

Summary of Policy Support Division Activities

Volume III

April 7, 1972

Warning System

September 30, 1971 Meeting with Joyce, Partch, Polishuk, Salaman. Joyce would like PSD to undertake a thorough study of disaster warning systems to "clarify the menu of Options". Program to be completed by April 1, 1972.

Would also like an evaluation of IEC proposal to be completed in 2 to 3 months. (W1)

October 6 Joyce confirmed earlier discussions and requested 6 months study. Request study plan by Nov. 1. (W2)

October 29 Partch submitted Study Plan. (W3)

November 3 Meeting Joyce, Partch, Berry, Martin, Babcock with OCD and NOAA on warning system. (W4)

Meeting Joyce, Partch, Berry, Babcock to discuss narrower study plan.

November 15 Partch submitted revised study plan. (W5)

November 16 Preliminary contract discussions with potential contractor. (W6)

November 17 Meeting with Joyce, Babcock, Partch, Polishuk, Messerschmitt to discuss study plan.

December 6 Meeting with A.R.F. contractor re warning contract. (W7)

December 8 Partch submitted proposed plan for warning receiver contract study to Joyce. (W8)

December 13 Berry presented working paper on costs (benefits of home warning system). (W9)

December 17 Joyce requested Partch to proceed with contract. (W10)

January 4, 1972 Meeting Partch, Russell (IEC), Salaman to discuss IEC proposal per request of Joyce.

January 10 Received warning receiver cost/performance study proposal from contractor. (W11)

January 11 Let purchase request for study contract to purchasing.

January 14 A.R.F. notified to initiate work on contract. (W12)

January 20 Meeting with Beery, Berry, and Partch concerning progress on warning system project.
Akima to proceed to examine DEI calculations on probability of falsing and error. (W13)

January 25 Comments on DEI calculations submitted by Akima. (W14)

January 27 Preliminary specifications on receiver obtained from A.R.F. (W15)

February 1 Purchase Order for A.R.F. contract issued. (W16)

February 23 Meeting with Davis (A.R.F.) and Partch concerning contract progress. (W17)

Meeting with Joyce, Beery, Polk, Engle, Berry, Partch, and Polishuk to discuss Warning System program. (W18) X

February 24 Meeting with Martin (OCD), Beery and Partch to discuss A.R.F. receiver contract. (W18)

March 7 Preliminary receiver cost data submitted to Joyce. (W19)

March 13 Comments concerning receiver contract submitted to Joyce. (W20)

March 24 A.R.F. contract extended to April 10. (W21)

March 25 Meeting with Mainard and Beckham (AT&T), Babcock, Beery, and Partch to discuss use of telephone for home warning. (W22) Y



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80302

W1

Date: October 7, 1971

Reply to
Attn of: JEP

Subject: Meeting with Charlie Joyce of OTP to discuss the
Disaster Warning System.


To: Roger Salaman

On September 30, 1971, Charlie Joyce of OTP met with Roger Salaman, Paul Polishuk and Jerry Partch of OT to discuss the disaster warning system. He would like us to undertake a thorough study of disaster warning systems to "clarify the menu of options." He made the following points concerning the study:

1. OTP will issue a policy statement in the next few weeks indicating that the already planned experimental phase of DIDS will be continued at this time. OCD has already let a contract for one experimental transmitter.
2. OTP is not in favor of the so-called legislative approach.
3. Civil defense and natural disaster warning systems should be integrated.
4. The cost of the receivers required to implement the DIDS has not been carefully analyzed. The costs of the receivers has been estimated to be 90% of the total system costs, so obviously a study of receiver-system tradeoffs is needed. The costs of address changing has not been determined considered as a system cost.
5. The report of the Steering Group, dated February 1, 1971, was biased toward mandatory legislation. The report should be read with the other viewpoint to demonstrate its deficiencies.
6. Mr. Joyce is not in favor of the telephone system since it shuts down a vital service for over three minutes during a disaster. If it were a much cheaper alternative it might be considered.

7. OCD has published specifications for this service in the Federal Register.
8. The warning tone must be followed by voice instructions, although they do not have to be delivered by the same medium.
9. SDC has done a study for OEP on the penetration expected for a voluntary system.
10. The DIDS is using a relatively large amount of bandwidth in the LF range. What are the costs associated with using this portion of the spectrum as compared to a higher frequency of operation?
11. There are no political problems associated with consulting private industry on the costs of receivers.
12. Feel free to contact members of the working group, except for Ken Miller of the FCC.

The program must be completed by 1 April 1972, since that is when OCD is planning to contract for more DIDS transmitters. Mr. Joyce would like us to study the problem for three to five weeks, then define some avenues to explore in depth. He would also like us to evaluate the proposal submitted to OTP by International Electric Corporation. The evaluation should be completed in two to three months.



J. E. Partch

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS POLICY
WASHINGTON, D.C. 20504

October 6, 1971


Mr. Robert Lowe
Acting Director
Policy Support Division
Office of Telecommunications
Department of Commerce
Washington, D. C. 20230

Dear Bob:

Confirming our earlier discussions, we would like the Policy Support Division to undertake a six-months study in support of our efforts to develop a National Warning System capable of reaching every citizen. As the attached policy statement indicates, the cost of manufacturing and distributing receivers has become the critical factor which will determine the effectiveness of the warning program. We need a sound study of receiver costs for the DIDS system, and for several alternatives to DIDS which might be pursued if DIDS turns out to be too expensive.

It would be most helpful if your team could develop an overall study plan for our review by November 1, with a completion date of April 1, 1972 for the entire effort. We would maintain close contact with your team over the period of the study so that we can make fully available to them what we have learned to date, and so that we may participate in the decisions which will be needed to narrow the scope of the effort to the essential questions.

Sincerely,



Charles C. Joyce, Jr.
Assistant Director

Attachment

October 29, 1971

Mr. Charles C. Joyce, Jr.
Assistant Director
Office of Telecommunications Policy
Executive Office of the President
Washington, D. C. 20504

Dear Charlie,

Pursuant to our discussion and your letter to Bob Lowe, we have studied the report of the Warning Working Group and would like to present the following study plan.

Data Base for Population Coverage

Before any meaningful discussion of penetration rates can be given, the location of the population must be known at various times of the day. The following types of information must be obtained:

Percent of population in homes vs. time of day

Percent of population in work areas vs. time of day

Percent of population in transit vs. time of day

It is also important to be able to break the total population into population density subsets to evaluate system coverage. Much of this information is available from Census Bureau statistics. This information will be used to form a data base for the determination of penetration rates.

Receiver Costs

The penetration rate of any warning device is highly dependent on its cost. The cost of a variety of receiver types and configurations will be studied in detail. As a part of the study, possible additional services or uses for the warning device will be considered, such as providing temperature and/or time of day, continuous news service, or continuous music service.

The costs associated with inclusion of addressing capabilities will be carefully determined.

Penetration vs. Transducer type

The penetration rate achieved by a variety of warning transducers (i. e., various receiver configurations, sirens, broadcast services, etc.) will be determined utilizing statistics on the buying habits of the public and the data base as discussed previously.

System Evaluation

The four systems identified in your options paper (DIDS, the existing NOAA VHF system, a system operating through the private broadcast industry, and a system using a communications satellite) will be analyzed with particular emphasis on the following areas:

Penetration rates

Total system cost (capitalized costs)

Public vs. individual costs

Meaning of reliability figures

Frequency spectrum requirements and interference problems.

The stated requirements for the warning system will be carefully considered.

Penetration vs. Cost Curves

In order to present a clear picture of the options available for a warning system, curves of penetration rate vs. total system cost will be prepared utilizing the information obtained during the study. If other parameters, such as time response, prove to greatly affect system cost they will also be parametrically displayed.

Specific tasks have been defined to be performed by personnel identified in the Policy Support Division, the Institute for Telecommunication Sciences, along with some outside contractor assistance for information on receiver costs and consumer habits.

We are also evaluating the proposal presented to the Office of Telecommunications Policy by International Electric Corporation as we agreed to do.

We look forward to discussing this plan with you next week in Washington. Paul Polishuk told us about the meeting you are having with personnel from OCD and NOAA at 10:00 a. m. Wednesday morning, and we will plan to attend.

Sincerely,

Jerry Partch
Policy Support Division

cc: Bob Lowe
Paul Polishuk
Les Berry
Roger Salaman

Chrono.
Subject
bcc
JEP/ pm (9-29-71)

2. National Warning System

- a) Jerry and I attended a meeting between OTP, OCD, and NOAA about DIDS and National home warning. The meeting was dominated by OCD, in particular by Bob Martin, OCD engineer responsible for DIDS. Apparently the director of OCD is holding up approval of some of DIDS' budget until he is sure that it will go. Martin wanted OTP to send a letter that would break loose the funds. Martin made the following points:
- DIDS, as a government warning system, will be implemented, whether or not home warning is included.
 - Home warning penetration will be minimum (about 5%) if it is voluntary. Addition of weather warning capability will not significantly increase penetration (not more than double). These are estimates for low receiver costs; penetration will be even less if receiver costs more than about \$15. (These are OCD and NOAA judgments based on past experience and studies.)
 - Distribution through local OCD offices is not feasible. The regular marketing distribution channels must be used.
 - Despite the above, OCD plans to spend \$450K on home and car receiver development and cost minimization studies in the next year or two (this is the money Martin wants released). Martin (and OCD?) apparently believe that the decision against legislative coercion will be reviewed and possibly reversed after the election next year. If they didn't, they wouldn't spend the money on receiver development.
 - No methods of regional distribution besides DIDS will be considered.
 - OCD will try to improve current use of broadcasters.
 - OCD and NOAA are studying addressing requirements of NOAA vs. reliability requirements of OCD as tradeoffs. (NOAA would like addressing for smaller than county units.) They will make overall systems concept studies of NOAA
 - control and operating procedures and of the NOAA-OCD interface, culminating in hardware development.

My impressions are that OCD and NOAA do not plan any marketing studies of market penetration of voluntary systems (because they believe that it will be too small, and because they believe that the home receivers will be required by law in the end). OCD is concerned about OT participation (especially about duplication of their studies). They asked for clarification. They will cooperate with us monitoring their studies (for our enlightenment).

- b) In a subsequent meeting between Joyce, Babcock and Boulder PSD, Joyce indicated that he wanted OCD development of DIDS to continue while options were studied because it would take so long to get it started up again if it were stopped at this time. Therefore, we must be discrete. But he wants us to study options by determining market penetration as a function of device cost and service. And also device cost as a function of service and numbers produced. These two studies together will allow policy makers to choose an option.
- c) Jerry and I went to OCD to talk to an engineer about the project, but he wasn't in. We got a bibliography of reports.
- d) Subsequently, John Messerschmitt, PSD, agreed to help us in the marketing survey.

3. PSD Meeting

- a) No comment.


Leslie A. Berry



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80302

file W5

November 15, 1971

Captain Courtland T. Babcock
Office of Telecommunication Policy
Executive Office of the President
Washington, D. C. 20504

Dear Court,

As a result of our meetings and discussions concerning the warning system on November 3, we have narrowed the scope of our program. Although some of the tasks presented in my October 29 letter are still applicable, we now feel that the main thrust of our program should be to supply you with the probable penetration for different receiver options. Our proposed program plan is enclosed for your comments and concurrence.

I will plan to meet with you to discuss our plans on Wednesday, November 17 at 1:30, if that is still convenient.

Sincerely,

Jerry Partch
Policy Support Division

- cc: L. A. Berry
- J. Messerschmidt
- J. Watts
- R. K. Salaman ←

PROGRAM PLAN: HOME WARNING SYSTEM

Purpose

Examine the question of voluntary penetration for various receiver configurations.

Method

To determine the penetration that a voluntary home warning device could be expected to achieve, we will obtain two sets of data. First, the number of devices which would be sold as a function of cost, for each service option. Second, the price of a device to provide each service option as a function of number produced. The device options that have been identified are:

1. Attack warning only.
2. Attack and natural disaster warning.
3. Warning tone only.
4. Warning tone followed by voice instructions.
5. Standby power capability.
6. Stand alone appliance.
7. Optional feature of radio or TV set.

The costs associated with additional service options will be treated as marginal costs to the greatest extent possible to simplify the study.

The first set of data will be developed in a market survey to be conducted under contract. The market survey will be defined and monitored by John Messerschmidt, PSD, who has a Masters degree in marketing. The results will be compared with the previous market study done for OCD in 1964.

The receiver design and specifications will be thoroughly reviewed by Jerry Partch, PSD and Jim Watts, senior instrumentation engineer in ITS, to identify alternative approaches. The cost data for the device options will be developed by contracts with engineering firms producing such devices. An effort will also be made to identify possible marketing costs and methods, since these items will affect the cost to the consumer.

All formal contracts with outside contractors will be made available for preview by OTP.

The attached program schedule indicates the major milestones to be achieved.

Output

As preliminary results become available they will be communicated to OTP. The final results of the two studies will be combined by Jerry Partch and Les Berry of PSD to display the significant options to OTP, as indicated by the final two milestones on the attached schedule.

MAJOR MILESTONES: WARNING SYSTEM STUDY

11/13 ——— ITS Begins Rcvr Study
11/20 ———
11/27 ———
12/04 ———
12/11 ——— Rcvr Contracts to Purchasing (Contractors Identified)
12/18 ——— IEC Evaluation to OTP
12/25 ———
01/01 ———
01/08 ——— Rcvr Contracts Let
01/15 ———
01/22 ———
01/29 ———
02/05 ———
02/12 ———
02/19 ——— Market Study Results
02/26 ———
03/04 ——— Rcvr Cost Results/ Market Report from John Messerschmidt
03/11 ——— Rcvr Report from ITS
03/18 ——— Preliminary Report to OTP
03/25 ———
04/01 ——— Report to OTP



Date: November 16, 1971

Reply to
Attn of:

Subject Meeting with Andrzej Przedpelski, Vice President, R&D
A.R.F. Products, Inc.
Boulder, Colorado

To: Warning System File

Background

A.R.F. Products, Inc. has performed engineering consulting work for OCD in the past (1957-58). They have extensive experience in electronic remote control systems, having produced the electronics for garage door openers for over 20 years. They have produced a line of LF remote control transmitters and receivers which operate at a frequency of 300 kHz. They have patents on such applicable items as prevention of falsing. Their design methods seem to emphasize the use of medium scale integrated circuits.

Approach

The R&D division has a standard approach for proposals that would be applicable to our study. They produce a design which consists of function blocks, such as amplifiers, discriminators, etc. The performance of these function blocks is supported in one of three ways:

1. Vendor supplied specifications or design data.
2. Test data from past usage by A.R.F. Products, Inc.
3. Test data from bench tests performed for that purpose.

The cost of the equipment is supported by quotes from vendors and manufacturing estimates from their manufacturing division.

Contract Methods

They would be willing to work under fixed price or cost plus fixed fee. They have experience working under cost plus fixed fee contracts with NOAA and NCAR and feel it would be the most satisfactory because there is more interaction.

There is some question as to the rights of the design. I assume that we would be purchasing the design, but this point needs clarification.

It was estimated that a thorough engineering cost study documented as previously discussed would cost in the neighborhood of \$15,000.

Jerry

Jerry Partch
Policy Support Division

cc: Les Berry
Jim Watts
Roger Salaman



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80302

W7

Date:

December 6, 1971

Reply to
Attn of:

Subject

Discussion with Henry Yekel and
Boyd Green, Purchasing

To

Warning System File

We discussed the procedure necessary to firm up a contract with A.R.F. Products for a warning receiver design and cost effort. The cost plus fixed fee contract is normal for this type of work. The first step to be taken is to request an unsolicited proposal from them. We should outline our requirements in a verbal discussion with them. Their proposal should address the following areas:

1. What they intend to do.
2. What they intend to furnish.
3. Budget
 - a. Labor
 - b. Materials
 - c. Other
 - d. Overhead
 - e. G & A expenses
 - f. Profit or fee
4. Time frame.

