

2016 BAYRICS AUTHORITY INTEROPERABLE RADIO EXERCISE RESULTS AND RECOMMENDATIONS

EXECUTIVE SUMMARY

On September 8, 2016, as part of 2016 Urban Shield Yellow Command, six Bay Area Public Safety agencies conducted tests of the region's advanced public safety radio communications systems. This Report provides test description, results, and recommendations from those tests.

The Yellow Command exercise, consisting of both full-scale and functional exercise play components, is specifically designed to engage all levels of Emergency Operations Centers (EOCs) and promote coordination between jurisdictions and agencies in response to a series of incidents occurring throughout the Region. This was the second consecutive year that interoperable radio tests have been conducted in conjunction with Urban Shield's Yellow Command.

For 2016, Yellow Command's *Regional Objective #3* involved the testing of alternative communication paths and interoperability across Bay Area operational areas utilizing radio and satellite phone technologies in response to a catastrophic earthquake scenario. To meet part of this objective, the Bay Area Regional Interoperable Communications Systems Authority (BayRICS) developed a series of interoperability radio tests across the region to validate the technical capabilities available with the Project 25 (P25) standards-based radio systems under development in the Bay Area.

BayRICS coordinated tests in three locations: San Mateo County, San Francisco and Oakland. Field technicians in each location evaluated radio programming procedures, regional talk group assignments and geographic coverage of the new P25 systems, to demonstrate that the radios were programmed properly and capable of operating on networks outside their home jurisdictions.

Results: Evaluators assigned to rate objective criteria reported an 82% calling success rate (22 of 28 calls completed) for the exercise. While evaluators found that the region's radio programming procedures and mutual aid channel/talk group assignments generally worked as expected, several programming and operational issues prevented some tests from being fully completed. Also, a lack of proper training caused some confusion. Overall, the tests continue to validate that the region's "system of systems" approach is capable of providing acceptable levels of interoperability and mutual aid support for the region, and identified several specific areas for improvement that will be addressed in future exercises.

Recommendations and Next Steps: This round of tests identified specific capability gaps and training/exercise needs for Bay Area first responders, which should be addressed in future regional training/exercise budgets. Specifically, BayRICS recommends that:

1. The P25 Operators Advisory Group, within the next 12 months, should develop a specific list of interoperable capabilities gaps and a proposed plan to close those gaps, to address both the technical programming and operational issues identified in these tests;
2. Once these gaps have been identified, the Bay Area should identify and allocate funding for development of a regional training program, including a comprehensive regional exercise simulating regional, mutual aid operational conditions with actual users of the technology—law, fire and EMS personnel.

TEST DESCRIPTION

1. BACKGROUND

Several years ago the Bay Area embarked on a “system of systems” approach to upgrade the region’s public safety Land Mobile Radio (LMR) networks to incorporate P25, standards-based technology. At that time, several agencies embarked on separate radio system upgrades, but with the understanding that the standards-based technology would provide interoperability for mutual aid response.

Currently, P25 systems have been completed in Alameda County, Contra Costa County and San Mateo County. Santa Clara County has partially installed a new P25 system. San Francisco has installed a P25 “overlay” network, and Marin County has deployed a 700 MHz conventional tactical system designed to interoperate with new digital radios. In addition, both San Francisco and Marin County are planning full upgrades to P25 compliant systems over the next 12-24 months.

BayRICS has been tasked with coordinating the work required to ensure that these separate systems are fully interoperable. BayRICS has established a “P25 Operators Advisory Group” to facilitate these efforts and provide a forum for resolving interoperability issues.

In 2015, the advisory group coordinated a series of tests during Urban Shield to (1) demonstrate the interoperability capabilities of these advanced radio systems, (2) verify the region’s radio programming procedures, (3) validate the channel and talk group allocations established in the Bay Area’s regional “Fleetmap” guide, and (4) test the extent of overlapping coverage areas of these systems.

Building on the 2015 test results, a new series of test were conducted on September 8, 2016 during the 2016 Urban Shield Yellow Command Exercise. The 2016 tests focused on coverage in South San Francisco in San Mateo County (near San Francisco International Airport), and in the cities of San Francisco and Oakland.

The exercises were limited to technical performance tests (not operational field testing), designed to set a baseline for future operational exercises incorporating these advanced technical capabilities. Because tests were technical in nature, as opposed to the operational and functional activities making up the bulk of the Yellow Command exercise, radio exercises were conducted in parallel to the Yellow Command exercise, but executed separately.

2. PARTICIPATING AGENCIES

- City and County of San Francisco Fire Department and Sheriff
- City of Palo Alto
- County of San Mateo
- East Bay Regional Communications Systems Authority (EBRCSA)
- County of Santa Clara
- County of Alameda

BayRICS coordinated the test logistics and evaluation process, and compiled this after-action report.

