STATE-SUPPORTED RADIO COMMUNICATIONS SYSTEMS

Legislative Commission
of the
Legislative Counsel Bureau

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Table of Contents

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LEGISLATIVE COMMISSION

B. Mahlon Brown
Carl F. Dodge
F. W. (Bill) Farr
James I. Gibson
Warren L. Monroe
C. Clifton Young

Keith Ashworth
Lawrence E. Jacobsen
Donald R. Mello
R. Hal Smith
William D. Swackhamer
Roy L. Torvinen

Assembly Concurrent Resolution No. 40—Committee on Ways and Means

FILE NUMBER 141 (1969)

ASSEMBLY CONCURRENT RESOLUTION—Directing the legislative commission to study the various state-supported radio communications systems.

WHEREAS, Communications are an essential problem facing any government agency in the state; and

WHEREAS, Many state and local departments, agencies and bureaus require radio communications systems in the performance of the duties imposed upon them by law; and

WHEREAS, Many of such communications systems are supported in whole or in part by state funds; now, therefore, be it

Resolved by the Assembly of the State of Nevada, the Senate concurring, That the legislative commission is hereby directed to make a study of the radio communications systems supported in whole or in part by state funds to determine the effectiveness of their utilization, to evaluate methods of correlating the various systems and to determine where savings or improvements might be made in the administration of such systems, and to report the results of such study to the 56th session of the legislature.

REPORT OF THE LEGISLATIVE COMMISSION

TO THE MEMBERS OF THE 56TH SESSION OF THE NEVADA LEGISLATURE:

This report is submitted in compliance with Assembly Concurrent Resolution No. 40 of the 55th Session, which directed the legislative commission to study the various state-supported radio communications systems. At the June 20, 1969, meeting of the Nevada legislative commission, the legislative counsel bureau was directed to undertake a study of "the radio communications systems supported in whole or in part by state funds to determine the effectiveness of their utilization, to evaluate methods of correlating the various systems and to determine where savings or improvements might be made in the administration of such systems," pursuant to the mandate of the resolution.

Acting under the authorization of this directive, the research division initiated a survey of radio equipment currently employed in state service. This survey was conducted by John G. Macdonald, Jr., staff communications officer of the Nevada department of highways, in conjunction with another, more exhaustive survey performed by Mr. Macdonald on behalf of the Governor's Ad Hoc Committee on Telecommunications. The research division opted for this cooperative approach to avoid duplication and to benefit from Mr. Macdonald's expertise in the communications field. An independent questionnaire had been developed by the division prior to the decision to engage Mr. Macdonald's assistance, but it was abandoned when further research demonstrated the necessity for a more technical questionnaire design than staff capabilities permitted. The research division is grateful to Mr. Macdonald and the highway department for the use of the data here presented.

A COMMUNICATIONS GAP IN NEVADA?

Nevada is the seventh largest state in the nation in terms of land area, yet it is one of the smallest states in population, ranking 47th in the 1970 Census. Its communities are separated by vast distances, and most areas are not serviced by any forms of modern rapid transit (air or rail). Yet the complexities of modern life affect all of Nevada's cities and towns in varying degrees, and certainly none can totally escape the problems of law enforcement, civil defense, highway safety and other public welfare concerns. An essential, and sometimes vital, requirement for the solution to these problems is instantaneous

communications, so that all of the communities in the state have access to needed information as quickly as circumstances demand. Radio provides a communications link which, from an information systems standpoint, unifies the state and lessens the time dependency otherwise sustained by limited geographical accessibility.

At the state level, time and coordination factors also play a vital role in governmental efficiency and quality of services. Here again, radio communications can provide greater economy of manpower and resources, reduce the critical time factor and minimize the waste caused by lack of coordination.

However, while the value of radio communications is generally recognized, the research division, in its cursory review, found that radio's potential contribution to sound governmental operating procedures has been only partially realized. In fact, in application, the present structure of state-owned and state-supported radio communications systems has sometimes tended to work against its avowed purposes by fostering intersystem jealousies, duplication, waste and lack of cooperation and coordination for maximum public benefit. Examples of serviceable equipment remaining in idle warehouse storage have been cited to the research staff in several conversations with technicians, agency personnel and suppliers. There are indications that some agencies have employed a "black box" approach to procurement; i.e., supplies have been purchased through competitive bid on an item (rather than a system) basis. The result has been the acquisition of diverse types of equipment designed by several different manufacturers. The "black boxes" thus obtained have lacked the necessary interfacing to be functionally operative as an integrated system of communication.