When we have this proposal and our purchase request, purchasing can proceed to formulate a contract. We must provide sole source justification. Their proposal can be negotiated, but it would save time if this is not necessary.

Purchasing can give them a letter of intent ahead of the formal contract.


Jerry Fartch

December 8, 1971

Mr. Charles C. Joyce, Jr.
Assistant Director
Office of Telecommunications Policy
Executive Office of the President
Washington, D. C. 20504

Dear Charlie,

I would like to present a proposed plan for a Home Warning Receiver Cost/Performance Tradeoff Study.

Object of Study

The basic object of the study is to provide the costs associated with some of the major requirements OCD has placed on the home warning receiver performance.

Method of Study

A manufacturer of low frequency remote control receivers, A. R. F. Products, Inc., will be asked to design and estimate receiver costs for the following receiver options:

- Receiver A: Basic stand alone receiver, warning tone only, w/o addressing, w/o standby power, w/o EMP filters.
- Receiver B: Basic applique receiver, warning tone only, w/o addressing, w/o standby power, w/o EMP filters.
- Option 1: Voice capability.
- Option 2: Addressing capability.
- Option 3: Standby power.
- Option 4: EMP protection.

The contractor will produce a design which consists of function blocks, such as amplifiers, detectors, etc. The performance of these function blocks will be supported in one of three ways:

	SURNAME	DATE	SURNAME	DATE
1. Vendor supplied specifications or design data.				
2. Test data from past usage by contractor.				
3. Test data from bench tests performed for that purpose.				

FILE COPY

Mr. Charles C. Joyce, Jr.

- 2 -

December 8, 1971

The cost of the receiver will be supported by quotes from vendors and estimates from their manufacturing division.

Output from Study

The contractor will supply a report which presents and supports the design and cost information as outlined under Method of Study. In addition they will include receiver operational specifications and a discussion of possible system changes which would result in a reduction of receiver costs.

Performance Time

The contractor would perform the study in an 8-week period.

Our purchasing department has recommended that we operate on a cost plus fixed fee contract, in order to maintain flexibility. We have not held formal discussions with the contractor, but in informal discussions they estimated the study would cost in the neighborhood of \$15,000.

If you concur with this plan I will proceed to ask the contractor for a proposal. It would be understood by the contractor that we would be under no obligation during the proposal stage. I would be happy to discuss any aspect of this plan in more detail if you wish.

We will be meeting with Stephen Russell of International Electric Corporation on Monday, December 13. I will keep you informed of our discussions. I have some comments on his November 3 letter concerning "fatal vulnerabilities" that I will be sending.

Sincerely,

Jerry Partch

cc: Capt. Courtland T. Babcock

FILE COPY

SURNAME	DATE	SURNAME	DATE

December 13, 1971

Mr. Charles C. Joyce, Jr.
Office of Telecommunication Policy
Executive Office of the President
Washington, D.C. 20504

Dear Charlie,

Enclosed is the working paper on the costs and benefits of a home warning system that I mentioned last week. This is a crude first cut just to get the feel of what the results would be. I used economic costs from the Warning Working Group report (with whatever limitations they might have), and computed the gross social costs in unnecessary warnings from information easily available. I would be interested in any comments or criticisms you might have. Unless you indicate that such analysis is irrelevant, I intend to try to sharpen and clarify the analysis.

I have also been suspicious of DEI's calculations of the probability of the address module falsing in noise and of probability of error. These calculations are the ones used in the Working Group report. There is some confusion in the report (and perhaps in their analysis) between signal acquisition and bit error rates. Because these reliabilities affect both the reliability of the system, and the cost of the receivers, I have asked an ITS expert in this field, Dr. Hiroshi Akima, to compute these probabilities independently. Is this a sensitive issue? In particular, can Dr. Akima visit DEI to learn details of the module design and operation that are not clear from the report? Should we coordinate with Bob Martin of OCD?

Your advice in this matter will be appreciated.

Sincerely,

Leslie A. Berry
Policy Support Division

info copies to: RKSalaman,

SURNAME	DATE	SURNAME	DATE
JEPartch, DDCrombre,	WPSP		

FILE COPY

Preliminary Cost-Benefit Analysis of Home Warning System for National Disasters

1. Introduction

This memorandum discusses the (social) benefits and social and economic costs of a system which extends into the home warnings of approaching severe weather and imminent enemy attack. The conclusion is that the benefits of weather warning are negligible compared to the costs; and that the expected marginal benefits of improved attack warning have not yet been calculated (and perhaps cannot be calculated).

The specific system considered is the augmented DIDS system described in the September 9, 1971 Summary Report of the Warning Working Group, with some additional information taken from the August 31 options paper, "Home warning: policies and programs." The home warning component of this system would be an applique on TV receivers (1975 cost estimated at \$9) or on automobile radios (1975 cost estimated at \$4), or a free standing unit (costs not estimated). This unit would allow a government official to turn on the TV or radio set of a citizen addressed at the county, state, or national level. When activated, the unit would produce a loud yelp 90 dB above .002 microbars, one foot from speaker. This would be followed by voice instructions on the nature of the warning. If the TV or radio is on at the time of the alert, the receiver will not be seized by the system; it is assumed that the TV or radio announcer will provide the warning, just as he now does.

The two proposed uses of the warning system have very little in common except the requirement of a receiver in the home that can be turned on by a remote government official. Civil defense wants to warn the entire nation about a ubiquitous catastrophic event of very low probability. They would use the system seldom, if ever. The Weather Service would issue frequent local warnings of local events. They would activate portions of the network perhaps a thousand times each year, but would rarely if ever use it as a national warning system.

Because of these differences in use, I will analyze the benefits separately. In so doing, remember that we are not going from zero warning capability to the DIDS capability, but rather from current capability (including sirens, EBS, Weather Service VHF-FM warning, etc.) to DIDS.

2. Weather Disaster Warning

Weather disaster warning can be analyzed more accurately than attack warning because real data exists.

2.1 Benefits

We will assume that the primary benefits of a home warning system will be lives saved, because events of the short time scale which require home warning capability allow little time for property preserving actions. Weather events such as hurricanes, large river floods, and blizzards for which adequate warning allows property savings are sufficiently slow moving that adequate warning is possible without a controllable home receiver.

Table 1. Lives Lost in Tornadoes, Floods and Tropical Cyclones in the United States, 1960 - 1969

<u>Year</u>	<u>Tornadoes</u>	<u>Floods</u>	<u>North Atlantic tropical cyclones and hurricanes</u>	<u>Total</u>
1960	47	32	65	144
1961	51	52	46	149
1962	28	19	4	51
1963	31	39	11	222
1964	73	100	49	493
1965	299	119	75	190
1966	105	31	54	168
1967	116	34	18	171
1968	131	31	9	
1969	64	(NA)	137	
10 year average	94.5	~50	46.8	~190

Weather disaster deaths in the U.S. in the last decade due to severe weather are shown in Table 1. Data in Table 1 were extracted from Table No. 260 of The 1970 Statistical Abstract of the United States. The ten year average is about 200 deaths per year. Nearly 100 of the deaths are due to tornadoes, and presumably a fraction of the 50 deaths per year due to floods are caused by flash floods which would benefit from home warning. However, hurricanes move slowly enough, and are well enough tracked that people are already warned of them, and large river floods are

similarly slow to arrive and predictable. People are now warned of tornadoes which occur in the afternoon and evening by their local broadcasting stations and by sirens, etc. Furthermore, as the anecdotes in Annex R of [2] show, some weather deaths are caused by inadequacies of the data gathering and reporting system, or by human failures, rather than by inadequate communication systems. These considerations are undoubtedly what led NOAA to conclude that at most 50% of the deaths due to severe weather could be saved by a home warning system. This will be about 100 deaths per year. A home warning system would not save deaths caused by lightning, earthquakes, heat waves, and blizzards. This estimate assumes virtually all homes have the receiver; it should be multiplied by the fraction of homes that actually do.

Table 2

No. 72. DEATHS AND DEATH RATES FROM ACCIDENTS: 1950 TO 1967
[Prior to 1960, excludes Alaska and Hawaii]

TYPE OF ACCIDENT	DEATHS					RATE ¹				
	1950	1955	1960	1965	1967	1950	1955	1960	1965	1967
All accidents.....	91,249	93,443	93,806	108,001	113,169	60.6	56.9	52.3	55.7	57.2
Railway accidents.....	2,126	1,344	1,023	962	997	1.4	0.8	0.6	0.5	0.5
Motor-vehicle accidents.....	34,763	38,429	38,137	49,163	52,924	23.1	23.4	21.3	25.4	26.7
Traffic.....	33,663	37,437	37,142	48,050	51,759	22.5	22.8	20.7	24.8	26.2
Nontraffic.....	900	939	995	1,113	1,165	0.6	0.6	0.6	0.6	0.6
Other road-vehicle accidents.....	533	330	243	319	238	0.4	0.2	0.1	0.2	0.1
Water-transport accidents.....	1,502	1,452	1,478	1,493	1,545	1.0	0.9	0.8	0.8	0.8
Aircraft accidents.....	1,436	1,446	1,475	1,529	1,790	1.0	0.9	0.8	0.8	0.9
Accidental poisoning by—										
Solid and liquid substances.....	1,584	1,431	1,679	2,110	2,506	1.1	0.9	0.9	1.1	1.3
Gases and vapors.....	1,769	1,163	1,253	1,526	1,574	1.2	0.7	0.7	0.8	0.8
Accidental falls.....	20,783	20,192	19,033	19,954	20,120	13.8	12.3	10.6	10.3	10.2
Fall from one level to another.....	7,117	6,811	6,019	5,802	5,420	4.7	4.1	3.4	3.0	2.7
Fall on the same level.....	4,569	4,275	3,659	5,735	5,167	3.0	2.6	2.1	3.0	2.6
Unspecified falls.....	9,097	9,106	9,315	8,414	9,533	6.0	5.5	5.2	4.4	4.8
Blow from falling object.....	1,613	1,332	1,404	1,493	1,435	1.1	0.8	0.8	0.8	0.7
Accidents caused by—										
Machinery.....	1,771	2,019	1,951	2,054	2,055	1.2	1.2	1.1	1.1	1.0
Electric current.....	955	1,075	989	1,071	992	0.6	0.7	0.6	0.6	0.5
Fire and explosion, etc.....	6,405	6,352	7,645	7,347	7,423	4.3	3.9	4.3	3.8	3.8
Hot substances, etc.....	842	742	402	420	376	0.6	0.5	0.2	0.2	0.2
Firearms.....	2,174	2,120	2,334	2,344	2,596	1.4	1.3	1.3	1.2	1.5
Inhalation and ingestion of objects.....	1,350	1,608	2,397	1,836	1,950	0.9	1.0	1.3	0.9	1.0
Accidental drowning.....	4,785	5,016	5,232	5,485	5,724	3.2	3.1	2.9	2.8	2.9
Excessive heat and insulation.....	137	615	168	106	86	0.1	0.4	0.1	0.1	(2)
Complications due to medical procedures.....	559	776	1,115	1,494	1,530	0.4	0.5	0.6	0.8	0.8
All other accidents.....	6,132	5,974	5,555	7,268	6,909	4.1	3.6	3.3	3.7	3.5

² Less than 0.05 percent. ¹ Per 100,000 resident population. For 1950 and 1960, based on population enumerated as of Apr. 1; for other years based on population estimated as of July 1.

Source of tables 71 and 72: Dept. of Health, Education, and Welfare, Public Health Service; annual report, *Vital Statistics of the United States*.

For perspective we include Table 2 (from the Statistical Abstract of the US) showing the annual number of deaths from various kinds of accidents. The total was about 113,000 in 1967; it averages 50 to 60 deaths per 100,000 population (so we could expect it to exceed 120,000 in 1980).

It is clearly impossible to reduce the number of lives lost in accidents in the US to zero; the relevant question is what are the actions likely to save the most lives. A weather warning receiver in every home is an unlikely candidate since the most optimistic estimates are that it would save less than 1% of the total.

2.2 Costs

The marginal economic cost of the weather warning as an add-on to an attack warning system is small, and will be included in the analysis of the attack warning costs. The main cost of home weather warning will be the social costs of unnecessary warnings. (These costs will interact with the benefits in a way which reduces the benefits, as shown by numerous NOAA surveys quoted in Annex N of WWG. The reduction in benefits was not included above.)

As shown by Table 1, the main benefits will be in saving of lives lost in tornadoes. Fortunately, enough data exists to estimate the order of magnitude of the number of unnecessary tornado warnings for each tornado strike. In the next paragraph we show that on the average 500-2000 unnecessary warnings will be received for each necessary warning. You can judge for yourself how likely a citizen is to respond correctly to the one critical warning; or how likely he is to disable his 90 dB yelper before that critical warning arrives.

When the Weather Service receives information that a tornado has been seen or has touched down, it warns the county involved, and one to three counties "downstream". The track of a tornado is long and narrow and covers from one square mile [2] to three square miles [3]. Let's compute the ratio of the area warned to the area hit by the tornado. If we assume that the tornadoes are distributed randomly with respect to the population this ratio will approximate the ratio of total number of warnings to necessary warnings. That ratio is

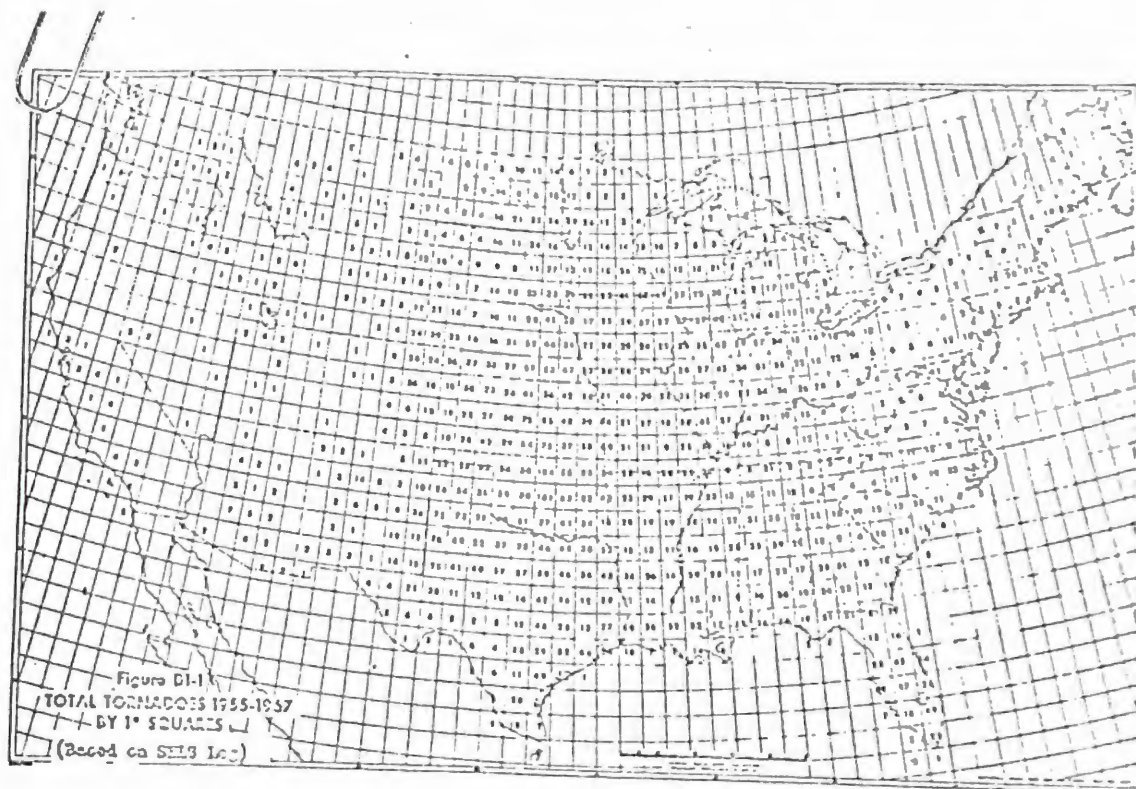
$$R = \frac{\text{area warned per tornado}}{\text{average area struck}} = \frac{\text{area of three counties}}{\text{area struck}}$$

The average area of counties in states that have an appreciable number of tornadoes is 700 square miles. So if the average area struck by a tornado is 1 square mile, there will be 2100 square miles warned for each mile struck; if the average area struck by a tornado is 3 square miles, there will be 700 square miles warned for each one struck. Under the assumption that tornado incidence is not correlated with population distribution, the ratio of people warned to those hit will also be R, as will be the ratio of unnecessary warnings to strikes for any individual.

