The Goose Gazette

The newsletter of the *Wild Goose Association,*
the international **loran** radionavigation forum.

Volume 90-4 - Special Fall Issue, 1990

FAA Program Office Issues Loran Operational Implementation Plan

The FAA Loran-C Program Office issued its draft Implementation Plan for Loran-C during November, 1990, and the Wild Goose Association provides this *Gazette* issue as a service to the loran community. Wide circulation is desired; comments/suggestions/recommendations are welcome.

Comments should be sent in writing to:

Loran-C Implementation Plan, AND-30
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

LORAN-C OPERATIONAL IMPLEMENTATION PLAN

1. INTRODUCTION

Loran-C was developed to provide the Department of Defense with a radio navigation capability having longer range and greater accuracy than its predecessor, Loran-A. It was subsequently selected as the U.S. Government radio navigation system for civil marine use in the U.S. coastal areas. Because of it's ease of use, low cost receivers and high navigation accuracy, the Loran system rapidly gained popularity with general aviation and air taxi operators.

The Loran-C navigation system is presently classified as a supplemental aid to Instrument Flight Rule (IFR) enroute and terminal navigation when used within the National Airspace System (NAS). This means that a 'sole means' navigation aid (i.e. VOR/DME) must be installed and operational in an aircraft until the Loran system is declared sole-means capable.

1.1 SYSTEM CONSIDERATIONS/ASSUMPTIONS

The Loran system consists of three principal components: the transmitters, the independent signal monitors and the airborne receivers:

- o Acquisition, maintenance and operation of the transmitters is the responsibility of the United States Coast Guard (USCG), although the FAA has participated in funding and certain of the implementation actions related to the Mid-Continent transmitters and improvement of coverage in South Central Alaska.

- o Acquisition, maintenance and operation of the independent Loran signal monitors is the responsibility of the Federal Aviation Administration (FAA).

- o Production of qualified IFR Loran receivers, antennas and displays is the responsibility of the equipment manufacturers.

- o Acquisition, installation and maintenance of qualified airborne equipment (receivers, antennas, cabling, displays, etc.) is the responsibility of aircraft owners and operators.

- o Establishment of receiver performance specifications, equipment/installation checkout procedures and operational procedures are the responsibility of the FAA.

- o Approval of certification of Loran procedures and their operational use is the responsibility of the FAA.

1.2 OBJECTIVES

The objectives of the joint FAA/US Coast Guard Loran-C program are:

- o Complete Loran-C coverage of the United States.

- o Enhance the Loran-C system so that it may be safely used as a nonprecision approach aid.

- o Provide instrumentation, for use by DOT personnel, which will verify the quality of Loran signals at airports selected for nonprecision approach procedures.

This plan addresses the steps necessary to implement Loran-C area navigation as an acceptable means of en route, terminal and approach navigation, under instrument meteorological conditions, in all areas of the United States. It discusses:

- o Loran-C transmitters
- o Independent Loran-C signal monitors
- o Public Nonprecision Instrument Approaches
- o Loran-C avionics for certifiable instrument approach procedures

2. BACKGROUND

Loran-C transmitters have provided a navigation guidance capability in the coastal areas and Great Lakes regions of the continental United States and in Alaska and Hawaii for many years. These transmitters are operated and maintained by the USCG. In January 1987, a program was initiated to procure four additional Loran-C transmitters to extend this capability throughout the entire United States, by filling the "Mid-Continent gap." This program is currently underway and is expected to reach completion by April 1991.

Serious evaluation of the civil aviation use of Loran area navigation began in 1972 with a joint DOT/TSC/FAA program. Several configurations of area navigation equipment were evaluated by the FAA's Technical Center and the Transportation Systems Center. A significant finding was the capability of Loran to provide very accurate guidance to a series of simulated heliports located around the island of Manhattan.

In 1974, the USCG collaborated with the Agency of Transportation of the State of Vermont to establish the feasibility of utilizing Loran-C area navigation for operations into mountain bound airports within the state. The FAA participated in the evaluation and then assisted in organizing a two year long test and evaluation program utilizing equipment better suited to general aviation operations.

Following the two year test program in Vermont (1979-80), the present program to expand the use of Loran-C for instrument approach guidance was initiated in 1985. The FAA Administrator formally approved a Loran-C nonprecision approach demonstration project called the Early Implementation Program (EIP). With this project, the FAA undertook a cooperative effort with the National Association of State Aviation Officials (NASAO), various aviation manufacturers and user groups. The objective of the effort was to fully integrate the use of Loran-C into the NAS by authorizing the use of the Loran-C propagated navigation signals as a basis for conducting standard instrument approach procedures (SIAP's).