One recent case illustrates the severity of the "black box" problem. In this instance, a portion of a larger system was let to bid with the requirement that those awarded contracts would have to post 100 percent performance bonds. Apparently no supplier felt confident enough about the functional capability of the contract specifications to be willing to post a performance bond, since no bids were received.

Maintenance of state-owned equipment affords another example of inefficient allocation of manpower and resources. Some of the smaller state agencies with limited radio networks provide independent maintenance service for their radio units, repeaters and other equipment. However, budgetary considerations preclude

the retention of more than one or two technicians to handle repairs and upkeep. As a result, certain agency-based servicemen are forced to crisscross the state to keep equipment operational. Frequently one technician from a state agency will pass another from a different agency headed toward the region he has just left. This situation becomes almost ludicrous when two or more agencies share mountaintop repeaters and must dispatch individual maintenance personnel to the same site to check or repair each agency's separate portions of the equipment occupying that location.

Lack of coordination, too, has evidenced itself in the past--most conspicuously, perhaps, in the recent Ash Canyon fire which threatened Carson City. During the crisis, firefighting units from several agencies and communities participated in the effort to extinguish the blaze. However, radio interference from competing networks, differences in communication skills and operational procedures between the various units, and other difficulties greatly reduced the coordination and cooperation among the participants. The result was a failure to maximize the full potential of the manpower and equipment employed at the emergency site. Similar obstacles have been encountered in mass rescue missions following plane crashes, during searches for persons lost in the wilderness or for individuals who have escaped from state institutions, and at other times when centralized command leadership is most essential.

From the comments and evaluations received by the research division, it would seem as if Nevada suffers from a governmental communications gap caused by lack of adequate planning to insure orderly and efficient development of integrated radio systems. Since the staff has no independent expertise or background to assess the merits of the criticisms brought to its attention and cannot technically diagnose deficiencies in current networks, no attempt will be made at this point to outline proposed solutions. Instead, the research division feels justified only in indicating the degree to which the State of Nevada is involved in radio communications systems at the present time and to assert that there appears to be a reasonable basis for the frequent charges of waste and managerial inefficiency in systems engineering, procurement, maintenance, coordination and cooperation among the various agencies currently operating radio nets under state appropriations.

INVENTORY OF STATE-OWNED EQUIPMENT.

In a 1965 staff study of the Nevada department of highways, an inventory of all state-owned radio systems revealed that the state

had 35 base station repeaters, 111 control stations, 902 mobile stations, eight microwave control stations and 13 pack sets scattered among six major users. This equipment had a replacement value at that time of approximately $353,800. In addition, the state-owned buildings for repeaters and maintenance plus test equipment was valued at $404,300. As of July 1964 (the base date of the survey), the investment in mobile equipment facilities in Nevada was $1,058,100. If one subtracts the $247,000 in civil defense equipment, which is federally funded, the state's commitment in radio systems amounted to $811,100 in 1964.

By way of contrast, the replacement value of radio equipment in service as of January 1970 is estimated at $1,578,580, excluding civil defense equipment. In other words, the state has almost doubled its radio equipment inventory in less than 6 years. A detailed breakdown of the state's current radio equipment inventory is attached at the conclusion of this report, as submitted by Mr. Macdonald, together with Mr. Macdonald's letter of transmittal indicating certain qualifications regarding data validity. (See Exhibits A and B).

FEASIBILITY OF TECHNICAL ASSISTANCE FOR RADIO SYSTEMS STUDY.

At the April 29, 1970, meeting of the Nevada legislative commission, the research division of the legislative counsel bureau was directed to investigate the possibility of obtaining federal financing or matching funds for a consultant firm to engage in investigation and planning of a statewide radio communications system. Pursuant to that directive, the research division solicited cost estimates from various consulting firms and reviewed potential sources of federal project grants.

COST ESTIMATES FOR PROJECTED STUDY.