The ratio R is independent of the number of tornadoes which occur. R is a ratio and does not tell how many false warnings a citizen will have to tolerate, but it can be used to calculate that value. The number of warnings issued can be estimated from the number of tornadoes reported (it may be slightly smaller, since some tornadoes are not reported in time to issue a warning.) Figure 1, reproduced from [3], shows the number of tornadoes per $1^{\circ} \times 1^{\circ}$ square for a recent 13-year period. At 40° latitude, where most tornadoes occur, such a square contains about 3500 square miles. The number of warnings a citizen residing in area A will receive per year is

$$N = (\text{tornadoes per year in area A}) \cdot \frac{(\text{size of warned area})}{A}$$
$$= (\text{tornadoes per year in area A}) \cdot \frac{(2100)}{(3500)}$$

Figure 1



The highest incidence shown in Figure 1 is 8 tornadoes per year, so people living in that area would receive about 5 warnings per year, most of them in the spring and summer. A large portion of the central United States would receive more than one warning per year.

Of course many of these unnecessary warnings are already received by people while they are listening to radio or TV broadcasts. In other words, we should really be calculating the marginal social costs as well as the marginal benefits. We could do this by convolving the diurnal variation of tornado incidence and the diurnal variation of percentage of population listening to TV and radio. A crude measure would be the estimate in the options paper that radio and TV reach 45% of the people in the prime evening hours. This would cut the number of unnecessary warnings by the warning device, in half. At other times of day, the number of unnecessary warnings would approach the numbers computed above.

The analysis above is for tornado warning only, but tornadoes account for nearly half the deaths caused by severe weather each year. Another weather event which would benefit greatly from externally-controlled home warning device is flash floods. Their characteristics are sufficiently like tornadoes (long, narrow damage track) and the warning procedures are similar to those for tornadoes (one to three counties warned) that one might expect the social cost (in unnecessary warnings) to be similarly high.

3. Attack Warning

3.1 Benefits

It is difficult to estimate the probable benefits of an attack warning system, let alone the marginal benefits of home receivers over present warning using sirens and the commercial broadcast system.

Unknown factors include the time of day and nature of the attack, the extent that it is a surprise, the response of people to the warning (including the possibility of communications and traffic jams), the actual availability of shelter space, etc.

The estimation of probable benefits is conceptually simple (perhaps simplistic is the right word);

Expected value per year = (Probability of attack during year) times
(Lives saved with home warning system -
Lives saved by present warning system). For example, if 100 million
people would survive attack with the present warning system, and 140

million people would survive attack with home warning, and the probability of attack occurring in any given year is 10^{-5} then the Expected Value of home warning would be 400 lives saved per year. The model could be made more complicated by considering the various kinds of attacks with the associated probabilities and benefits, but it is already clear that such an exercise is futile. The probabilities of attack would surely be guesses, based on no data. Estimates of lives to be saved have been made for some cases by OCD, they may be correct to an order of magnitude. One factor that has perhaps changed since the early planning for a home warning system is the probability that a large scale attack could be a complete surprise, since electronic surveillance and intelligence capability has greatly improved in the last decade. The added benefit of a home warning receiver is considerably decreased if the attack is not a complete surprise.

About the best one can say is that the home warning system may produce a very large social benefit if an exceedingly unlikely event occurs during its operating life.

3.2 Costs

The social costs in the form of unnecessary warnings of an attack home warning device (unlike those of a weather emergency home warning device) are probably small. The probability of falsing in noise (unnecessarily demuting receiver) was computed by DEI as 10^{-15} . (Their test results were much worse than this.) It is unclear what this is the probability of. Is it the probability of any single receiver falsing each second, each day, each year, or ever? Suppose it applied to seconds. There are $3(10^7)$ seconds in a year. If there were 60,000,000 receivers, then there would be $18(10^{14})(10^{-15}) = 1.8$ receivers unnecessarily demuted per year, which is a fairly low social cost.

Economic costs of combined warning system:

First, estimate costs of terminal subsystem. Data are taken from Annex F of [2].

		\$, K
Fed. Gov. costs:	300 city siren controllers @ \$3200	960.
	5000 community siren controllers @ \$160	800.
	5700 institutional warning receivers @ \$100 (?)	<u>570.</u>
		2,330.

Note: Long range forecast is need for one million or two million institutional receivers. Who pays is not specified.

Non. Fed. Gov. Costs:	Using the lower estimate:	100,000.
	Home receivers (if mandatory)	700,000.
	Home receivers (10% penetration)	<u>70,000.</u>
	Total (mandatory)	802,330.
	Total (10%)	82,330.

Now, compute total costs:

	\$, million	
	Investment	Annual
Control subsystem	14.42	1.15
Distribution subsystem	17.80	1.44
Terminal subsystem (min)	82.330	0.00
Terminal subsystem (max)	<u>802.33</u>	<u>1.40</u>
Total (min)	114.55	2.59
(max)	834.55	3.99

Minimum cost assumes 10% penetration after 10 years. Maximum cost assumes 90% penetration after 10 years. The minimum assumes voluntary purchase of home receiver, so it is not fair to count receiver costs. Assuming a 10-year period, and making benefits proportional to penetration, the minimum cost is \$14.2 million per year for 10 lives per year saved that would have been lost in weather disasters, plus protection provided by increasing attack warning by 10% during sleeping hours, and somewhat less in prime time viewing hours.

Cost for maximum is 87.4 million per year, many unnecessary weather warnings, and political price of mandatory legislation, to save 100 lives per year otherwise lost in weather disasters and to provide maximum potential warning against enemy attack.

4. Concluding Remarks

It appears that the cost relative to benefits of weather warning is excessively high. Cost relative to benefits for the minimum attack warning capability also seems high. Whether the benefits of the maximum warning system are worth the costs (\$87 million per year, coercive legislation) is a judgment which should be made at the highest levels. The most important considerations are:

Probability of large scale attack on US during planned life of system (probably unknowable).

Probability that such an attack would be a complete surprise, given present and projected intelligence capabilities.

Presence of sufficient shelter space capable of protecting citizens against expected attack.

Probability that most citizens would respond quickly and correctly to surprise attack warning, and that conditions would allow them to reach shelter.

References:

- [1] "Home Warning: Policies and Programs," Options paper, August 31, 1971.
- [2] "Summary report of the warning working group," Sept. 9, 1971, with annexes.
- [3] "Tornado Incidence Maps," ESSA Technical Memorandum, ERLTM-NSSL 49, August 1970.
- [4] "Methods of distributing radio alert and warning receivers," SRI Report, October 1965.

OFFICE OF TELECOMMUNICATIONS POLICY
EXECUTIVE OFFICE OF THE PRESIDENT
WASHINGTON, D.C. 20504

December 17, 1971

News

Mr. Jerry Partch
Policy Support Division
Office of Telecommunications
U.S. Department of Commerce
Boulder, Colorado 80302

Dear Jerry,

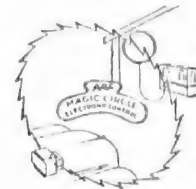
This is to confirm your telephone conversation with Captain Babcock regarding your Home Warning Receiver Cost/Performance Study contained in your letter of December 8, 1971.

The study as outlined is acceptable, and it is requested that you proceed with the necessary contracting arrangements. Please provide me with a schedule indicating the major milestones, and a plan for briefing this Office at appropriate times during the course of the study.

Sincerely,

Charles C. Joyce, Jr.
Charles C. Joyce, Jr.
Assistant Director

cc: / Mr. Paul Polishuk



W11

A.R.F. PRODUCTS, INC. ESTABLISHED 1942

ENGINEERS AND MANUFACTURERS OF PRECISION ELECTRONIC EQUIPMENT

HOME OFFICE & MANUFACTURING PLANT
RATON, NEW MEXICO
GARDNER ROAD • PHONE AREA CODE 505 445-3665

RESEARCH & DEVELOPMENT LABORATORY
BOULDER, COLORADO
2559 75TH ST. • PHONE AREA CODE 303 443-4844

Post Office Box 3226
Boulder, Colorado 80303
10 January 1972

U. S. Department of Commerce
Office of Telecommunication
Boulder, Colorado 80302

Attention: Mr. Jerome Partch

Gentlemen:

A. R. F. Products, Inc., is pleased to submit the attached Unsolicited Proposal, No. P-1309, in five (5) copies, for your consideration and evaluation.

The proposal describes a Cost/Performance Tradeoff Study leading to the design recommendations and manufacturing cost information for a low frequency receiver with several options. The appendixes contain the necessary supporting material for the proposed study effort and A. R. F.'s facilities, experience, and personnel.

We have also included a Contract Pricing Proposal, DD Form 633-4, in the amount of \$14,451. for realization of this project as outlined in the technical proposal. The amount represents a target cost of \$13,137. and fixed fee of \$1,314.

In the event any questions arise concerning these documents, please do not hesitate to contact the undersigned or Mr. A. Przedpelski, Vice President, Development.

We look forward to serving the needs of the Office of Telecommunications and your installation in the near future.

Sincerely,

A. R. F. PRODUCTS, INC.

John D. Ellington

John D. Ellington
Deputy Director
Research & Development Laboratory

JDE/n^d

Enclosures



①

A.R.F. PRODUCTS, INC.

ENGINEERS AND MANUFACTURERS OF PRECISION ELECTRONIC EQUIPMENT

Unsolicited Technical Proposal P-1309

COST/PERFORMANCE TRADEOFF STUDY

U. S. Department of Commerce
Office of Telecommunications
Boulder, Colorado

10 January 1972

HOME OFFICE AND MANUFACTURING PLANT - RATON, NEW MEXICO
RESEARCH AND DEVELOPMENT LABORATORY - BOULDER, COLORADO

A.R.F. PRODUCTS, INC.

RESEARCH & DEVELOPMENT LABORATORY
2559 75TH ST., BOULDER, COLO. 80302
PHONE: (303) 443-4844

ENGINEERING DOCUMENT NO. P-1309

Unsolicited Technical Proposal
TYPE

10 January 1972
DATE

COST/PERFORMANCE TRADEOFF STUDY
TITLE

SUBJECT

A description of the plan and actions to be taken
during investigation of a low frequency receiver
with options.

PREPARED FOR

U. S. Department of Commerce
CONTRACTING AGENCY

CONTRACT NO.

Office of Telecommunications
ADDRESS

REQUEST NO.

Boulder, CO 80302

FILE NO.

To be determined as part of study
SPECIFICATIONS

PREPARED BY

Research and Development
DEPARTMENT

PE5-1/12/3
PROJECT NO

A. B. Przedpelski and J. D. Ellington
PREPARED BY



APPROVED BY Andrzej B. Przedpelski
Vice President, Development



A.R.F. PRODUCTS, INC.

ENGINEERS AND MANUFACTURERS OF PRECISION ELECTRONIC EQUIPMENT

Unsolicited Technical Proposal P-1309

COST/PERFORMANCE TRADEOFF STUDY

U. S. Department of Commerce
Office of Telecommunications
Boulder, Colorado

10 January 1972

HOME OFFICE AND MANUFACTURING PLANT - RATON, NEW MEXICO
RESEARCH AND DEVELOPMENT LABORATORY - BOULDER, COLORADO

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

TABLE OF CONTENTS

	Page
1. Introduction	1
2. Receiver Design	2
3. Output of Study	3
3.1 Block Diagram	3
3.2 Specifications	3
3.3 Circuit Design	3
3.4 Design Supporting Data	3
3.4.1 Manufacturers' Data	3
3.4.2 Test Data	4
3.4.3 Theoretical Analysis	4
3.5 Pricing of the Proposed Design	4
3.6 Pricing Support Data	4
3.7 Performance Specifications	5
4. Discussion	6
4.1 Company Facilities	6
4.2 Company Experience	6
4.3 Personnel	6
4.4 Conferences and Travel	6
4.5 Duration of Study	7
Appendix 1. Facilities	
Appendix 2. General Experience	
Appendix 3. Low Frequency Experience	
Appendix 3.1 Low Frequency Control and Communication Systems	
Appendix 3.2 Multisecurity-Wireless Remote Control	
Appendix 3.3 Patents	
Appendix 4. Personnel Resumes	

A. R. F. PRODUCTS, INC.

BOULDER, COLO.

NO. P-1886

PAGE 1 OF 7

DATE 10 February 1957

PROJECT PEE-1/1270

FILE

TITLE

UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

1. INTRODUCTION

1.1 This Unsolicited Proposal for a cost/performance tradeoff study is submitted to U. S. Department of Commerce (Office of Telecommunications) for consideration. It will involve the design of a low frequency receiver as well as the pricing of this design.

1.2 The pricing is on a Cost-plus-fixed-fee basis and the breakdown is given in DD Form 633-4.

A.R.F. PRODUCTS, INC.

BOULDER, COLO.

NO. U-1200

PAGE 2 OF

DATE 10 January 197

PROJECT PE5-1/12/8

FILE

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

2. RECEIVER DESIGN

The following receiver options will be considered:

- | | |
|-------------|--|
| Receiver A: | Basic stand alone receiver, warning tone only, without addressing, without standby power, without EMP filters. |
| Receiver B: | Basic applique receiver, warning tone only, without addressing, without standby power, without EMP filters. |
| Option 1: | Voice capability |
| Option 2: | Addressing capability |
| Option 3: | Standby power |
| Option 4: | EMP protection |

The receiver specifications are to be provided by the Office of Telecommunication at the beginning of the study. Receiver B is intended to be an applique to a radio or television set and will not duplicate the normal function of a radio or television set.

A. R. F. PRODUCTS, INC.

BOULDER, COLO.

NO. F-1807

PAGE 3 OF

DATE 10 January 1962

PROJECT PE5-1111

FILE

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

3. OUTPUT OF STUDY

A. R. F. Products, Inc., will provide study outputs or results as described in the following subparagraphs.

3.1 Block Diagram

The block diagram will show the main functions for the different receiver options.

3.2 Specifications

Requirements for each of the circuit blocks will be specified to permit evaluation and procurement.

3.3 Circuit Design

The actual circuit of each block, satisfying the requirements of 3.2, will be provided.

3.4 Design Supporting Data

Supporting data for the design of 3.3. will be provided in one of the forms described below.

3.4.1 Manufacturers' Data

This will mainly apply to MSI and LSI integrated circuits or other complete functional circuits. This data may be in the form of a specification for a standard or proposed circuit, or actual test data, where the parameter of interest is not usually specified. Manufacturers' data for individual components (such as transistors, for instance) will also be used in technical analyses.

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

3.4.2 Test Data

Where the desired performance data is not available from the manufacturer, breadboard tests will be performed to obtain the desired parameters. Test data from previous similar tests will be used whenever possible to reduce study costs.

3.4.3 Theoretical Analysis

In some cases, especially when approaching "state-of-the-art" design to reduce future costs, it may be necessary to analyze the proposed circuit on a theoretical basis only. The original analysis would then be performed by A. R. F. with further supporting data or analysis from the most suitable manufacturer(s).

3.5 Pricing of the Proposed Design

The proposed designs of the receiver will be priced on the same basis to permit evaluation of cost versus performance/function. In some cases, more than one cost estimate will be given. This will be the case when new, more suitable components are in the planning stage or when special MSI or LSI circuitry would be more suitable for large production runs. Both the available and the special circuitry will then be priced, if appreciable and different quantity/cost tradeoffs are involved.