3. EXERCISE LOCATIONS AND SCENARIOS

The exercise was comprised of three separate activities conducted from 0900–1200 on Thursday September 8, 2016:

<p>Exercise One: Commences at 0930</p>	<p>San Francisco, SVRCS Alameda County and Oakland test interoperable P25 radio communications on regional mutual aid talk groups in South San Francisco in San Mateo County/South San Francisco, at:</p> <p style="text-align: center;">480 North Canal, City of South San Francisco, CA 94080</p> <p>After those tests San Francisco and San Mateo County to test the P25 mutual aid SECURE encrypted talk group.</p>
<p>Exercise Two: Commences at 1030</p>	<p>San Mateo County, SVRCS, Alameda County and Oakland test interoperable P25 radio communications on regional mutual aid talk groups outside the City and County of San Francisco Emergency Operations Center:</p> <p style="text-align: center;">1011 Turk St., San Francisco, CA 94102</p>
<p>Exercise Three: Commences at 1130</p>	<p>San Francisco, San Mateo County and SVRCS test interoperable P25 radio communications on regional mutual aid talk groups in Alameda County/City of Oakland at:</p> <p style="text-align: center;">1801 Adeline Street, Oakland, CA. 94607</p>

At each test location, field techs made calls using the regional mutual aid talk groups designated in the BayRICS regional Fleetmap guide. Participants also made calls back to their “home” dispatch centers, to determine if coverage was available and verify that the radios could be quickly switched from one system to another in the field.

A total of 28 separate radio tests were conducted at the three exercise locations. Evaluators were assigned to rate objective criteria for each of the calls, including time and location of the call attempt, channel talk groups used, and the success in completing the call. Evaluation logs included feedback from both the field units making the call and the dispatch centers receiving the call, to evaluate the capabilities at both the sending and receiving ends of the calls.

RESULTS

Evaluators reported that the tests were generally successful. Specifically, evaluators reported 82% calling success rate, with 23 of 28 calls partially or fully completed. Evaluators concluded that the interoperability capabilities of the systems and radios generally worked as expected, and validated the region’s radio programming procedures and mutual aid channel/talk group assignments.

Radio coverage of all systems throughout the Bay Area was very good. In almost all cases, San Francisco, San Mateo and Alameda County/EBRCS radio techs were able to make calls back to their home networks from all test locations.

Evaluators reported four failed calls during Activity One and one failed call during Activity Three. Another ten calls were only partially completed, meaning that calls made on some, but not all, talk groups were successful, or that that calls were successfully heard and acknowledged on the system, but not fully completed to the designated dispatch center. In all cases, unsuccessful calls fall into one of two categories: technical programming errors or operational errors.

Technical programming issues were reported for five calls, including the encrypted talk group test and failed calls from radios that were not programmed with all agency talk groups. Of the calls that were partially completed, two resulted from incorrect radio programming, with the field tech discovering that radio ID's had two numbers transposed. These technical programming issues were quickly identified and corrected.

Operational issues were reported on another eight calls, primarily due to inexperienced radio operators lacking necessary training (amateur radio operators) covering dispatch for Alameda County EOC. These calls were partially completed and acknowledged by other system users. This issue was addressed with a quick, real-time training session, after which some calls to Alameda County EOC were completed.

Evaluators were not asked to evaluate the quality of the audio communications, only whether each call was successfully completed. However, evaluators noted that digital audio was very clear and audible in almost every case. Evaluators also recognized the high level of collaboration and communication among agency technicians during the tests, as they identified and quickly resolved programming issues.

The evaluators' summary technical notes for each test are provided in Appendix 1, Summary Technical Notes. Paper copies of evaluation sheets are available on request to Barry Fraser (bfraser@acgov.org).

RECOMMENDATIONS

Although these tests demonstrate that considerable progress has been made in the deployment of regional interoperable radio systems, the failed and partially completed calls experienced in this round of tests highlight specific capability gaps and training/exercise needs. The tests revealed deficiencies that must be addressed to ensure an adequate response in the event of a regional emergency. **The Bay Area should consider developing a plan to address these gaps and allocate future regional UASI grant funding to develop training and exercise programs to ensure that personnel are adequately trained and knowledgeable in using the new technology.**

Specifically, BayRICS recommends that:

1. **The P25 Operators Advisory Group, within the next 12 months, should develop a specific list of interoperable capabilities gaps (addressing the technical, programming and operational deficiencies identified in these tests) and a proposed plan to close those gaps.** For example, radio shops (both P25 and conventional shops), as well as dispatch centers, need to work more closely to develop and maintain consistent radio programming guidelines, practices and procedures. Agencies should improve their procedures for system key sharing and radio programming practices that ensure that every radio used for mutual aid response are programmed with the correct talk groups.
2. **Once these gaps have been addressed, the Bay Area should identify and allocate funding for development of a regional training program, including a comprehensive regional exercise that engage actual users of the technology.** The operational problems experienced with the tests demonstrate the need for additional training and practice using the interoperable talkgroups and technology by actual users of the technology--not only the law, fire and EMS "boots on the ground," but also the dispatch center personnel that handle these calls. The Bay Area should design a curriculum of interoperable radio training courses, and conduct a comprehensive exercise simulating a regional mutual aid scenario that engages the actual users of the

technology. These tests should evaluate whether personnel are properly trained to use these new capabilities in a mutual aid scenario across the region's P25 systems.

We encourage radio technicians from all Bay Area agencies to review the programming issues identified and resolved during these tests, and take steps to ensure that these issues do not recur in future field exercises and incidents. The BayRICS P25 Operators Advisory Group will continue to meet monthly to share interoperable radio lessons learned and best practices. All agencies may to participate in these meetings, and may obtain more information by sending an email to info@bayrics.net.

APPENDIX 1 – SUMMARY TECHNICAL NOTES

1. Equipment Notes

Agencies used Motorola APX6000 and APX7000 portable radios for field testing at most locations.

2. Talk Groups Tested

The region has adopted a regional fleetmap guide for interoperable talk groups and channels. The tests utilized the following talk groups, which are designated for regional mutual aid response:

West Bay:		East Bay:	South Bay:
San Francisco	San Mateo Co.	Alameda Co.	Santa Clara
-Calling (reserved only for testing)	-Calling (reserved only for testing)	-Calling (reserved only for testing)	-Calling (reserved only for testing)
-Interop 1	-Interop 1	-Interop 1	-Interop 1
-Interop 2	-Interop 2	-Interop 2	-Interop 2
-Interop 3	-Interop 3	-Interop 3	-Interop 3
-Interop 4	-Interop 4	-Interop 4	-Interop 4
-Interop 5	-Interop 5	-Interop 5	-Interop 5
SECURE (encrypted)	SECURE (encrypted)		

3. Evaluators Notes

Activity 1:

All field units to Alameda County: inexperienced radio operators working in Alameda County EOC were unable to handle test calls initially. Evaluator pulled the operators and gave them a quick training on the objectives of the exercise and radio etiquette. After that, calls from SF Fire units in San Francisco and Oakland were completed.

All tests of San Mateo County Radios and Mutual Aid Talk Groups were completed and radios performed as expected (except SECURE Talk Group, see below). All calls to San Mateo County EOC dispatch completed as expected.

Gene Ashton (SF): The San Mateo shop never did configure their EOC's radios with the SECURE talk group so that was not tested. On Wednesday though I was in contact with the San Mateo radio shop and we were able to configure one of their radios correctly over the phone. We talked to each other on the San Mateo SECURE talk group just fine. So, we know it works but it just never made it to Urban Shield testing.

Activity 2:

SVRCS to San Francisco: Interop 3, 4 & 5 not completed due to faulty radio programming in field SVRCS tech determined that radio ID's had 2 numbers reversed in programming.

Oakland to San Francisco: Not completed – talk groups not programmed into radios.

Activity 3:

SVRCS to Alameda County: Alameda Dispatch was unavailable for the entire test, Oakland Radio preformed the role of dispatch to complete the exercise.

STRENGTHS IDENTIFIED

1. Well organized exercise, and all participants proactive.
2. San Mateo County Dispatch was ready on time, very professional and conducted the testing perfectly. Audio was very clear.
3. Oakland Radio was able to jump in and conduct East Bay testing when Alameda County dispatch was unavailable. Dispatch role should always be played at the he dispatch console.
4. Palo Alto was allowed to participate even though not on the original activity list.
5. Radio coverage of various systems throughout the Bay Area was very good. Digital audio was very clear and audible when in strong coverage.

AREAS FOR IMPROVEMENT

1. Need to check and coordinate with every agency whether radios are programmed with Interop channels for San Mateo & San Francisco systems. Maybe set a number of radios for each agency that have all systems programmed for mutual aid.
2. Agency coordination to share system keys.
3. Other than Sam Mateo County, dispatch players did not seem to be using headsets.
4. Continued/additional testing to engage end users, rather than radio technicians, during these tests.
5. Radio shops work more closely on programming, make sure the Alpha Numeric displays are the same on all radios. This would cause confusion if the display names are different in any way to public safety users.