In developing cost projections, potential consultants were given the following instructions:

> Pursuant to a directive from the 55th Session of the Nevada Legislature, the Nevada Legislative Commission is exploring the possibility of hiring technical assistance to critically evaluate state-owned or subsidized radio communications systems, procurement practices, use and deployment of facilities, maintenance policies, and other aspects of its voice-to-voice networks. The objective will be to eliminate waste, maximize efficiency and avoid duplication of resources and manpower.

If your firm has the capability of performing a study such as that specified below, we would like to solicit from you a cost estimate based on the requirements of your concern. Since immediate contracting is not the objective, it is not necessary for you to make a firm offer as to price. Our intention at this point is merely to develop a range of cost estimates so that the Legislative Commission can determine the feasibility of pursuing the study to contract stage.

SPECIFICATIONS

The projected study should be based on primary data collection and analysis, using personal interviews, review of existing facilities, documentation, and emerging trends in agency communications needs.

Working with the Legislative Counsel Bureau, Research Division, the consultants should determine present radio communication requirements for all agencies of the State of Nevada, including:

1. Type of service; i.e., mobile, portable, fixed station.

2. Operating configurations; i.e., point-to-point, mobile net, person-to-person.

3. Approximate number of users and communications traffic for each configuration.

4. Propagation conditions; i.e., terrain, antenna system, distance requirements.

5. Environmental requirements, such as temperature extremes, vibration conditions, possible water immersion, and related conditions.

Once operating requirements have been identified, consultants should validate the application of the existing inventory of equipment (presently valued at approximately $1,578,000) against the requirements, with discrepancies or nonconformance noted. Where deficiencies are found, corrective measures should be recommended.

Consultants should review present procurement practices and recommend ways of improving cost effectiveness of current procurement policies. Similarly, a review should be made of operating and maintenance practices with appropriate recommendations being made for the upgrading of equipment use and service.

The study, then, will focus on both processes (operation of existent systems) and hardware. Administrative structures, operating procedures, and equipment use should be examined for potential means of increasing efficiency, reducing cost, and eliminating waste.

Replies were received from eight firms, with estimates of projected costs ranging from $10,053 to $85,000. The variance in time frame was equally dramatic, running from 65 man-days to 6 months. A precis of each company's capabilities, experience and estimated cost and time factors is given below.

SUMMARY DATA ON FIRMS SUBMITTING COST ESTIMATES.

Environment Monitoring Systems, Incorporated: W. R. Vincent, Vice President. Environment Monitoring Systems, Inc. has performed studies for the Department of Defense, the Iranian Government (involving terrain similar to Nevada's), the FCC and others. Mr. Vincent seems to have a good grasp of the Nevada situation. The projected time for the study is 65 man-days at a cost of $18,237. Firm is California-based.

Hughes Aircraft Company: Eugene Hoo, Manager, Communications Systems. The Hughes people spent a great deal of time with research division personnel during the initial stages of the study and have a good grasp of the Nevada situation. Hughes, though California-based, is strongly identified with Nevada and may, therefore, be expected to be conscientious in its efforts. They have performed studies for the military and the city of Los Angeles, among others. Projected time for the study is 70 man-days spread over 12 weeks at a cost of $19,800.

Philco-Ford Corporation: J. J. Ross, Contracts Manager. Headquartered in Tucson, Arizona. Philco-Ford is a division of the Ford Motor Company. They have recently completed a study of the public safety requirements of southern Arizona. Projected time for the study is 36 man-weeks spread over 10 weeks at a cost of $25,000.

North American Rockwell Information Systems Company: S. L. Hasin, President. California-based. Has performed radio communications studies for city of Tulsa, Los Angeles Police Department, United States Marine Corps, etc. One survey study afforded limited exposure to Nevada law enforcement agencies (Carson and Reno police departments, Clark, Ormsby and White Pine sheriffs' offices). Well-presented program plan. Projected time for the study is 11 weeks at a cost of $26,100.

Jack A. Rickel Associates, Inc.: Harlan Egan, Associate. Located in Washington, D.C., with Mr. Egan based in California. Claims experience in working with FCC. Performed study of Nevada's telecommunications network for the Educational Communications Commission and, hence, is familiar with the state. Also worked on the University of Nevada television linkup between Las Vegas and Reno. Projected time for study is 6 months at a cost of $10,053.