3.6 Pricing Support Data

Quotations will be obtained for the majority of available and proposed components where current price lists are not available or do not cover the required quantities. When a price is not available, an estimate will be made and the basis for this estimate will be given. Furthermore, because of the rapid pricing changes of some of the recent integrated circuits, a price versus time projection will be made where applicable and possible. Again, the basis for this projection will be given.

A.R.F. PRODUCTS, INC.

BOULDER, COLO.

NO. P-1309

PAGE 5 OF

DATE 10 January 1971

PROJECT PE5-1/12/3

FILE

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

3.7 Performance Specifications

The receiver performance specifications (provided to A. R. F. at the beginning of the study) will be revised in accordance with the study results and furnished to the customer as A. R. F. - recommended final performance specifications.

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

4. DISCUSSION

4.1 Company Facilities

Since this is mainly a study contract, few facilities will be required. However, some breadboard experimental work may be required to prove concepts and test components for normally unspecified characteristics. Appendix 1 describes the R and D facilities in Boulder, Colorado, where this contract would be executed.

4.2 Company Experience

Appendix 2 shows some of the general experience of the Company, and Appendix 3 lists low frequency experience related to the proposed study contract.

4.3 Personnel

Appendix 4 gives résumés of some of the people who may be involved in the study. Mr. K. Ringer is the engineer on present remote control equipment and worked extensively on the low frequency systems. Dr. G. Davis and Mr. J. Jackson will contribute to any theoretical analysis and will run any required computer programs. Mr. J. Ellington will handle contractual matters as well as provide any necessary technical services. The work will be performed under the direction of Mr. A. Przedpelski.

4.4 Conferences and Travel

Local conferences (in Boulder) between the Office of Telecommunications and A. R. F. Products, Inc., should be on a biweekly basis, at least, to permit close monitoring of progress. These conferences can be of the short informal type, and will allow a fast change in pursued approach, in case the information obtained until then would require it. A. R. F. Products, Inc., will document these meetings to indicate actions requested. A. R. F. personnel will be available for short trips (conferences away from Boulder) as required. Travel expenses will be charged directly to the project.

TITLE UNSOLICITED PROPOSAL FOR
COST/PERFORMANCE TRADEOFF STUDY

4.5 Duration of Study

It is anticipated that about eight (8) weeks will be required to complete the study. However, the schedule may be accelerated or decelerated, as required by developments during the study, by mutual agreement between the customer and A. R. F. Products, Inc.

A. R. F. PRODUCTS, INC.

BOULDER, COLO.

NO. D-1500

PAGE 1 OF 3

DATE: JANUARY 1972

PROJECT FE5-1-1570

FILE

TITLE APPENDIX 1. FACILITIES

LOCATION

A. R. F. Products, Inc., Research and Development Laboratory is located in Boulder, Colorado. The facility was moved to this location in 1962 following approximately 20 years operation in River Forrest, Illinois.

The present location was selected primarily due to the emergence of Boulder, Colorado, as one of the technology centers in the United States. The resources of the following institutions and corporations are immediately available to A. R. F. by virtue of this location:

- Department of Commerce (National Bureau of Standards)
- National Center for Atmospheric Research
- University of Colorado
- International Business Machines
- Ball Brothers Research Corporation
- Beech Aircraft

Additionally, our location in the Denver, Colorado, metropolitan area increases the technological resources availability and provides a major base for vendor selection in the electronic, electromechanical, and finishes categories.

PHYSICAL DESCRIPTION

The laboratory is situated on an 11-acre tract which provides ample capability for expansion. Our 10,000 square-foot building is constructed from concrete blocks and features air conditioning, tile flooring, and modern lighting.

Besides the administrative sections, there are five principal areas in the laboratory. Two large bays are designated for engineering and testing (including vibration, shock, and temperature environments). Another large bay contains the electronic and electromechanical assembly areas. The model (machine fabrication) shop is completely enclosed to reduce the noise and other contamination problems. Finally, the drafting department has its own separate area.

SECURITY CLEARANCE

The R & D Laboratory has been granted an industrial security clearance of secret from the Inspector of Naval Material, San Francisco, California.

TITLE APPENDIX 1. FACILITIES

Our cognizant Industrial Security Office is DCASR, Goodfellow Boulevard, St. Louis, Missouri, and inspections are regularly performed by the DCASO (Denver) personnel.

EQUIPMENT

A partial listing of the type and quantity of electronic, manufacturing, inspection, and environmental test equipment in the laboratory inventory is given in Tables I to IV.

COMPUTER CAPABILITY

A. R. F. has one full time programmer specializing in scientific programming, particularly electrical engineering problems. Two GE-435 computers are available on time sharing through a terminal in our R&D Laboratory. Also, a CDC 6400 is available locally at the University of Colorado for large batch processing. These computers offer standard network analysis and design programs as well as the powerful FORTRAN language capable of handling the most difficult and specialized electronic problems.



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80302

W12

Date: January 14, 1972

Reply to
Attn of:

Subject: Telephone call from Merle Gibson, Purchasing

To: Warning System File

Purchasing has called Jack Ellington, A.R.F. Products, Inc., and given them a verbal go-ahead on the contract. They are covered for up to \$2500.00 by this verbal order and can start charging immediately. The actual contract will be sent out next week and will list a January 24 starting date with completion by March 17, 1972.


Jerry Partch



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80302

Date: January 24, 1972

Reply to
Attn of: PSD/JEP

W13

Subject: Meeting with Ray Beery, January 20, 1972

To: Warning System File

A meeting was held to discuss PSD's effort on the home warning system. Attendees were Ray Beery, Les Berry and Jerry Partch. The following subjects were discussed:

1. Ralph Sinot, OCD, informed Ray that OCD's fiscal 73 funds have been cut, resulting in a one year delay in deployment of DIDS. Two transmitters and several thousand receivers have been cancelled. There has been no change in FY72 plans to build the transmitter at Edgewood.
2. Charlie Joyce has written an article summarizing the history and present policy concerning national warning systems. The article will appear in Broadcast Engineering.
3. The Utilities Telecommunications Council report and present position were discussed. The Power Commission is presently planning more extensive tests of the interference caused by DIDS transmitters to their power line carrier operations. Ray will call on us if he needs assistance in this area. The present position of the UTC is that they would probably move their frequency of operation if DIDS is deployed.
4. A representative of the Canadian Department of Communications has contacted OTP to discuss possible interference with their operations for which they have frequency assignments. (The representative is going to observe the interference tests planned by the Power Commission.)
5. The receiver cost/performance tradeoff study was discussed in some detail. No changes to the present approach are anticipated. It was agreed that we should present and discuss the contract effort with OCD as soon as possible. Ray felt that no contract milestones were necessary since it is only 8 weeks in duration. However, we should always keep him informed of any significant items.

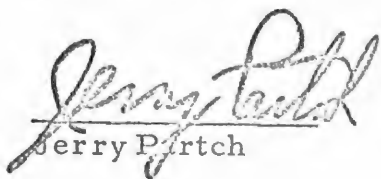
6. The letter from Elmer Lipsey, International Engineering Company, was discussed. Ray said that the issue is closed as far as OTP is concerned.

7. The effort by John Messerschmitt to discover methods of transforming the alert system receiver into a marketable product which the public would purchase freely has been dropped as a dead end.

Ray agreed that the main effort should be the cost/performance tradeoff study and that possible market efforts would be considered at a later date.

8. Les discussed the proposed effort by Hiroshi Akima to examine DEI's calculations of the probability of falsing and error in the presence of noise. Ray indicated that he should proceed with the effort.

9. Our examination of the International Electric Corporation's proposal and letter were discussed. This is a continuing effort.


Jerry Pirtch

To: Les Berry

From: Hiroshi Akima

Date: January 25, 1972

Subject: Your questions about DEI report "Sensor-Address Module Development"

This report is very hard to read, mainly because of incompleteness of descriptions. The followings are my comments. Nos. 1 to 8 pertains to the analysis (pp. 15-19), and 9 to 11 to the tests (pp. 54-59).

1. Paragraph 5.3.1 (pp. 17-19) deals with two different subjects, i. e.,

(a) the probability of element error (in the sense of common usage) in an AI (on-off keying) system, described from l. 18, p. 17 to l. 15, p. 19:

(b) the signal-acquisition problem, described from l. 10 to l. 18, p. 17 and from l. 16 to l. 25, p. 19.

Description of (a) is almost a dead copy of the Bennett and Davey's book (with some errors); there is nothing to comment. Subject (b) contains a big problem, which is not answered in this report. There is a big gap between line 15 and line 16. The values of P (false), P (error), and P (no response) on p. 19 are given without any supporting evidence. No wonder why they don't agree with test results.

2. The probability of false alarm should depend on the decision procedure used by the system and the decision threshold preassigned to the receiver; in this report neither procedure nor threshold is described. The probabilities of error and of no response should depend on the signal-to-noise ratio (SNR) as well as the decision procedure and the decision threshold; no value is given to the expected SNR in this part of the report. I don't see any significance in the values of these probabilities that are given on p. 19 without descriptions of decision procedure, decision threshold, and expected SNR.

3. The term "error" is used in this report in two ways, i. e. (a) as indicating an element error, and (b) as a malfunction of the system in general. The common practice calls for (a), and we should avoid (b) in order to eliminate any possible confusions that appears in this report.
4. The sentence from l. 5 to l. 7, p. 19, is in error. "In general" should be replaced by "if the ratio of threshold to signal peak is equal to 0.5." (This threshold for binary decision should not be confused with that for signal acquisition.)
5. I think that, since the bandwidth is very small (of the order of 1 Hz), the assumption of Gaussian noise is not too bad.
6. Your question on the meaning of P (false) is a very good point. As you pointed out, time is continuous. This report does not say whether or not a decision of signal acquisition is made at a regular interval. If yes, the interval must be specified. If not, and the receiver is standing-by continuously, an average time interval between two successive false alarms instead of P (false) must be described.
7. I cannot say whether the AGC is feasible without extra cost, because the requirements on the AGC characteristics are not clearly specified in this report.
8. I wonder if this receiver is in any way related to a standard home TV receiver.
9. The term "signal-to-noise ratio" is used on pp. 54-55 without a proper definition. The bandwidth in which the noise power is measured must be specified.
10. I don't agree with the last sentence on p. 55. As a general rule, P (no response) for a fixed SNR can be reduced by allowing a higher P (false). The data on P (no response) alone cannot tell anything about P (false).
11. I cannot interpret Table II on p. 58. I wonder how the "falsing test" could be done with a signal on and with the address transmitted 4416 times a day.

I am afraid that the above comments do not answer all of your questions. But I don't think anyone can with this report alone. If you are to evaluate the system design effort, you have to call Rowland Johnson (the author of this report) and get more detailed information on the following items:

- (a) How often is the transmitter expected to address the receiver? (What does "remote" mean? What does "dropout" mean?)
- (b) Is the decision on signal acquisition made at a regular interval, or does the receiver stay alert continuously?
- (c) What is the procedure of decision on signal acquisition? Criterion? Threshold?
- (d) To what extent is a false demuting allowed?

A. R. F. PRODUCTS, INC.

BOULDER, COLO.

NO. 70A-306

W15

PAGE 1 OF 4

DATE 27 January 1

PROJECT DC-1-1

FILE

TITLE PRELIMINARY SPECIFICATION 167-191 KHz AM
HOME WARNING RECEIVER (SELF CONTAINED)

1. SCOPE

This specification is for a radio receiver for the reception of amplitude modulated emissions in the 167 to 191 KHz band of frequencies. The audio output shall be a warning tone. Options, which can be added to this basic receiver are described in paragraph 4.

2. REQUIREMENTS (ELECTRICAL)

2.1 Power Supply

The receiver shall operate from an AC line having the following characteristics:

Amplitude - 117 VRMS \pm 10%
Frequency - 49 to 61 Hz

2.2 RF Frequency Range

The receiver shall be internally preset to a frequency of 167 KHz, 179 KHz, or 191 KHz.

2.3 Sensitivity and Dynamic Range

The receiver shall operate within a field strength level of 500 UV/meter to 1V/meter, vertically polarized.

2.4 Antenna

The antenna shall be omnidirectional and shall be part of the receiver.

NO. 70A-306

PAGE 1 of 4

ISSUE: X

DATE: 27 January 1972

Typed: mh

Checked:

Approved:

A. R. F. PRODUCTS, INC.

BOULDER, COLO.

NO. 0A300

PAGE 2 OF

DATE 27 January 1972

PROJECT BCM-1

FILE

TITLE PRELIMINARY SPECIFICATION 107-191 kHz AM
HOME WARNING RECEIVER (SELF CONTAINED)

2.5 Selectivity

The receiver selectivity shall be within the following limits:

3 DB Bandwidth	5 kHz (MAX)
60 DB Bandwidth	30 kHz (MAX)

2.6 Rejection

The receiver shall reject all spurious signals a minimum of 40 DB.

2.7 Output

The output of the basic receiver is an audible warning note.

2.8 Activation

The receiver shall be demuted by an AM modulation (22% minimum) of the RF signal at an audio frequency in the 200 to 235 kHz range. It shall be demuted only as long as that signal is present.

2.9 MTBF

One year minimum.

TITLE RELIABLE SPECIFICATION NO. 107-191 200z AM
MOBILE WALKING RECEIVER (SELF CONTAINED)

3. REQUIREMENTS (ENVIRONMENTAL, OPERATING)

3.1 Temperature

10°C to 50°C.

3.2 Humidity

Up to 95% (no condensation).

3.3 Shock and Vibration

Normal handling and shipping conditions.

A.R.F. PRODUCTS, INC.

BOULDER, COLO.

NO. 70A800

PAGE 4 OF

DATE 27 January 1972

PROJECT DCM-1

FILE

TITLE PRELIMINARY SPECIFICATION 167-191 KHz AM
HOME WARNING RECEIVER (SELF CONTAINED)

4. OPTIONS

The following options can be incorporated into the basic design in any combination.

4.1 Voice Reception

Provisions shall be made for automatically switching off the warning tone and turning on a voice channel.

4.2 Multiple Address

Provisions shall be made for selective energizing of receiver functions by coding of the AF tone. At least 1000 codes shall be provided.

4.3 Stand-by Power

Provisions shall be made for receiver operation (in the muted mode) for at least 48 hours after power line failure. Switchover and switchback shall be automatic.

4.4 EMP Protection

Power input and RF input protection as well as overall shielding shall be provided to withstand high RF fields of short duration without damage to the receiver.

