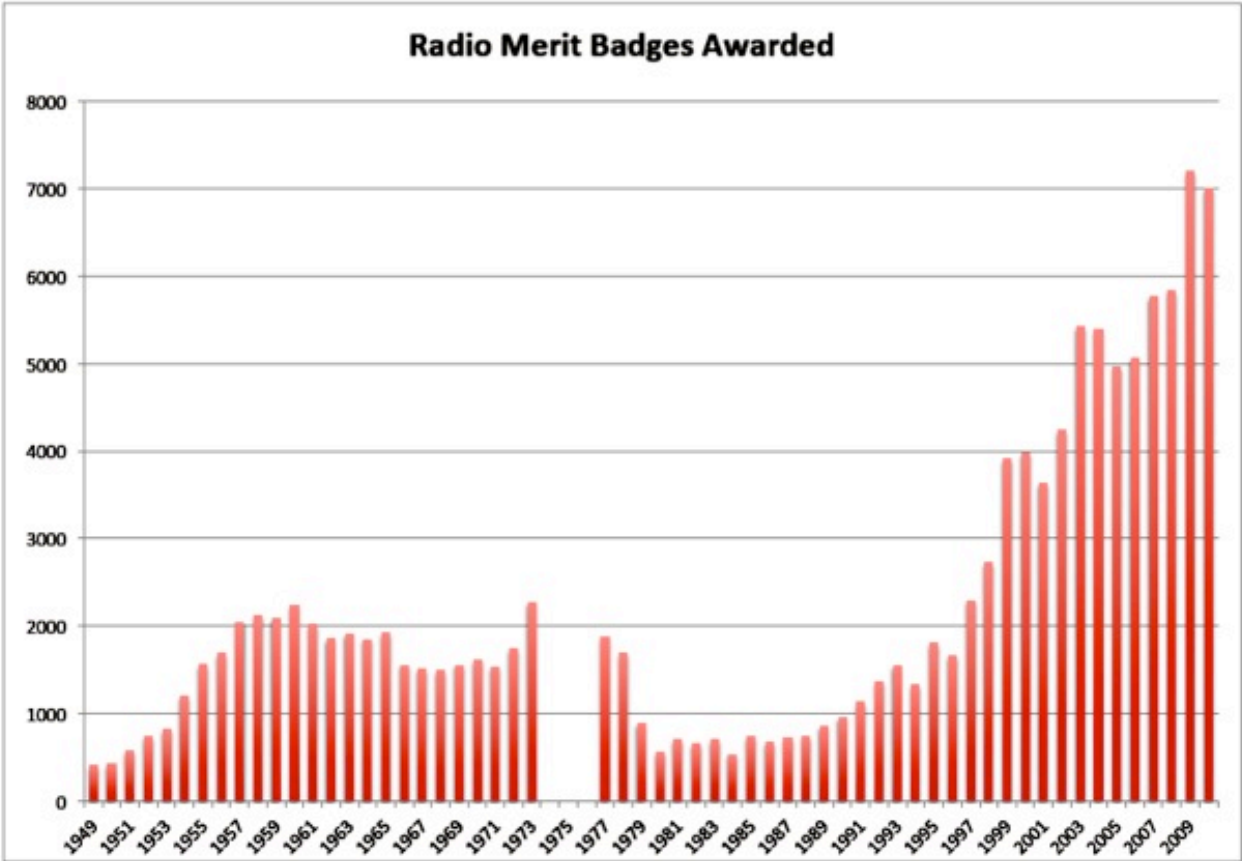
Staff Members	46 positions filled from 50 allocated
Demonstration Station visitors	5,000+
Radio Merit Badge	332 started, 210 completed
FCC Licensing	316 took the test
	143 Technician licenses
	33 General licenses
	8 Extra Class licenses

Appendix H --- U.S. Licensed Amateur Radio Operators

The number of licensed amateur radio operators has continued to grow over the last several decades. It is now at just over 700,000.

Date (month of December for each year)	Licensed Amateur Radio Operators
1971	285,000
1981	433,000
1991	494,000
2001	683,000
2011	700,221

Appendix I --- Radio Merit Badge History



Appendix J --- Optional Operations Plan

This appendix provides an optional operations plan should additional staffing be available to support a full program. Key features of this plan are an additional operating location at the Visitors/Summit Center, FCC License training/testing, foxhunting, and emergency communications and support. This optional plan requires an additional 20 to 26 staff members, should the full plan be implemented.

Potential Additional Goals

With increased staffing levels, the following goals could be added to the K2BSA operation:

- Provide Amateur Radio FCC Licensing training and testing to both Scouts and Leaders. Target 250 new or upgraded licenses. [Requires 8 to 10 additional staff members]
- Provide demonstrations and communication from the Jamboree Visitor/Summit Center to visitors. [Requires 6 to 8 additional staff members]
- Provide Amateur Radio Direction Finding Foxhunting experiences to 500 plus Scouts. [Requires 6 to 8 additional staff members]
- Provide emergency communications throughout the Jamboree property.