The Stanwick Corporation: J. A. Pruitt, Executive Director, Communications and Electronics Systems Division. Based in Arlington, Virginia. Has conducted studies for the military and municipal and state agencies. Projected time for study is 3 months at a cost of $64,480.

Gautney & Jones Communications, Inc.: George E. Gautney, President. Based in Falls Church, Virginia. Has performed studies for states of Mississippi, Delaware, and numerous local governments. Mr. Gautney is apparently unfamiliar with the state and hence asks "that you will realize the difficulty we have in making a reasonably close estimate of the cost for the project." Project time not stated. Cost estimated to run between $60,000 minimum to $85,000 maximum, although program letter suggests that Gautney & Jones contemplate an in-depth study of a more comprehensive nature than most of the other respondents.

Telcom, Inc.: Lewis J. Graham, Regional Marketing Manager. Based in McLean, Virginia, with a branch office of 65 employees located in Las Vegas. Telcom currently serving as communications engineer for the Atomic Energy Commission. Has performed studies for state and local governments; governments of Nigeria, Bolivia and Thailand; various federal agencies, etc. Projected time for study is 16 man-weeks, divided between two specialists over an 8-week period. Estimated cost is $22,586.

Consulting Firm	Estimated Dollar Cost of Study	Time Frame
The Stanwick Corporation	$ 64,480	3 months
Gautney & Jones Communications, Inc.	60,000-85,000	Not stated
North American Rockwell Information Systems Company	26,100	11 weeks
Philco-Ford Corporation	25,000	36 man-weeks 10 weeks
Telcom, Inc.	22,586	16 man-weeks
Hughes Aircraft Company	19,800	70 man-days 12 weeks
Environment Monitoring Systems, Incorporated	18,237	65 man-days
Jack A. Rickel Associates, Inc.	10,053	6 months

FEDERAL FUNDING FOR RADIO COMMUNICATIONS STUDY.

The research division of the legislative counsel bureau has explored the possibility of federal financial assistance in meeting the costs of the proposed radio communications study for the State of Nevada. It would seem that there are at least four areas in which some grants-in-aid may be available at the present time: Law enforcement, highway safety, civil defense and forestry.

The Omnibus Crime Control and Safe Streets Act of 1968 (Public Law 90-351) established the Law Enforcement Assistance Administration (L.E.A.A.), which allocates crime control funds to the various states and works with state crime commissions in developing programs to improve law enforcement administration. For research and development purposes, the L.E.A.A. (through the state crime commission) will provide 90-percent funding for law-enforcement-related projects, with a 10 percent matching requirement at the state level. Staff time can be counted as a portion of the state's matching contribution. However, this grant would only apply to a portion of the radio communications study (that portion directly related to law enforcement--e.g., highway patrol, sheriffs' offices, etc.). The Nevada crime commission reports that present funds are already allocated, so that additional moneys will not be available

until July 1, 1971. Some discretionary funds are available, but they are much more difficult to obtain. Program grantees must submit quarterly, progress, final financial and narrative reports, and must maintain complete records on the disposition of funds. A final federal audit is performed at the close of grant.

The Highway Safety Act of 1966 (Public Law 89-564) authorizes 100-percent federal funding, usually on a cost-reimbursable basis, for certain highway safety demonstration projects. The program is administered by the Federal Highway Administration of the Department of Transportation. The range of financial assistance is between $25,000 and $1,413,000. In fiscal 1970, only 12 projects were authorized. Programs must be related to highway safety and are subject to reporting restrictions similar to those applicable to L.E.A.A. grants.

The Federal Civil Defense Act of 1950, as amended (Public Law 81-920), offers project grants through the Office of Civil Defense, Department of the Army, for survival supplies, equipment and training. All activities and expenditures must be for civil defense purposes only. This program has a 50-percent state-matching requirement. Because of the number and character of project restrictions, this program does not appear to be a very profitable avenue for further exploration.