METHOD OF PURCHASE 1. FEDERAL SUPPLY SCHEDULE 2. FEDERAL SUPPLY STOCK 3. SURPLUS PROPERTY TRANSFER 4. ADVERTISING 5. WAR POWERS NEGOTIATION 6. OTHER EXEMPTION				PURCHASE ORDER U.S. Department of Commerce OFFICE OF TELECOMMUNICATIONS		ORDER NO. OT-0040
7. MISCELLANEOUS (See GSA Reg. No.)		PAGE 1 OF				
L OR S S	METHOD 6	CODE 4	ISSUED AT BOULDER, COLORADO 80302		SUBMIT INVOICE IN DUPLICATE IDENTIFIED WITH THE ABOVE NO. TO Office of Telecommunications Contracting Office Boulder, CO 80302	
DATE ISSUED: February 1, 1972			PROJECT NO. 9047200			
CONTRACT NO. OT-0040		REQUISITION NO. 904-0020		WORKING DIVISION AND SEC 904		
SUBJECT CLASS 25.3		WORK ORDER NO.		PROJECT NO. 9047200		

PLEASE ADDRESS SHIPMENT AS SHOWN BELOW

TO A.R. F. Products, Inc. 2559 75th Street Boulder, Colorado 80302	CONSIGNEE AND DESTINATION S Office of Telecommunications H OT-0040 I Boulder, Colorado 80302 P T O
--	--

INVITATION NO.	DATE OF BID	F.O.B. POINT	SHIP VIA
GOV'T B/L NO.	DISCOUNT	DELIVERY TIME	

ITEM NO.	ARTICLES OR SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	Obligation of funds for performance under Contract No. OT-0040 during the period January 24, 1972 through March 17, 1972.		CFFF		\$14,451.00

Partch-3007		TOTAL \$14,451.00
SIGNATURE _____ Boyd L. Green		
NAME _____ TITLE Contracting Officer		
MVG/df		

Contract No. OT-0040

Index

Article 1.	Scope of Work
Article 2.	Time and Money
Article 3.	Allowable Cost, Fee, and Payment
Article 4.	Limitation of Allowable Cost
Article 5.	Duplication of Effort
Article 6.	Access of Records and Right to Audit
Article 7.	Examination of Records
Article 8.	Changes
Article 9.	Termination for Default or for Convenience of the Government
Article 10.	Disputes
Article 11.	Excusable Delays
Article 12.	Reproduction and Use of Technical Data
Article 13.	Covenant Against Contingent Fees
Article 14.	Gratuities
Article 15.	Officials Not to Benefit
Article 16.	Equal Opportunity
Article 17.	Contract Work Hours Standards Act
Article 18.	Convict Labor
Article 19.	Utilization of Small Business Concerns
Article 20.	Utilization of Concerns in Labor Surplus Area
Article 21.	Federal and State Laws
Article 22.	Nonsegregated Facilities
Article 23.	Buy American Act
Article 24.	Price Certification
Article 25.	Special Notice
	Signature Page

Memorandum of Agreement made and entered into this twentieth day of January 1972 by and between the United States of America (hereinafter called the Government), represented by the Contracting Officer, Office of Telecommunications, U.S. Department of Commerce, Boulder, Colorado, and the A.R.F. Products, Inc., 2559 75th Street, Boulder, Colorado 80302 (hereinafter called the Contractor).

Witnesseth

Whereas, the Government in the performance of its statutory functions requires the design of a low frequency receiver and a cost/performance trade-off study, and

Whereas, the Contractor has the knowledge and experience, the qualified personnel, and the facilities to perform the said design and study, and

Whereas, the Contractor is willing to undertake the work hereinafter specified on a cost-plus-fixed-fee basis as hereinafter stipulated,

Now, Therefore, the Parties Agree:

Article 1. Scope of Work

a) The Contractor shall furnish qualified personnel and facilities to design a low frequency receiver and perform a cost/performance trade-off study. More specifically:

1. Receiver Design

The following receiver options shall be considered:

Receiver A: Basic stand alone receiver, warning tone only, without addressing, without standby power, without EMP filters.

Receiver B: Basic applique receiver, warning tone only, without addressing, without standby power, without EMP filters.

Option 1: Voice capability
Option 2: Addressing capability
Option 3: Standby power
Option 4: EMP protection

The receiver specifications will be provided by the Government at the beginning of the study. Receiver B is intended to be an applique to a radio or television set and will not duplicate the normal function of a radio or television set.

2. Output of Study

The Contractor shall provide study outputs or results as described in the following subparagraphs:

- 2.1 Block Diagram: The block diagram shall show the main functions for the different receiver options.
- 2.2 Specifications: Requirements for each of the circuit blocks shall be specified to permit evaluation and procurement.
- 2.3 Circuit Design: The actual circuit of each block, satisfying the requirements of 2.2, shall be provided.
- 2.4 Design Supporting Data: Supporting data for the design of 2.3 shall be provided in one of the forms described below:
 - 2.4.1 Manufacturers' Data: This will mainly apply to MSI and LSI integrated circuits or other complete functional circuits. This data may be in the form of a specification for a standard or proposed circuit, or actual test data, where parameter of interest is not usually specified. Manufacturers' data for individual components (such as transistors, for instance) will also be used in technical analyses.
 - 2.4.2 Test Data: Where the desired performance data is not available from the manufacturer, breadboard tests will be performed to obtain the desired parameters. Test data from previous similar tests will be used whenever possible to reduce study costs.
 - 2.4.3 Theoretical Analysis: In some cases, especially when approaching "state-of-the-art" design to reduce future costs, it may be necessary to analyze the proposed circuit on a theoretical basis only. The original analysis would then be performed by the Contractor with further supporting data or analysis from the most suitable manufacturer(s).
- 2.5 Pricing of the Proposed Design: The proposed designs of the receiver shall be priced on the same basis to permit evaluation of cost versus performance/function. In some cases, more than one cost estimate will be given. This will be the case when new, more suitable components are in the planning stage or when special MSI or LSI circuitry would be more suitable for large production runs. Both the available and the special circuitry shall then be priced, if appreciable and different quantity/cost trade-offs are involved.

2.6 Pricing Support Data: Quotations shall be obtained for the majority of available and proposed components where current price lists are not available or do not cover the required quantities. When a price is not available, an estimate shall be made and the basis for this estimate will be given. Furthermore, because of the rapid pricing changes of some of the recent integrated circuits, a price versus time projection shall be made where applicable and possible. Again, the basis for this projection will be given.

2.7 Performance Specifications: The receiver performance specifications (provided by the Government) shall be revised in accordance with the study results and furnished to the Government as Contractor-recommended final performance specifications.

3. Conferences and Travel

Local conferences (Boulder) between the Government and the Contractor, should be on a biweekly basis to permit close monitoring of progress. These conferences can be of the short informal type, and will allow a fast change in pursued approach, in case the information obtained requires it. The Contractor shall document these meetings to indicate actions requested. Contractor personnel shall be available for short trips as required. Travel expenses will be charged directly to the project.

- b) The Government's Technical Contract Monitor will be: J. E. Partch, Office of Telecommunications, Boulder, Colorado.

Article 2. Time and Money

- a) Performance under this contract shall commence on January 24, 1972 and continue thereafter until March 17, 1972.
- b) The maximum estimated cost for the full performance of this contract, as determined by Article 3. hereof, is \$13,137.00; the fixed fee is \$1,314.00; and the total estimated cost is \$14,451.00.

Article 3. Allowable Cost, Fee, and Payment

- a) The Government shall pay to the Contractor the allowable cost of the performance of this contract determined in accordance with the applicable provisions of Section XV, Part 2, Armed Services Procurement Regulations, or Section 15, Federal Procurement Regulations.
- b) A fixed fee of \$1,314.00 shall be paid to the Contractor for the full performance of this contract. Partial payments up to 85% of the full fee will be allowed with the balance to be paid upon completion of the contract.

- c) The provisional indirect cost rates applicable to this contract shall not exceed 125% for direct labor and 7% for general and administrative expense. The rates are subject to adjustment by negotiations conducted on the basis of audit or other criteria.
- d) Once each month (or at more frequent intervals, if approved by the Contracting Officer) the Contractor may submit in such form and reasonable detail as the Contracting Officer may require, an invoice or public voucher supported by a statement of cost incurred by the Contractor in the performance of the contract and claimed to constitute allowable cost. Submit invoice or public voucher, in original and one copy, to:

Office of Telecommunications
Contracting Office
Boulder, CO 80302

Article 4. Limitation of Allowable Cost

- a) If at any time the Contractor has reason to believe that the cost, including all indirect costs, to be incurred by it in the performance of this contract in the next succeeding 60 days, when added to all previous costs, will exceed the total estimated cost of performance, as revised from time to time in accordance with the provisions herein, the Contractor shall notify the Contracting Officer to that effect, giving a new estimate of the total expenditures required to perform this contract together with an appropriate breakdown of such estimate and a statement setting forth the reasons for such anticipated increase in cost so that, at the discretion of the Contracting Officer, an appropriate increase may be made in the estimated cost.
- b) If at any time the Contractor has reason to believe that the cost to be incurred by it in the performance of this contract in the next succeeding 60 days, when added to all previous costs, will exceed any specific limitation on reimbursement of allowable cost set forth in the schedule, if any, as revised from time to time, the Contractor shall notify the Contracting Officer to that effect.
- c) Notwithstanding any other provisions of this contract, any cost incurred by the Contractor in the performance of this contract in excess of either (i) the total estimated cost, as revised from time to time, or (ii) any specific limitation on reimbursement of allowable cost set forth in the schedule, if any, as revised from time to time, shall not be considered as an item of allowable cost under this contract. The Government shall not be obligated to reimburse the Contractor for any expenditures in excess of either such total estimated cost or such limitation on reimbursement, and the Contractor shall not be bound to take any action in or in connection with the performance of this contract that would cause the total amount expended by the Contractor in such performance to exceed either such total estimated cost or such limitation on reimbursement.

Article 5. Duplication of Effort

The Contractor certifies that the cost of work to be performed under this contract, or any subcontract hereunder, does not duplicate any costs charged against any other Government contract, subcontract, or grant in the Contractor's possession. The Contractor shall promptly inform the Contracting Officer, in writing, of the existence of any Government contract, subcontract or grant under which it is performing or under which it has performed which covers or covered work directly related to the purposes of this contract. The Contractor shall include the provisions of this clause in any subcontract issued under this contract which exceeds \$2500.00.

Article 6. Access of Records and Right to Audit

The Contractor agrees that the Secretary of Commerce or his duly authorized representatives shall, until the expiration of three years after final payment under this contract (or letter of intent to contract) have access to and the right to examine any books, documents, papers, and records of the Contractor involving transactions related to this contract (or letter of intent to contract). The Contractor agrees to require all sub-contractors under this contract, if any, to agree to the "Access of Records and Right to Audit" clause for sub-contracts in excess of \$2,500.00.

Article 7. Examination of Records

- a) The Contractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under this contract, or of the time periods for the particular records specified in Part 1-20 of the Federal Procurement Regulations (41 CFR Part 1-20, whichever expires earlier, have access to and the right to examine any directly pertinent books, documents, papers and records of the Contractor involving transactions related to this contract.
- b) The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under the subcontract, or of the time periods for the particular records specified in Part 1-20 of the Federal Procurement Regulations (41 CFR Part 1-20), whichever expires earlier, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes (1) purchase orders not exceeding \$2,500 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

Article 8. Changes

Within the general scope of this contract, the Government may at any time, by written order from the Contracting Officer who signed this contract or his duly authorized designee, make changes in or additions to the work or requirements, methods or specifications. If such changes cause an increase or decrease in the cost of the performance of this contract, or in the time required for its performance, an equitable adjustment shall be made and this contract shall accordingly be modified in writing.

Article 9. Termination for Default or for Convenience of the Government

(a) The performance of work under the contract may be terminated by the Government in accordance with this clause in whole, or from time to time in part:

- (1) Whenever the Contractor shall default in performance of this contract in accordance with its terms (including in the term "default" any such failure by the Contractor to make progress in the prosecution of the work hereunder as endangers such performance), and shall fail to cure such default within a period of ten days (or such longer period as the Contracting Office may allow) after receipt from the Contracting Officer of a notice specifying the default; or
- (2) Whenever for any reason the Contracting Officer shall determine that such termination is in the best interest of the Government.

Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying whether termination is for the default of the Contractor or for the convenience of the Government, the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective. If, after notice of termination of this contract for default under (1) above, it is determined for any reason that the Contractor was not in default pursuant to (1), or that the Contractor's failure to perform or to make progress in performance is due to causes beyond the control and without the fault or negligence of the Contractor pursuant to the provisions of the clause of this contract relating to excusable delays, the Notice of Termination shall be deemed to have been issued under (2) above, and the rights and obligations of the parties hereto shall in such event be governed accordingly.

(b) After receipt of a Notice of Termination and except as otherwise directed by the Contracting Officer, the Contractor shall:

- (1) Stop work under the contract on the date and to the extent specified in the Notice of Termination;
- (2) Place no further orders or subcontracts for materials, services, or facilities, except as may be necessary for completion of such portion of the work under the contract as is not terminated;
- (3) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;
- (4) Assign to the Government in the manner and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders or subcontracts so terminated, in which case the Government shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
- (5) With the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final and conclusive for all purposes of this clause, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable in whole or in part, in accordance with the provisions of this contract;
- (6) Transfer title to the Government (to the extent that title has not already been transferred) and deliver in the manner, at the times, and to the extent directed by the Contracting Officer, (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in respect of the performance of, the work terminated by the Notice of Termination; (ii) the completed

or partially completed plans, drawings, information, and other property which, if the contract had been completed, would be required to be furnished to the Government; and (iii) the jigs, dies, and fixtures, and other special tools and tooling acquired or manufactured for the performance of this contract for the cost of which the Contractor has been or will be reimbursed under this contract,

(7) Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in (6) above: PROVIDED, HOWEVER, THAT the Contractor (i) shall not be required to extend credit to any purchaser, and (ii) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Contracting Officer: And provided further, That the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Government to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct;

(8) Complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and

(9) Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is the possession of the Contractor and in which the Government has or may acquire an interest.

The Contractor shall proceed immediately with the performance of the above obligations notwithstanding any delay in determining or adjusting the amount of the fee, or any item of reimbursable cost, under this clause. At any time after expiration of the plant clearance period, as defined in Subpart 1-8.1 of the Federal Procurement Regulations (41 CFR 1-8.1), as the definition may be amended from time to time, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Contracting Officer, and may request the Government to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) days thereafter, the Government will accept such items and remove them or enter into a storage agreement covering the same; PROVIDED, That the list submitted shall be subject to verification by the Contracting Officer upon removal of the items or, if the items are stored, within forty-five (45) days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer his termination claim in the form and with the certification prescribed by the Contracting Officer. Such claim shall be submitted promptly but in no event later than one year from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer upon request of the Contractor made in writing within such one-year period or authorized extension thereof. However, if the Contracting Officer determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such one-year period or any extension thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Contracting Officer may, subject to any review required by the contracting agency's procedures in

effect as of the date of execution of this contract, determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

(d) Subject to the provisions of paragraph (c), and subject to any review required by the contracting agency's procedures in effect, as of the date of execution of this contract, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount of amounts to be paid (including an allowance for the fee) to the Contractor by reason of the total or partial termination of work pursuant to this clause. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount.

(e) In the event of the failure of the Contractor and the Contracting Officer to agree in whole or in part, as provided in paragraph (d), as to the amounts with respect to costs and fee, or as to the amount of the fee, to be paid to the Contractor in connection with the termination of work pursuant to this clause, the Contracting Officer shall, subject to any review required by the contracting agency's procedures in effect as of the date of execution of this contract, determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amount determined as follows:

(1) If the settlement includes cost and fee -

(i) There shall be included therein all costs and expenses reimbursable in accordance with this contract, not previously paid to the Contractor for the performance of this contract prior to the effective date of the Notice of Termination, and such of these costs as may continue for a reasonable time thereafter with the approval of or as directed by the Contracting Officer: PROVIDED, however, That the Contractor shall proceed as rapidly as practicable to discontinue such costs;

(ii) There shall be included therein so far as not included under (i) above, the cost of settling and paying claims arising out of the termination of work under subcontracts or orders, as provided in paragraph (b)(5) above, which are properly chargeable to the terminated portion of the contract;

(iii) There shall be included therein the reasonable costs of settlement, including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the contract and for the termination and settlement of subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of termination inventory: PROVIDED, HOWEVER, That if the termination is for default of the Contractor there shall not be included any amounts for the preparation of the Contractor's settlement proposal; and

(iv) There shall be included therein a portion of the fee payable under the contract determined as follows -

(A) In the event of the termination of this contract for the convenience of the Government and not for the default of the Contractor, there shall be paid a percentage of the fee equivalent to the percentage of the completion of work contemplated by the contract, less fee payments previously made hereunder; or

(B) In the event of the termination of this contract for the default of the Contractor, the total fee payable shall be such proportionate

part of the fee (or, if this contract calls for articles of different types, of such part of the fee as is reasonably allocable to the type of article under consideration) as the total number of articles delivered to and accepted by the Government bears to the total number of articles of a like kind called for by this contract.

If the amount determined under this subparagraph (1) is less than the total payment theretofore made to the Contractor, the Contractor shall repay to the Government the excess amount.

(2) If the settlement includes only the fee, the amount thereof will be determined in accordance with subparagraph (1)(iv) above.

