Operation Sky-High

The Bucket Truck Antenna Challenge — Field Day Workshop & Deployment Report

Activity Overview

Transforming heavy-duty club infrastructure into an engaging, hands-on STEM and emergency-preparedness workshop. Participants learned critical principles of mechanical advantage, propagation height, and industrial safety while assisting in suspending high-performance Field Day antennas utilizing certified utility boom (bucket) trucks.

Target Audience	Club members, newly licensed hams, youth groups (Scouts), and community visitors looking for a unique Field Day experience.
Required Equipment	Certified bucket truck with qualified operator; lightweight wire antennas (dipoles/end-feds), dacron support rope, pulley blocks, carabiners, PPE (hard hats, harnesses, lanyards, high-vis vests), laser measure/height worksheet, and antenna analyzer.

Program Objectives

- **Safety First:** Teach proper industrial safety protocols, personal protective equipment (PPE) utilization, and OSHA/ANSI standards around aerial lifts.
- **Radio Science & Physics:** Demonstrate how antenna height and clearance from obstacles affect radiation patterns, takeoff angles, and signal reach.
- **Emergency Deployment Skills:** Simulate rapid infrastructure deployment strategies used by emergency communications (EmComm) teams during disasters.

Step-by-Step Activity Structure

Phase 1: Safety Briefing & Pre-Check (15 Minutes)

Reviewing basic aerial lift safety, pinch points, and clear communication signals (hand signals and two-way radios) between the bucket operator and ground crew. Demonstrating proper inspection, fitting, and tie-off procedures for full-body harnesses and lanyards inside the bucket.

Phase 2: Physics in the Sky (15 Minutes)

Discussing why height matters by analyzing ground attenuation, Fresnel zones, and how elevating an antenna changes its radiation takeoff angle. Identifying optimal anchor points such as mature tree limbs or independent temporary masts where the bucket truck can safely position lines.

Phase 3: The Lift & Deploy Challenge (30 Minutes)

Assigning participant roles including Bucket Operator, Ground Rigged Safety Coordinator, Line Handler, and Log/Analyzer Technician. The operator elevates the bucket to a safe predetermined height to secure pulley blocks or hoist support ropes over target structures, working together with ground crews to tension lines for ideal sag and height.

Phase 4: Testing & Tuning (15 Minutes)

Lowering the antenna temporarily for manual adjustments or testing live in position. Utilizing antenna analyzers to map SWR curves across target bands (e.g., 20m and 40m) and comparing these metrics against baseline readings taken near ground level to empirically showcase elevation benefits.

Field Deployment Photo Documentation

Visual records capturing the setup, aerial lift positioning, antenna suspension, and integration with local emergency communications infrastructure during the workshop.

Figure 1: Marcus Radio utility boom truck staged on site during initial preparations.

Figure 2: Site overview showing proximity to communications tower and warehouse infrastructure.

Figure 4: Twilight view of the deployed antenna system securing elevated propagation height.

Figure 3: Detailed view of the bucket truck articulating boom raising support rigging.

Workshop Outcomes & Summary

> Successful completion of Operation Sky-High provided participants with hands-on experience in emergency radio deployment, reinforcing crucial lessons in radio wave propagation, team coordination, and industrial safety compliance.

By integrating heavy utility equipment into amateur radio training, the club effectively bridged the gap between theoretical classroom knowledge and practical field operations. Operators successfully documented noticeable improvements in SWR resonance and signal propagation efficiency.