Under various forest management acts administered by the Forest Service of the United States Department of Agriculture, limited funds are available for project grants for forestry-oriented programs. Only a small percentage of the proposed radio communications study could be so classified, and it is doubtful whether the financial contribution of the Federal Government under any of the forestry assistance programs would justify the time required to meet the guidelines imposed.

If federal funding is sought, it would likely entail coordination between the state, its consultants and two or three federal agencies. Reports would have to be separately prepared for each agency supervising the administration of the grant within its jurisdiction.

It is the recommendation of the research division that federal grants not be sought if it is decided that the legislative commission should pursue a relatively inexpensive communications study (i.e., one involving less than $30,000). The loss of flexibility and the complications arising from federal requirements would not seem to be sufficiently offset by any countervailing financial benefits.

However, if the legislative commission is directed to pursue a more costly, in-depth study of the state radio communications system, the research division recommends that federal assistance applications be drawn up and submitted for approval to minimize the dollar outlay by the state.

A FINAL CONSIDERATION.

Since 1962, 13 studies have been made of various aspects of the state's communications needs. The general consensus of these studies, with few exceptions, has been that the State of Nevada should create a department or commission within the executive branch of government to manage communications planning, procurement and maintenance of equipment. The relevant studies are listed below in chronological order:

1962--Nevada Highway Patrol
1962--Bell Telephone
1963--Communications Associates, Inc.
1964--University of Nevada
1964--Bell Telephone
1964--Governor's Natural Resources Subcommittee on Communications
1965--Collins Radio Company on Communications
1967--Microfleet Co., Inc., Radio Corporation of America
1967--Nevada State Highway Department
1968--Potentials for Transmission, N.E.C.C.
1968--Project Quicklook, N.E.C.C.
1969--Nevada State Highway Department
1969--Governor's Ad Hoc Committee on Telecommunications

This list was compiled by John G. Macdonald, Jr., Assistant Communications Specialist, Nevada department of highways, and the studies referred to are available through his office for review.

Given the large number of completed studies recommending essentially the same remedies to the state's communications problems, the legislative commission deems it ill-advisable to invest in another radio communications study, which would likely arrive at similar conclusions. However, if such a study is performed prior to or during a session, the legislature could benefit from the technical and independent expertise of the consultant in drafting

or analyzing any proposed legislation which comes before it during the session. In addition, such a study would avoid the inevitable bias toward the department sponsoring it, since the legislative commission--unlike the highway patrol, department of highways, or N.E.C.C.--has no direct stake in the outcome except its interest in increased governmental efficiency.

Respectfully submitted,

Legislative Commission
State of Nevada

Carson City, Nevada
January 1971

GOVERNOR'S AD HOC COMMITTEE ON TELECOMMUNICATIONS

PAUL LAXALT
Governor

ROBERT J. GREGORY
Chairman

March 20, 1970

Mr. Art Palmer
Legislative Council Bureau
State Capitol Building
Carson City, Nevada 89701

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Dear Mr. Palmer:

Listed in the enclosed sheets are the numbers and estimated replacement costs of the various types of radio equipment used by State agencies.

The replacement cost of the equipment was selected as the only practical means of assigning a value to the equipment. It must be realized that if the State attempted to replace any large numbers of radio equipment, suppliers would bid very competitively and this would result in a much lower price than has been estimated.

The quantities listed are the totals listed by the various agencies in response to questionnaires sent out by the ad hoc Committee on Telecommunications. The accuracy of these figures is not guaranteed but it is felt the figures are reasonable.

The attached list will show the Nevada Military Department as an individual report. The communications utilized at present is furnished by the Department at no cost to the State.

The Nevada Industrial Commission will be separated as that system is also federally funded.

The listing of Facilities and Miscellaneous Equipment is included as these are necessary to the operation of any radio system. These figures include the value of shops, radio sites, test equipment and vehicles assigned to radio repair service.

The figures for microwave equipment might be misleading. The dollar value includes a large number of ancillary items necessary for the operation of a system. This includes antennas, antenna towers, station batteries and chargers, as well as many other items. Furthermore, the number of terminals is misleading as the system consists of two terminals and four intermediate repeaters made from two terminals each.

If you need further clarification, please let me know.