(f) The Contractor shall have the right of appeal, under the clause of this contract entitled "Disputes," from any determination made by the Contracting Officer under paragraph (c) or (e) above, except that, if the Contractor has failed to submit his claim within the time provided in paragraph (c) above and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due under paragraph (c) or (e) above, the Government shall pay to the Contractor the following: (1) if there is no right of appeal hereunder or if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (2) if an appeal has been taken, the amount finally determined on such appeal.

(g) In arriving at the amount due the Contractor under this clause there shall be deducted (1) all unliquidated advance or other payments theretofore made to the Contractor, applicable to the terminated portion of this contract, (2) any claim which the Government may have against the Contractor in connection with this contract, and (3) the agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the Contractor or sold pursuant to the provisions of this clause and not otherwise recovered by or credited to the Government.

(h) In the event of a partial termination, the portion of the fee which is payable with respect to the work under the continued portion of the contract shall be equitably adjusted by agreement between the Contractor and the Contracting Officer, and such adjustment shall be evidenced by an amendment to this contract.

(i) The Government may from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated portion of the contract whenever in the opinion of the Contracting Officer, the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally determined to be due under this clause, such excess shall be payable by the Contractor to the Government upon demand, together with interest computed at the rate of 6 percent per annum, for the period from the date such excess payment is received by the Contractor to the date on which such excess is repaid to the Government: PROVIDED, HOWEVER, That no interest shall be charged with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until ten days after the date of such retention or disposition, or such later date as determined by the Contracting Officer by reason of the circumstances.

(j) The provisions of this clause relating to the fee shall be inapplicable if this contract does not provide for payment of a fee.

Article 10. Disputes

- a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. Within thirty days from the date of receipt of such copy, the Contractor may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Secretary, and the decision of the Secretary or his duly authorized representative for the hearing of such appeals shall, unless determined by a court of competent jurisdiction to have been fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence, be final and conclusive; provided that, if no such appeal is taken, the decision of the Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.
- b) This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in paragraph a) above: PROVIDED, that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

Article 11. Excusable Delays

Except with respect to defaults of subcontractors, the Contractor shall not be in default by reason of any failure in performance of this contract in accordance with its terms (including any failure by the Contractor to make progress in the prosecution of the work hereunder which endangers such performance) if such failure arises out of causes beyond the control and without the fault or negligence of the Contractor. Such causes may include, but are not restricted to, acts of God or of the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, but in every case the failure to perform must be beyond the control and without the fault or negligence of the Contractor. If the failure to perform is caused by the failure of a subcontractor to perform or make progress, and if such failure arises out of causes beyond the control of both the Contractor and subcontractor, and without the fault or negligence of either of them, the Contractor shall not be deemed to be in default, unless (a) the supplies or services to be furnished by the subcontractor were obtainable from other sources, (b) the Contracting Officer shall have ordered the Contractor in writing to procure such supplies or services from such other sources, and (c) the Contractor shall have failed to comply reasonably with such order. Upon request of the Contractor, the Contracting Officer shall ascertain the facts and extent of such failure and, if he shall determine that any failure to perform was occasioned by any one or more of the said causes, the delivery schedule shall be revised accordingly, subject to the rights of the Government under the clause hereof entitled Termination for Default or for Convenience of the Government. (As used in this clause, the terms "subcontractor" and "subcontractors" mean subcontractor(s) at any tier.

Article 12. Reproduction and Use of Technical Data

The Contractor agrees to and does hereby grant to the Government, to the full extent of the Contractor's right to do so without payment of compensation to others, the right to reproduce, use, and disclose for governmental purposes (including the right to give to foreign governments for their use as the national interest of the United States may demand) all or any part of the reports, drawings, blueprints, data, and technical information specified to be delivered by the Contractor to the Government under this contract and schedules; provided, however, that nothing contained in this paragraph shall be deemed, directly or by implication, to grant any license under any patent now or hereafter issued or to grant any right to reproduce anything else called for by this contract.

Article 13. Covenant Against Contingent Fees

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fees.

Article 14. Gratuities

- a) The Government may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found, after notice and hearing, by the Secretary of Commerce or his duly authorized representative, that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing, of such contract; provided, that the existence of the facts upon which the Secretary or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court.
- b) In the event this contract is terminated as provided in paragraph a) hereof the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor, and (ii) as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Secretary or his duly authorized representative) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.
- c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

Article 15. Officials Not to Benefit

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

//
EQUAL OPPORTUNITY

During the performance of this Contract, the Contractor Agrees as follows:

- (1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- (2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.
- (3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965 and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and by the rules, regulations and relevant orders of the Secretary of Labor.
- (5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.
- (6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations or orders, this contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies involved as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.
- (7) The Contractor will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204, of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: PROVIDED, HOWEVER, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontract or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Article 17. Contract Work Hours Standards Act

This contract, to the extent that it is of a character specified in the Contract Work Hours Standards Act (40 U.S.C. 327-330), is subject to the following provisions and to all other applicable provisions and exceptions of such Act and the regulations of the Secretary of Labor thereunder.

- a) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any workweek in which he is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such workweek on work subject to the provisions of the Contract Work Hours Standards Act unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all such hours worked in excess of eight hours in any calendar day or in excess of forty hours in such workweek, whichever is the greater number of overtime hours.
- b) Violation: liability for unpaid wages: liquidated damages. In the event of any violation of the provisions of paragraph (a), the Contractor and any subcontractor responsible therefor shall be liable to any affected employee for his unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the provisions of paragraph (a) in the sum of \$10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of eight hours or in excess of the standards work-week of forty hours without payment of the overtime wages required by paragraph (a).
- c) Withholding for unpaid wages and liquidated damages. The Contracting Officer may withhold from the Government Prime Contractor, from any moneys payable on account of work performed by the Contractor or subcontractor, such sums as may administratively be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions of paragraph (b).
- d) Subcontracts. The Contractor shall insert paragraphs (a) through (d) of this clause in all subcontracts, and shall require their inclusion in all subcontracts of any tier.
- e) Records. The Contractor shall maintain payroll records containing the information specified in 29 CFR 516.2(a). Such records shall be preserved for three years from the completion of the contract.

Article 18. Convict Labor

In connection with the performance or work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment at hard labor.

Article 19. Utilization of Small Business Concerns

- a) It is the policy of the Government as declared by the Congress that a fair proportion of the purchases and contracts for supplies and services for the Government be placed with small business concerns.
- b) The Contractor agrees to accomplish the maximum amount of subcontracting to Contractor finds to be consistent with the efficient performance of this contract.

Article 20. Utilization of Concerns in Labor Surplus Area

It is the policy of the Government to place contracts with concerns which will perform such contracts substantially in or near concentrated unemployment or under-employment sections of States or in areas of persistent or substantial labor surplus, where this can be done consistent with the efficient performance of the contract and at prices no higher than are obtainable elsewhere. The Contractor agrees to use his best efforts to place his subcontracts in accordance with this policy. In complying with the foregoing and with paragraph b) of the clause of this contract entitled "Utilization of Small Business Concerns" the Contractor in placing his subcontracts shall observe the following order of preference: (a) Certified-eligible concerns which are also small business concerns; (b) other certified-eligible concerns; (c) persistent labor surplus area concerns which are also small business concerns; (d) other persistent labor surplus area concerns; (e) substantial labor surplus area concerns which are also small business concerns; (f) other substantial labor surplus area concerns; and (g) small business concerns which are not labor surplus area concerns.

Article 21. Federal and State Laws

The Contractor shall, in the performance of his obligation hereunder, comply with all applicable Federal and State laws, rules and regulations which deal with or relate to the employment by the Contractor of the employees necessary for such performance.

Article 22. Nonsegregated Facilities

By signing this contract, the Contractor will be deemed to have signed and agreed to the provisions of the "Certification of Nonsegregated Facilities". The certification provides that the Contractor does not maintain or provide for his employees facilities which are segregated on a basis of race, creed, color, or national origin, whether such facilities are segregated by directive or on a de facto basis. The certification also provides that he will not maintain such segregated facilities.

Article 23. Buy American Act

The Contractor agrees that there will be delivered under this contract only such unmanufactured articles, materials, and supplies (which term "articles, materials, and supplies" is hereinafter referred to in this clause as "supplies") as have been mined or produced in the United States, and only such manufactured supplies as have been manufactured in the United States substantially all from supplies mined, produced or manufactured, as the case may be, in the United States. Pursuant to the Buy American Act (41 U.S. Code 10 a-d), the foregoing provision shall not apply (i) with respect to supplies excepted by the Secretary of Commerce from the application of that Act, (ii) with respect to supplies for use outside the United States, or (iii) with respect to the supplies to be delivered under this contract which are of a class or kind determined by the Secretary or his duly authorized representative not to be mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality, or (iv) with respect to such supplies from which the supplies to be delivered under this contract are manufactured as are of a class or kind determined by the Secretary or his duly authorized representative not to be mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality, provided that this exception (iv) shall not permit delivery of supplies manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

Article 24. Price Certification

- a) By signing this contract, Contractor certifies that he is in compliance and will continue to comply with the requirements of Executive Order 11615, August 15, 1971, as superseded by Executive Order 11627, October 15, 1971 for the duration thereof and further certifies that the prices herein conform to the requirements of Executive Order 11615, as superseded by Executive Order 11627, October 15, 1971, or shall be reduced accordingly at the time of any billings that are made during the effective period of the Executive order.
- b) Prior to the payment of invoices under the contract, the Contractor shall place on, or attach to, each invoice submitted the following certification:

I hereby certify that amounts invoiced herein do not exceed the lower of (i) the contract price, or (ii) maximum levels established in accordance with Executive Order 11615, August 15, 1971, as superseded by Executive Order 11627, October 15, 1971.

- c) The Contractor agrees to insert the substance of this clause, including this paragraph c), in all subcontracts for supplies or services issued under this contract.

Article 25. Special Notice

- a) The terms of this contract cannot be modified by any Government employee except the Contracting Officer. The Government will not be liable for any costs incurred by the Contractor which result from the Contractor's acting upon orders received from any Government employee other than the Contracting Officer.
- b) The Government's contract monitor will represent the Contracting Officer in the technical work area only. He is not authorized to issue any orders which would affect the scope of the work, cost of the work, or other terms and conditions of the contract.

In Witness Whereof, the Government and the Contractor have caused this Agreement to be signed and sealed, intending to be legally bound thereby.

THE UNITED STATES OF AMERICA

Date signed 5-26/72 by Boyd L. Green

Boyd L. Green
Contracting Officer

CONTRACTOR

Date signed 20 January 1972 by Andrzej B. Przedpelski
Andrzej B. Przedpelski
Vice President, Development

CERTIFICATION:

I, Arthur H. Maciszewski hereby certify that _____

Andrzej B. Przedpelski who has executed this Agreement on

behalf of A. R. F. PRODUCTS, INC.

has authority to do so and to bind the said A. R. F. Products, Inc.

_____ by said act to all the terms of the Agreement.

Arthur H. Maciszewski
Arthur H. Maciszewski
President

(Title)



Date: February 23, 1972

Reply to: PSD/JEP
Attn of:

Subject: Informal meeting with Gobel Davis, A.R.F. Products

To: Warning System File

1. Antenna

They are investigating ferrite rod, vertical whip, and loop antennas. At this point the loop antenna appears most promising.

2. TRF Receiver

They are looking at possibility of using a TRF receiver. I warned that because of past problems with this approach (see "DIDS Development Program", Dec. 71) their work would have to be well supported. The use of a different antenna may make this approach feasible.

3. Phase-locked, loop detector

They are proposing the use of a phase-locked loop detector. This item is very promising and has not been proposed before for the DIDS receivers. An integrated circuit is available for this purpose.

4. Address Code

They would like to know the maximum number of zeros in any address sequence now that a 13th bit has been added.


Jerry

cc: RKSalaman



Date: March 1, 1972

Reply to
Attn of: PSD/JEP

Subject: Meetings during week ending 2-25-72

To: Warning System File

Meeting with Charlie Joyce

Wednesday morning there was a meeting at OTP to discuss the warning system program, and some new contract work. Those in attendance were: Charlie Joyce, Ray Beery, Max Polk and Brian Engle from OTP and Les Berry, Jerry Partch and Paul Polishuk from OT.

1. Our present effort in the receiver cost/performance tradeoff study was presented and discussed. Charlie expressed satisfaction with its direction.
2. The Berry memo, dated December 13, 1971, was discussed at some length. Charlie objected to the conclusions of the memo. He felt that the policy decision to implement a warning system, albeit through voluntary purchase, must be assumed in any study. Then the marginal costs and benefits of weather warning could be studied to determine the feasibility of adding this additional service.
3. He suggested that we outline the conclusions of the warning working group, then re-outline with the assumption of voluntary purchases of the home warning receiver.
4. Charlie is taking another look at the use of the telephone in a home warning system. He would like me to attend a briefing on the subject at AT&T headquarters in New York with Court Babcock and Ray Beery.
5. At the conclusion of the A.R.F. Products contract, Charlie would like us to take the cost/performance data, postulate systems, and do a logical analysis to determine the probable consequences.
6. Charlie suggested that any output be marked as a discussion draft.
7. The time table at OCD has slipped, so our results are not needed in April. We should complete our work by June or July.

March 1, 1972

8. The remainder of the meeting was a discussion with Paul of two new projects.


Meeting with Bob Martin, OCD

On Friday morning, Ray Beery and I met with Bob Martin at OCD to discuss our receiver contract and to be briefed on their present effort.

Bob Martin expressed concern that the receiver option of providing only a warning tone was not viable from a systems point of view, since it would depend on the broadcast industry for distribution of information. He warned that we should not forget the total system operation when we examine the various receiver options.

Bob Martin described two contracts that they are pursuing. First, they are examining the possible methods to insert the weather information (warning) into the system. This contract is for two phases, study and hardware. The second contract is to design and test various configurations of home warning receivers (stand alone, applique, auto radio, etc.). He only received one proposal and expressed some reservations that it was unimaginative. They may ask for more proposals.

They have gone to 13 bits in their address code to add addresses for the weather warning function.


JEP

cc: Roger Salaman
Les Berry

March 7, 1972

PSD/JEP

Status of Warning Receiver Tradeoff Study

Charles C. Joyce, Jr., OTP

I was briefed by A. R. F. Products, Inc., Monday, March 6, 1972, on the status of their warning receiver contract. I specifically asked for preliminary cost data and for a firm date for their final report, as you requested.

Cost Data - Preliminary

Cost of electrical components alone; no box, no hardware, no PC boards. For a quantity of around 10,000:

Basic Receiver	\$17.48
Audio Option	2.38
Address Option	15.00

These costs are for normal published prices for the integrated circuits involved, not for negotiated prices. They are having problems receiving the cooperation of vendors in either asking for forecasts of prices or for prices of very large quantities. The vendors treat this area as proprietary.

A very rough guess for the remaining components:

Case:	\$0.50
PC Boards:	2 @ \$2.00 each
Hardware:	cord, etc. \$2.00.

Preliminary total component costs:

Receiver with addressing:	\$41.36
Receiver without addressing:	\$26.36.

The addressing option thus adds 57% to the cost of the basic receiver (with audio option).

Final Report Date

They have given me a firm date of 27 March 1972. The delay has been caused by difficulties in obtaining vendor prices.

SURNAME	DATE	SURNAME	DATE

FILE COPY

OFFICE OF TELECOMMUNICATIONS

Charles C. Joyce, Jr.

- 2 -

March 7, 1972

Conclusion

At this point, I feel that two conclusions will be reached after their final report:

1. The total receiver cost will be too high to achieve a satisfactory home penetration. This cost will be based on the publicly available price information from integrated circuit vendors. The price reduction achievable through large scale integration would be a guess.
2. The addressing option will add approximately 50% to the cost of the home warning receiver.

The probable conclusions point out the main areas for future concern. First, any receiver development contract should consider the costs of the addressing capability.