Potential Additional Activities

With increased staffing levels the following activities could be added to support the goals above:

- Facilitate amateur radio FCC license training and testing to allow Scouts and leaders to further their involvement in Radio Scouting.
- Visitor/Summit Center demonstrations and communication through operating a high power multi-band amateur radio station to communicate throughout the world. In addition, provide VHF-UHF communication throughout the Jamboree footprint.
- Foxhunting on a suitable orienteering course that would allow several groups to be on the course at one time.

Primary Location

Four tents at 20 feet by 30 feet with concrete or wood floors (raised above grade for drainage) and power outlets, Internet connections, and antenna grounding. A draft location layout is provided.

- Main Station
- Radio Merit Badge Classroom with partitions
- FCC License Training and Testing Classroom with partitions
- Foxhunt Staging and Training and Technical Support

Main Station for demonstrations and communication operations

- Four identical demonstration stations with low-cost HF transceiver (Yaesu FT-450, Kenwood TS-480, or ICOM IC-718) feeding multi-band vertical and/or dipole/inverted vee. Computer with logging software (networked) and set up for PSK and Echolink. Set up with two operating chairs and four observing chairs --- one K2BSA operator with one Scout for operation, swap Scout operating with each of the four observers.
- Two VHF/UHF stations for demonstrations, repeater monitoring, and emergency communication

Radio Merit Badge Classroom

- Seating for number of Scouts to be determined (estimated 36 at this stage)
- Partitions to divide the space into four class areas
- Consider using computer based training for several merit badge requirements as suitable (estimated 18 computers at this time).
- Provide classroom discussion and presentation of more difficult concepts
- Large display television screen for slides, videos, etc.
- Large whiteboard for classroom presentations
- Flipcharts as needed

FCC License Training and Testing Classroom

- Seating for number of Scouts and Leaders to be determined (estimated 36 at this stage)
- Large display television screen for slides, videos, etc.
- Large whiteboard for classroom presentations
- Flipcharts as needed

Foxhunt Staging and Training, Technical Support and Staff Area

- Foxhunt staging area for storage of equipment
- Technical support area with workbenches and test equipment

Foxhunt Course

- Nearby Foxhunt course that would allow multiple groups to be on the course at the same time locating the foxhunt beacons.

Visitor/Summit Center Location

One tent with VHF/UHF FM communication link to Jamboree locations including the Main Station. Include amateur television two-way transmission to main station. One high power DXing HF station with top of the line HF transceiver, amplifier, and 20m to 6m beam on tower as well as 40m and 80m vertical. Used for handing out contacts to those interested in contacting the Jamboree and demonstrating amateur radio operation for visitors.

Staffing --- Optional Operations Plan

Previous Jamborees have required 40 to 50 or more staff members for all operations. The co-location of the Radio Merit Badge operations will help in that staff members will be in one location for that work. However, the additional requirement of a Visitor Center Operation will no doubt make up for that potential savings.

Staff members will be needed to build and set up the station as well as take down the station at the end of the Jamboree. Many of these positions can be filled by those that are only available for a portion of the Jamboree. Here is our current estimate for staff members and their locations with a total of 54 to 61 staff positions. A top-level organization chart is included later.

Staff Position	Number
Demonstration station operators	15
Visitor Center operators	6 to 8
Radio Merit Badge instructors	10
FCC Licensing instructors	8 to 10
Foxhunt coaches	6 to 8
Technical system operation and repair (RF transmission, antennas, networking, etc.)	3 to 4
Web and social media support staff, to include photography of operations	2
Chairman and first line supervisors	4

Costs --- Optional Operations Plan

A moderately detailed cost estimate is included later. This cost estimate was built with the activities noted above in mind and with prices generally available via web search in September 2011. These costs are for new items and do not presently consider any materials already in possession of the K2BSA Jamboree operation or items that could be loaned or rented. It attempts to take into account all elements required for the operation.

The cost estimate comes in at roughly \$200,000.

Appendix K --- Acknowledgements

Thanks to Bill Ragsdale, K6KN, who drafted a comprehensive proposal for the 2013 Jamboree operation that provided the framework and much of the detail in this plan. Thanks also to Ed Dudley, WA4ISI, Gary Wilson, K2GW, and David Gaddis, KE4KPC who provided substantial feedback on the first draft of this plan.

Brian Milesosky, N5ZGT, Larry Sack, N8QNM, Sidney Hughes, K0SCH, and Ed Dudley, WA4ISI also provided substantial feedback on the second draft of this plan.

Bob Weimers, W5FIG, provided substantial insight into staffing levels around the cut back from 50 staff members in 2010 to 30 staff members in 2013.