Very truly yours,

John G. Macdonald, Jr.
Staff Communications Officer

JGM/bs
Enclosure
cc: Robert J. Gregory

RADIO EQUIPMENT IN SERVICE AS OF JANUARY 1970

MOBILE RADIOS*		ESTIMATED REPLACEMENT COST EACH	TOTAL
Highway Dept.	520	$700	364,000
Dept. of Agriculture	6	$600	3,600
Dept. of Motor Vehicles	150	$650	97,500
Fish and Game/Forestry	100	$850	85,000
U of N	3	$800	2,400
Totals	779		$552,500

*Although not reported on the questionnaire, it is believed the Public Service Commission and the Attorney General's Office have some mobiles on the Highway Patrol net. These might not be included in the DMV figure.

CONTROL STATIONS		ESTIMATED REPLACEMENT COST EACH	TOTAL
Highway Dept.	19	$800	15,200
Dept. of Motor Vehicles	10	$3000	30,000
Fish and Game/Forestry	15	$1000	15,000
Totals	44		$ 60,200

BASE STATIONS*		ESTIMATED REPLACEMENT COST EACH	TOTAL
Highway Dept.	63	$1000	63,000
Dept. of Motor Vehicles	20	$3000	60,000
Fish and Game/Forestry	2	$850	1,700
Totals	85		$124,700

*The University of Nevada operates a FM broadcast station rated at 10 watts and worth $10,000.

REPEATER STATIONS		ESTIMATED REPLACEMENT COST EACH	TOTAL
Highway Dept.	15	$3500	52,500
Dept. of Motor Vehicles	17	$3000	51,000
Fish and Game/Forestry	9	$4200	37,800
Totals	41		$141,300

MICROWAVE TERMINALS*		ESTIMATED REPLACEMENT COST EACH	TOTAL
Highway Dept.	10	$23400	$234,000

*Department of Motor Vehicles has a four terminal, (2 link) 960 MHz system being made operational at the time of this writing. Other terminals are on hand in various stages of repair. It is not known how many terminals are available nor is the estimated replacement cost of these terminals known.

FACILITIES

Highway Dept.	Repair Shops, Radio Sites	225,000
Dept. of Motor Vehicles	" " " "	62,000
Totals		$287,000

MISCELLANEOUS EQUIPMENT

Highway Dept.	48,000
Totals	$ 48,000

MOBILE RADIOS		ESTIMATED REPLACEMENT COST EACH	TOTAL
Nevada Military Dept.	135	$708	95,580
Nev. Industrial Commission	21	$600	12,600
Totals	156		$108,180

CONTROL STATIONS		ESTIMATED REPLACEMENT COST EACH	TOTAL
Nev. Industrial Commission	1	$300	300
Totals	1		$ 300

BASE STATIONS		ESTIMATED REPLACEMENT COST EACH	TOTAL
Nev. Military Dept.	11	$445	4,900
Nev. Industrial Commission	3	$2500	7,500
Totals	14		$ 12,400

EQUIPMENT IN SERVICE

	MOBILE RADIO			CONTROL STATIONS			BASE STATIONS			REPEATER STATIONS			MICROWAVE TERMINALS		FACILITIES	EQUIP.	TOTALS
	Qty	Replacement Cost	Total	Qty	Replacement Cost	Total	Qty	Replacement Cost	Total	Qty	Replacement Cost	Total	Qty	Total			
Highway Dep't	520	$700	$364,000	19	$800	$15,200	63	$1,000	$63,000	15	$3,500	$52,500	10	$234,000	$225,000	$48,000	$1,001,700
NIC	21	600	12,600	1	300	300	3	2,500	7,500								20,400
Dep't of Agriculture	6	600	3,600														3,600
Nevada Military	135	708	95,580				11		4,900								100,480
U. of N. Reno	3	800	2,400				1	10,000	10,000								12,400
Dep't of Motor Vehicles	150	650	97,500	10	3,000	30,000	20	3,000	60,000	17	3,000	51,000			62,000		300,500
																(Subtotal	1,439,080)
Fish & Game Comm.	100	850	85,000	15	1,000	15,000	2	850	1,700	9	4,200	37,800					139,500
	935		$660,680	45		$60,500	100		$147,100	41		$141,300	10	$234,000	$287,000	$48,000	$1,578,580

Exhibit B--page 3