Second, the previous predictions of price reduction through the use of special LSI circuits should be evaluated. The price reduction for the address module, as given in the working group report, was taken from Phase I of an OCD contract to Datronics Engineers Inc. Their report indicated, page 60, that price estimates were to be made in Phase II of the contract and that their Phase I predictions had a rather low confidence level. Since the total cost of the warning receivers when manufactured in moderate quantities (as applicable for voluntary marketing) appears to be excessive, there is no point in pursuing further receiver development before consideration of these two points.

Jerry Partch
Policy Support Division

cc: Ray Beery

FILE COPY

SURNAME	DATE	SURNAME	DATE

March 13, 1972

PSD/JEP

OCD Home Warning Receiver Contract

Charles C. Joyce, Jr., OTP

After studying the OCD work statement for the home warning receiver contract, I have some reservations about the contract's usefulness.

The main concern at this point in the development of DIDS is the cost (to the purchaser) of the home warning receiver. Previous OCD contracts have produced prototype designs for similar receivers and the A.R.F. Products contract will produce a design concept for the latest version of the home receivers. All of the contracts, including the A.R.F. Products contract, are deficient in their cost projections for very large quantities. The cost reductions achievable through the use of large scale integrated circuits have not been carefully studied in a quantitative manner. Until this reduction is tied down, perhaps through a circuit development contract to an integrated circuit manufacturer, the whole future of the voluntary purchase program is in doubt. The effort to be expended might be better spent in integrated circuit development.

Jerry Parich
Policy Support Division

cc: Ray Beery, OTP

JEP:db

FILE COPY

SURNAME	DATE	SURNAME	DATE

March 24, 1972

281.00

Mr. John D. Ellington
Deputy Director
Research & Development Laboratory
A.R.F. Products, Inc.
2559 75th Street
Boulder, Colorado 80302

Subject: Office of Telecommunications Contract No. OT-0040,
Supplemental Agreement No. 1

Reference: Your letter dated 23 March 1972

Dear Mr. Ellington:

The subject supplement, transmitted herewith in duplicate, responds to your referenced letter of request.

Please have the original supplement executed for A.R.F. Products, Inc. and return that document to the writer. A signed copy of the supplement will then be returned to you within a few days.

Sincerely yours,

MERLE V. GIBSON
Contract Specialist
Contracting Office

Enclosure

cc: Partch-3007, w/supp. ✓

MVG/df

Supplemental Agreement No. 1

to

Contract No. OT-0040

Memorandum of Supplemental Agreement made and entered into this twenty-fourth day of March 1972 by and between the United States of America (hereinafter called the Government), represented by the Contracting Officer, Office of Telecommunications, U.S. Department of Commerce, Boulder, Colorado, and the A.R.F. Products, Inc., 2559 75th Street, Boulder, Colorado 80302 (hereinafter called the Contractor).

Witnesseth

Whereas, the Government and the Contractor entered into Contract No. OT-0040 on the twentieth day of January 1972, and

Whereas, the contract is scheduled to terminate on the seventeenth day of March 1972, and

Whereas, the Government and the Contractor desire to continue the contract in effect for their mutual benefit,

Now, Therefore, the Parties agree to amend the contract in the following particular:

Article 2. Time and Money, a), shall be amended to read:

- a) Performance under this contract shall commence on January 24, 1972 and continue thereafter until April 10, 1972.

No other changes. All other terms and conditions remain as first written and in full force and effect.

FOR OFFICIAL USE ONLY



U.S. DEPARTMENT OF COMMERCE
Office of Telecommunications
INSTITUTE FOR TELECOMMUNICATION SCIENCES
Boulder, Colorado 80502

W22

Date: March 27, 1972

Reply to
Attn of:

Subject: Telephone Warning -- Meeting at AT&T

To: Warning System File

NOTE: Some of the information in this memo may be proprietary.
It is intended for internal discussion only.

On March 22, 1972, a meeting to discuss telephone warning was held at AT&T headquarters, New York City. Those present: Tom Mainard and Claud Beckham, AT&T; Capt. Babcock and Col. Beery, OPT; Jerry Partch, PSD.

Claud Beckham reviewed the history of telephone warning that led up to their report to OCD. In 1965, SRI studied telephone warning under an OCD contract, and concluded that such a system could be implemented for about \$0.65 per line. This report generated renewed interest in telephone warning, and resulted in an RFP from OCD which was directed at AT&T. For proprietary reasons AT&T undertook a study using their own funds. Their work culminated in a report entitled, "Telephone Warning Study", issued 15 October 1970. They concluded that it could be done, but would be far more expensive than indicated by the SRI study. AT&T management had been willing to take a serious look at telephone warning since a voice message was to be included as part of the system.

The following points were stressed during a discussion of the report:

1. Beckham stressed that the costs were only applicable to the 100 SMSA's that were studied, and should not be extrapolated to obtain an estimate for the total population. It would require further investigation to obtain this estimate.
2. AT&T management is very concerned about interruption of calls in progress and local authority to issue a warning. Both of these concerns impinge upon the integrity of the telephone system.
3. The report is based on the cheapest possible system and is thus a lower bound as far as costs are concerned.

FOR OFFICIAL USE ONLY

Memo to
Warning System File

-2-

3-27-72

4. The annual recurring cost of 40% of investment cost (used in Warning Group report) was questioned and discussed. The 40% figure includes capital recovery, return on investment, tax, and yearly maintenance costs. The actual yearly equipment maintenance costs might be about 20% of capital investment.
5. Perhaps the most interesting point raised in the whole discussion concerned the future development of ESS. The cost per line for implementing the system in ESS-equipped offices is far less than for the older offices (\$0.15 for ESS, compared to \$0.50 for No. 5 crossbar, and \$3.35 for step-by-step). In addition, if the warning system were added as the ESS was installed, further cost reduction could be achieved. The following estimate for future implementation of ESS was obtained:

1975	18%	of all lines
1980	37%	
1985	55%	
1990	70%	
1995	80%	
2000	100%	

The implementation of the warning function in the ESS systems as they are installed seems to be an attractive possibility.


Jerry Partch

JP:dd

cc: Ray Beery
Roger Salaman

Technology/Systems Assessment

December 6, 1971 Lockett Wood prepared preliminary paper showing opportunities and problems in area of short-haul communications.

January 7, 1972 Revision of Wood paper. (TA1)

January 20 Project summary submitted to Hinchman. (TA2)

February 18 TV Technology review Contract outlined by Hinchman to Berry.

March 1 Draft description of TV Technology review contract submitted to Hinchman by Berry. (TA3)

March 6 Memo from Berry to Crumlish, OT, about TV Technology Review contractors. (TA4)

March 8 Initial meeting with Denver Research Institute Industrial Economics Division re TV Technology. (TA5)

March 14 Discussion of Technology/Systems assessment area with Hinchman, Mustin, Lynch of OTP, Hatfield, Berry, Wood of OT.

March 23 Second meeting with DRI. Proposed Project Team and discussed plans.

March 24 Revised description of TV Technology Review contract sent to Hinchman, Mustin, by facsimile. (TA6)

April 5 Received proposal from DRI: Technological innovations in Video and their potential impacts on industry, the consumer, and government. (TA7)

JAN 7 1972 150 p. 1

7 January 1972

DRAFT

SHORT-HAUL TELECOMMUNICATIONS

L. E. Wood

TA 1

Introduction

The initial task in telecommunications service analysis is to evaluate the demand for short-range telecommunication links. These links can be implemented by microwave, optical, or cable transmission systems and provide point-to-point communications between closely-spaced terminals in a manner that must be economical, reliable, and technically feasible. This report does not concern requirements for long-distance, high-capacity trunk line service nor does it consider the problems of land mobile communications. Figure 1 gives the task outline in the form of a block diagram.

Initial investigation has shown that it may be most convenient to classify the short-haul telecommunication applications into two broad categories. The first category consists of the applications where it is desirable for the user to own his own telecommunications network, ^{and for} local intra-facility or intra-system communications. Examples of these applications are numerous, these include data terminal to data terminal or data terminal to computer in manufacturing plants, data communications between company offices in separate buildings, between numerous time-share terminals and a centralized computer on the university campus, and communication between the centralized general hospital and outlying patient care centers.

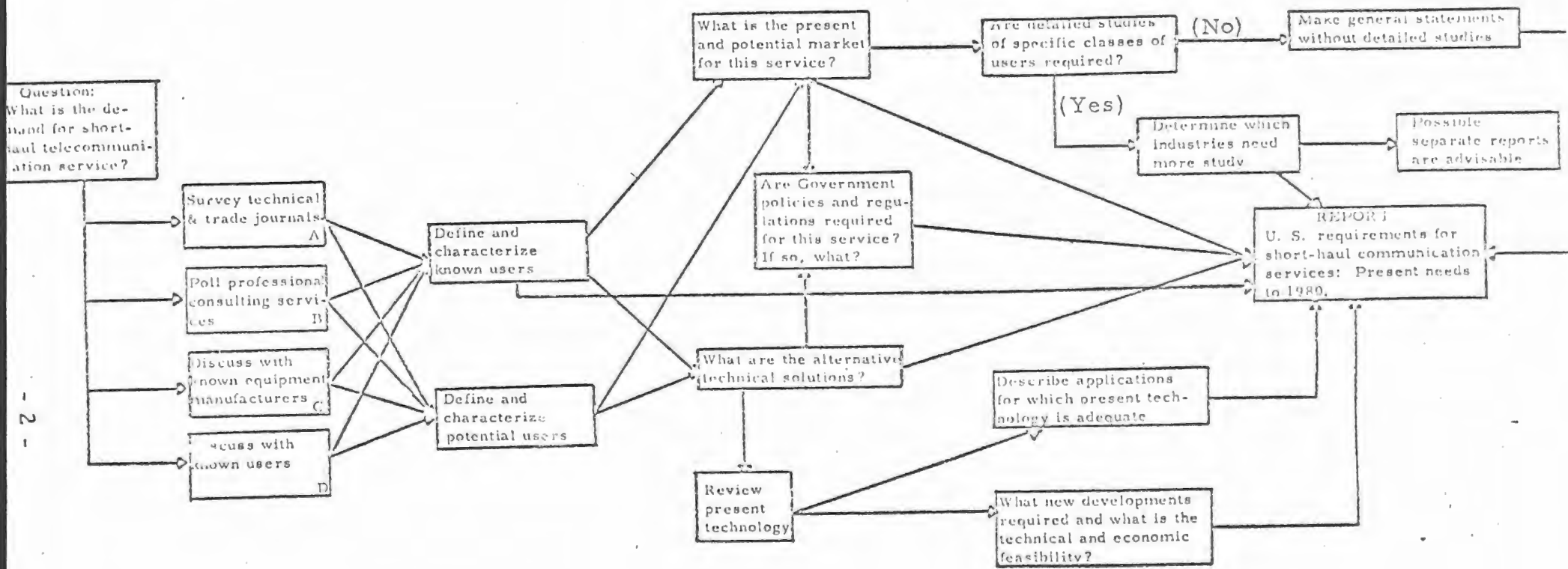


Figure 1

These applications require careful and specific investigation of each industry, and indeed many require investigation of specific applications within an industry in order to properly determine their impact. Even without this specific investigation, however, the following areas are identified as involving potential policy questions.

(1) Interconnection. In view of the Carterfone decision, it is reasonable to expect more and more users to want to install a complete internal communication system. This internal system then connects to the common carrier at a single point. Several users, in fact, have already begun operation in this mode. As the specialized common carrier service and the cable TV industry grows, it can be anticipated that similar problems will be encountered in both of these areas.

(2) Spectrum crowding. As individual users or companies install telecommunication systems with links longer than a few hundred feet, it may become cost effective to install microwave links. If so, it will be necessary to decide what frequencies should be allowed for these applications and what should be the criterion for the choice of these frequencies. These are only two of the questions that must be considered within the framework of the first broad category outlined above. Other questions will be posed as the study progresses.

The second broad category is that of the commercial telecommunication services. These services are provided by a single company to

a broad range of users. This is the service provided by the telephone and telegraph carriers, radio and TV broadcasters, coaxial cable TV operators, and the specialized common carriers. The nature of these services is such that at times each could supply the same service that any of the others might supply. As a result, the opportunity for competition in the supply of these services will grow and policy decisions concerning their interaction will be necessary.

Consequently, it will become increasingly important in the future that careful distinction be made between the type of service to be provided and the technique used for provision of this service.

Historically, the type of service provided has tended to be connected almost inseparably to the technique used to provide the service. For example, the broadcast industry has provided broad-band, one-way service from a large powerful transmitter to many thousands of inexpensive receivers. The telephone and telegraph carriers have supplied narrow-band, two-way communications between individuals. The broadcast and telephone companies have not been in strong competition because the transmission techniques were suitable for only one type of service.

In contrast, future developments will tend to consider first the type of service to be provided and then the technique for providing this service will be determined on the basis of cost effectiveness. Thus, the

specialized common carriers will use a combination of telephone, coaxial cable, microwave, millimeter, and optical links.

To illustrate how this involves complicated policy matters, consider that at present it is technically possible to develop a broad-band, full-duplex communication system that supplies all the communication requirements for all users in a local area, namely, one-way TV, TV with audience participation, two-way voice or voice and video, facsimile, two-way high-speed data, etc. This could come about in an evolutionary manner from today's CATV systems. Such a system obviously replaces service provided by the telephone companies, over-the-air broadcasters, and the specialized common carriers. This could generate a situation in which the telephone and broadcast companies would no longer exist as separate entities and would either cease to function or would themselves become CATV suppliers. The alternative might be a rather narrow and possibly arbitrary restriction on the service that any particular supplier would be permitted to provide. This latter approach could result in an inefficient system with greatly increased cost to the subscribers. The former certainly results in a large and powerful monopoly.

The Specialized Common Carriers

Implementation of a system with broad capabilities described above is, of course, several years in the future. Problems of a smaller scale but similar in nature exist now. Presently there are over thirty companies with an interest in becoming specialized common carriers, as evidenced by their applications before the FCC. These carriers have been organized with the intent of supplying various telecommunications services.

The Microwave Communications of America group of which Microwave Communication, Inc., is a member, typifies the present carriers. This group sees itself as evolutionary and coming about naturally from increased use of private microwave systems. Thus, MCI proposes to offer its subscribers the advantages of a private communications system on a lease basis. The customer will lease his choice of a variety of analog and digital channels for point-to-point service. Switched service is not intended as a part of the MCI service, but a customer could install his own switching equipment for his own link if he so desired.

The local distribution system for these links is a short-haul communication service which is now receiving increasing attention by the MCI group. Early plans called for local distribution by AT&T facilities; however, the problem of increased load on the telephone companies, which are already having difficulty meeting demand in many places, and the disadvantage of increased noise on these switched circuits has led to the consideration

of alternate methods of local distribution. These include:

- (a) telephone, if this appears to be optimum for a particular customer;
- (b) letting the customer provide his own link between his site and the MCI trunk terminal;
- (c) ask MCI to install the short-haul link between the customer's site and the trunk terminal.

It appears clear that the later alternative is likely to be the most popular, since many customers will not have the communication expertise to plan, install, and operate their local loop service and they may be reluctant to split their communications system between separate carriers. Thus, MCI is developing plans for a short-haul system using microwave, millimeter wave, optical, and cable.

The backbone of the MCI short-haul system has been described in their Petition for Rule Making before the FCC to establish a Carrier Distribution Service in the 38.6- to 40.0-GHz band. It is proposed that this frequency band be reserved primarily for the use by the specialized common carriers. This band would be broken into twelve channels with one carrier given one pair of channels within any given metropolitan area. Each pair of channels could then be used by the carrier in whatever way best suited to its needs. Present estimates by MCI for the cost for their CDS is near \$60 million.

Data Transmission Company proposes to operate a nationwide switched digital communications common carrier network. The system would initially serve 35 metropolitan areas with over 71% of the nation's computers and could later be expanded to 52 cities. DATRAN has identified local distribution as the most expensive, most crucial, and most difficult part of their installation. DATRAN expects installation of the local distribution to cost between \$184-225 million.

From the outset DATRAN has proposed development of its own local distribution system. They seriously question the ability of the local telephone companies to supply adequate local distribution facilities. They are convinced that the service they are providing for their customers will be seriously degraded by local distribution through the telephone company. DATRAN gives the seven following reasons for reserving local distribution rights to themselves:

1. In many cities local exchange facilities are heavily overburdened.
2. Service to voice subscribers may be seriously deteriorated by heavy use of data transmission on the local voice switching circuits.
3. DATRAN and the telephone company are competing for many of the same customers. Consequently, the telephone company would have unfair competitive advantage if DATRAN were required to use their service for local distribution.

Most of the other specialized carriers intend to operate in a manner very similar to that proposed by MCI. Consequently, remarks about MCI operation are, in general, applicable to them.

At present FCC has the MCI frequency proposal under consideration and has asked for the opinions of the other carriers, manufacturers of equipment and others.

With the exception of Datran most carriers and equipment manufacturers believe that allocation at 11 GHz for local distribution service would cause severe spectrum crowding and therefore interference with the proposed trunk line service. Most agree with MCI that 38.6- to 40-GHz is an acceptable frequency band for this service. They do not agree, however, with MCI's proposed allocation within this band. Most contend that there are more channels available within this band than were originally proposed by MCI. AT&T states that "all necessary equipment and facilities are available for experimental purposes at frequencies up to 100 GHz and could be put into commercial production given adequate incentive." A comprehensive study of the frequency range of 10 to 100 GHz for this specific purpose could be of great benefit.

There seems to be no question that the local distribution market has presented a real opportunity and challenge to the equipment manufacturers. RESALABS, Inc., has made recent market studies which indicate installation in excess of 10,000 local distribution links within the next 6 years. Frost and Sullivan in ^{the} specialized communications common carrier market describe this as "perhaps the most

exciting opportunity for technological development to stem from the establishment of the specialized common carriers." The following table gives their prediction for the dollar volume for this market by 1978.

Conspicuously present in this list is the optical communications link. This link appears to be proving itself as a highly effective alternative in situations where the link does not exceed a few hundred feet. It is still unclear how many installations have requirements for paths this short or whether an optical link with repeaters may not be superior to a microwave link for reasons of economy or relief from spectrum crowding. DATRAN appears to be most optimistic about this approach and has been testing optical links for over a year. Conspicuously absent from this list is the requirement for cable installation. While it is true that some form of cable transmission is required from the user terminal to the radiating link, it is generally perceived that long cable runs will not be cost effective in most instances.

References

The following references are considered relevant primarily to the policy and market aspects of short-haul telecommunications systems:

Stine, L. L., C. M. Plummer, M. H. Umbert, "Local Distribution of Telecommunications - A Perspective," MITRE Rept. # M71-91, MITRE Corp., Bedford, MA., Aug. 1971.

Frost and Sullivan, Inc., "The Specialized Communications Common Carrier Market," Frost and Sullivan, Inc., 1971.

Comments on Docket No. 18920 before the FCC on local distribution on the "Carrier Distribution Service," as suggested by MCI:

Comments by DATRAN - Oct. 1, 1970.

Comments by AT&T - Aug. 12, 1971.

Comments by EIA - Aug. 10, 1971.

Comments by Cubic Corp. - July 30, 1971.

Comments by COMSAT - Aug. 17, 1971.

Comments by RESALAB, Inc. - Aug. 11, 1971.

Comments by Southern Pacific Railroad - Aug. 17, 1971.

Comments by Western Union Telegraph Co. - Aug 13, 1971.

Comments by Laser Link Corp. - Aug. 7, 1971.

SHORT-HAUL COMMUNICATION SERVICES

Major Tasks:

- A 1. Survey of literature for technical and policy considerations involving short-haul communications services.
- A 2. Establish list of professional consulting services qualified to provide input for study of short-haul service.
- A 3. Establish contacts with manufacturers of equipment for short-haul communications.
- A 4. Discuss short-haul communications requirements with known users of this equipment to establish trends of future need.

- B 1. Define firms or industries which have already devoted significant time and money to the improvement or installation of short-haul equipment to determine areas for potential policy problems.
- B 2. Identify firms or industries which will potentially use short-haul communication systems. Determine if these introduce significant factors not considered in B 1.
- C 1. What is the present and future market for short-haul communications services and equipment. This provides perspective on significance of the investigation.
- D 1. Investigate status of present technology for short-haul communications. Review technical alternatives and the significance of these alternatives on policy.
- D 2. Review any new technical developments required in order to meet short communications demand. What are the economic and technical feasibilities of these new developments.
- E 1. Review specialized needs of particular industries and what influence this has on short-haul communications in general.

F 1. Prepare preliminary report describing findings of above work and outline additional investigation as necessary. Parts of this report will be supplied as they are produced for preliminary review.

F 2. Prepare report.

PROJECT SUMMARY

TA 2

TITLE: Short-Haul Communication Services

LEADER: Lockett E. Wood

REQUIREMENTS: The dramatically increasing demand for short-haul communication services capable of handling a wide variety of analog and data information make it important that the government understand the technical, economic, and policy implications of the satisfaction of this demand.

STATEMENT OF WORK: This project will review the demand for short-haul communications services by various groups including public, industry, and government. A review of technical alternatives will be presented and an attempt to predict the direction of this technology will be made. Potential policy issues will be identified. The following are considered major project tasks:

- (1) Survey of technical and policy documentation.
- (2) Establish contacts with professional consulting services, equipment manufacturers, and known or potential users of short-haul equipment.
- (3) Assess present and future requirements for short-haul services and equipment.
- (4) Review technology for implementation of short-haul systems.
- (5) Review specialized needs of particular segments of users.

PROJECT RESULTS: A report which describes the status of short-haul systems and their future, including the economic and policy impact of selected aspects of these systems. Technological alternatives and implication of these alternatives will also be defined. Intermediate results will be made available.

SIDE ISSUES: Impact of short-haul systems on telephone companies. Allocation of microwave spectrum for short-haul applications.

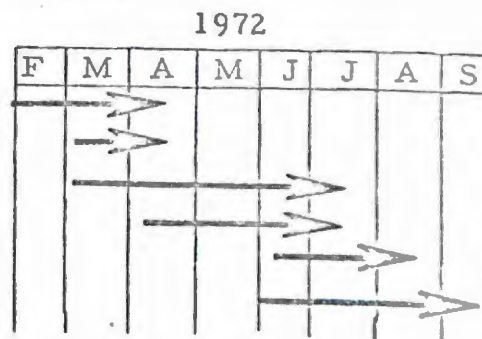
INTERAGENCY ACTIVITY: The Department of Defense and the Atomic Energy Commission have shown particular interest in this area. The Department of Transportation has also identified several applications for these systems.

MANPOWER: Manpower rate will be about 0.7 man/month per month with occasions in excess of this.

BUDGET: Salary and consulting services - \$33,000

MILESTONES:

Documentation Survey
 User and Manufacturer Contacts
 Complete Demand Survey
 Investigate Technol. Alternatives
 Identification of Policy Areas
 Complete Report



March 3, 1972

Mr. Walter R. Hinchman
Office of Telecommunications Policy
Executive Office of the President
Washington, D. C. 20504

Dear Walt,

Enclosed are:

A two page description of the 'method of cataloging spectrum usage/availability, which I wrote to answer Will's question about it.

The work statement for the Metropolitan Spectrum Availability study which contains objectives and philosophy.

I hope these two items will provide enough information to spring the data so that the study can get underway.

Also enclosed is a draft description of the TV technology review, for discussion purposes. I will be happy to discuss it over the phone, by mail, or in person as soon as you or Seb are ready.

Sincerely,

Leslie A. Berry
Policy Support Division

Enclosures

3-1-72:LABerry: DRAFT

DRAFT description of contract:
TV Technology Review

1. Background

There have been many technological developments since commercial video broadcasting became an established industry. Some of these developments are tested and proven, but have not been adopted because of standards, regulations, or inertia; some are now under development; and others are on the near horizon. At the same time, the potential of cable distribution has raised the video expectations of some citizens, while approaching saturation of the color TV market requires entrepreneurial innovation to sustain the consumer market strength. The combination of these different forces puts video broadcasting at the threshold of major change.

In order to ensure consumer choice without inhibiting supplier opportunity or disrupting the established industry, the policy maker should know the technological potential in video distribution, and the impact (benefits and costs) of these possible innovations on the industry and on the consumer.

2. Objective

The purpose of this study is to discover and list potential technological innovations in video distribution; and to determine their impact on both the industry and the consumer.

3. Approach

To ensure a broad and imaginative review, a systems analysis approach will be used. That is, the system function will be defined as delivering video information to the home--including the present entertainment/ advertising/education function but also others such as still presentation of textual material, video shopping, etc. The technologies (systems) available to perform the function will be defined (e.g., present broadcasting, CATV, satellite broadcasting). Then potential technological innovations (in any of these distribution modes) will be listed and analyzed.

Include incremental improvements possible in basic broadcast service (e.g., solid state receivers with sufficient selectivity to eliminate adjacent channel taboos); innovations which would increase consumer choice (e.g., large, flat wall screens, stereo TV, high resolution TV, pocketsize portable receivers, etc.); and those innovations specific to a particular delivery mode (e.g., economical receivers built specifically for CATV reception). The complete list will be developed by reviewing

the scientific and engineering literature and the trade press, and by interviewing principals in the electronic and broadcasting industry, in universities, and in government.

For each item on the list, the analysis will include:

- compatibility with present systems
- time to technical feasibility--both time to proven prototype and time to manufacture in economical quantities
- marginal costs of innovation as a function of market penetration (and time, as technology improves?)--to both industry and consumer.
- marginal benefits to industry and to consumer.

4. Milestones

- list of possible innovations
- estimates to time of technical feasibility
- cost/benefit studies completed
- final report.

OFFICE OF TELECOMMUNICATIONS

March 6, 1972

TA 4

PSD/LAB

TV Technology Review Contract: Potential Contractors

Joe Crumlish

As I told you on the phone this morning, my present first choice for this contract is Alfred F. Barghausen, a member of ITS, Division 1. His extension here is 3384. I have talked extensively with him about the contract. Walt Hinchman and I discussed the possibility, and Walt considers the idea of contracting with ITS acceptable in principle, although he would like other contractors considered. There are certain advantages to having the work done by a government agency, especially when time is short.

Since talking with you, I have talked to Martin Robbins (?spelling uncertain) of the Industrial Economics Division of the Denver Research Institute. (Paul knows Robbins, and has been talking to him about other areas.) He is interested in the project, and they are doing some related studies. I will be meeting with the potential project personnel Wednesday morning and will let you know how it comes out.

A slightly revised work statement of the project is enclosed. This is the version that I sent to Walt Hinchman. I hope to discuss it with him or Seb Lasher this week.

Also enclosed for your information is a work statement entitled, "Satellite engineering cost tradeoff model". This study is not on the OT-OTP approved list; it is one I was working on earlier. The reason I include it is that Walt Hinchman has not rejected it. It is low on his list of priorities, but it is already pretty well set up (with CSC) and could be let in a hurry if necessary. Walt is supposed to let me know definitely about it within a week or so.

Les Berry
Policy Support Division

Enclosures

FILE COPY

SURNAME	DATE	SURNAME	DATE

March 9, 1972

PSD/LAB

Industrial Economics Division, Denver Research Institute

TV Technology review files

The division has an annual budget of about \$750,000, and about 30 employees, half of which are professionals with advanced degrees. They are one of seven divisions of the Denver Research Institute, which has about 400 employees. The Industrial Economics Division has a track record in market studies, technological transfer (for NASA and NSF), technological assessment (for both marketing studies and policy studies of social impact), operations research and (operating) systems design (for local government, including recently, police and other emergency communications). They frequently include engineers or physicists from the other divisions on their research teams.

Acting Division Head is Paul Bortz, ex-applied mathematician, operations researcher, systems analyst and aerospace program manager. Talks like an OR man with a market orientation. Impression is more that of a sharp aerospace program manager than of an academic.

I described the TV technology review study we want done. They were enthusiastic about doing it because they have recently set internal goals expanding their activity in telecommunications and marrying their expertise and experience in technology assessment and marketing to policy studies. Because of this, they would (they said they would) rearrange their schedules to be sure they put together a strong team which would produce a timely and responsive study. I told them that I would call them after I had discussed the study with OTP. In future meetings, I will deal with the designated project leader, so that he will have a clear understanding of the requirements, and I can assess his competency to fulfill them. They will appreciate a high degree of sponsor participation in the study.

Other contact there is Martin Robbins, who has been talking to Paul Polishuk about studies of regional government communication systems.

My overall initial impression is favorable. They appear to be practical, competent, and responsive.

The DRI public information brochure is attached.

FILE COPY
Les Berry

SURNAME	DATE	SURNAME	DATE

3-17-72: Berry: Draft

TV Technology Review

1. Background

There have been many technological developments since commercial video broadcasting became an established industry. Some of these developments are tested and proven technically, but have not been adopted because of standards, regulations, or inertia; some are now under development; and others are on the near horizon. At the same time, the potential of cable distribution has raised the video expectations of some citizens, while approaching saturation of the color TV receiver market requires entrepreneurial innovation to sustain the consumer market strength. The combinations of these different forces provide new opportunities for the video distribution industry, and new challenges to the policy maker.

To develop wise and responsive policies, the policy maker must know the technological potential in video distribution, and the economic and institutional impact of possible technological innovations.

2. Objective

The purpose of this study is to develop a complete list of potential technological innovations in video distribution, and to determine their impact on the industry, the consumer, and on spectrum allocation policy.

3. Approach

To ensure a broad and imaginative review, a service function point of view will be adopted. The system service function will be defined as delivering video information to the home--not only the present entertainment/advertising/education function, but also new services such as still presentation of textual material, video shopping, etc. The technologies (systems) available to perform the function will be determined (e.g., present or augmented over-the-air broadcasting, CATV, satellite

broadcasting). Then potential technological innovations (in any of these distribution modes) will be listed and analyzed. The information will be developed by reviewing the scientific and engineering literature and the trade press, and by interviewing principals in the electronic and broadcasting industry, in universities, and in government.

4. Specific tasks

I. Develop a complete list of potential technological innovations in video distribution. Include incremental improvements possible in basic broadcast service (e.g., advanced technology receivers with sufficient selectivity to eliminate adjacent channel interference); innovations which would increase the range of consumer choice (e.g., large, flat wall screens, stereo TV, pocketsize portable receivers, etc.); and innovations specific to a particular delivery mode (e.g., economical receivers built specifically for CATV reception). Each item on the list should be described in enough detail that a non-expert can understand its differences from the status quo.

II. Estimate when the innovation will be technically feasible. In general, there will be two dates--the date when a laboratory prototype will be tested and approved, and the date when the device can be manufactured in economical quantities. For some inventions, it is possible that both of these dates have already passed--but regulations, inertia, or insufficient market demand have prevented implementation.

III. Evaluate the market for those innovations which are technically feasible before 1980. Determine the cost of the innovation to the supplier and the consumer--as an increment to the cost of the present (or some base) service if possible. The costs will presumably depend on the size of the market, so supply and demand curves should be estimated if possible. If costs will change significantly with time because of improving technology, this change should be estimated.

IV. Determine the extent to which each innovation is compatible with the present system. What are the transition costs?

V. Determine the radio spectrum implications of each item on the list. Implications include both the change in amount of spectrum (bandwidth) required, or denied to others; and the nominal frequency of the required band.

VI. Identify any externalities associated with items on the list.

5. Milestones

Each milestone except the last will consist of an informal working paper containing the specified information.

	Information	Due at contract beginning plus
I.	List of possible technological innovations	one month
II.	Dates of technical feasibility	two months
III.	System compatibility	three months
IV.	Market evaluation studies	four months
V.	Spectrum implications	five months
VI.	Externalities	five months
VII.	Final report	six months