During the last five years, sixteen Loran-C nonprecision instrument approaches have been commissioned for private use under special Letters of Authorization. This activity included the development and use of special real time signal monitors, the publication of special use nonprecision approach procedures, the certification of Loran avionics equipment and the training of FAA, State and user personnel. The special real time signal monitors were used to insure the status of the Loran signal during an instrument approach.

Automatic signal "Blink" will be implemented at all Loran-C transmitter sites that serve the NAS. Initiation of automatic Blink will occur at secondary transmitter stations based on signal and time measurements and it will occur almost instantaneously. The time error threshold for Automatic Blink will be 500 nanoseconds. Currently, manual initiation of Blink is at a time error threshold of 100 nanoseconds.

Before Loran-C can be used as a landing aid at a specific location, on site Loran-C monitors must be installed and time difference data collected and analyzed. This time difference data is used for preparing the 56 day local calibration corrections which appear with the SIAP charts. A data collection and analysis time period of approximately six months is required before sufficient monitor information is available to support a procedure. Currently, delivery and installation of the permanent Loran-C aviation monitor system is nearing completion. NASAO members have provided to the FAA listings of its recommendations for the top 10 airports to receive Loran-C SIAP's in each state.

The FAA has been directed by the Administrator to insure that all required rules, regulations, circulars, directives, and policies have been issued for the establishment of the initial Loran-C nonprecision SIAP's. The Early Implementation Program is thus considered to have satisfied its objectives. The next step is to make the system and its procedures available to the public.

3. IMPLEMENTATION PLAN

Public use of Loran-C nonprecision approaches throughout the United States is contingent upon the availability of automatic blink, independent Loran monitors, FAA certified airborne receivers, publication of approach procedures and the completion of the Mid-Continent Loran transmitters.

Several separate parts of the Loran-C program must be completed to achieve program objectives:

- o Completion of new Loran-C transmitters and modification of existing transmitters.
- o Development of local area monitor receivers.
- o Development and approval of Loran-C public approach procedures.
- o Production and certification of Loran-C instrument approach avionics.

3.1. Loran-C Ground Equipment

3.1.1 Mid-Continent Loran-C Transmitters

Four new Loran-C transmitters are being installed in the Mid-Continental United States and joined with existing transmitters to form two new chains: The South Central U.S. Chain (SOCUS) and the North Central U.S. Chain (NOCUS). The SOCUS is expected to be operational in December 1990. The NOCUS is expected to be operational in April 1991. The schedule for upgrade and installation of these transmitters is shown in Appendix 1.

This effort is being carried out by the U.S. Coast Guard and is currently on schedule.

3.1.2 Automatic Blink

To provide the integrity and safety necessary for the use of Loran-C as an approach aid, it is necessary to install automatic aviation blink capability within the Loran-C transmitters. This is to provide a 'blink' modulation of the basic Loran-C signal which will be detected and automatically displayed by airborne receivers. Automatic blink will provide warning for transmitted Loran-C signals which are out of tolerance for aviation use. The FAA requires that navigation aids used for IFR operations must be capable of notifying the aviator of performance which is out of tolerance. In the case of an approach aid, the warning must be made available within 10 seconds of an out of tolerance condition.

The Center for Navigation, the Volpe Transportation Systems Center (TSC) is responsible for the implementation of an automatic aviation blink capability in cooperation with the USCG. They plan to implement automatic aviation blink by installing software and hardware modifications to the existing Remote Operating System (ROS) equipment (computer control of watchstanding functions) at Loran-C transmitting stations.

To implement the system, the TSC will take the following actions:

- Provide FAA an implementation schedule for automatic blink.
- Review Loran-C signal monitor data for abnormalities to determine operational policy and additional modifications that may be required.
- Design, fabricate, test and evaluate the hardware and software for the automatic blink capability.
- Install, test and certify the acceptability of the automatic aviation blink capability at each transmitter.

Until the installation and certification of the automatic blink capability is completed, the FAA will assure the Loran-C signal quality at a limited number of airports. This will be performed by using real-time monitors within 90 nautical miles (nm) of each Loran-C instrument approach site. The monitors have Green/Red lights which advise Air Traffic Control personnel of the acceptability of the local Loran signal behavior. The personnel will clear a pilot for such an approach only when the associated monitor shows the Loran-C signal to be within tolerance. The pilot must therefore remain in continuous radio contact with the monitoring controller while making an approach. This interim quality assurance method was developed and tested during the Early Implementation Program.

3.1.3 Independent Loran-C Local Area Monitors

Independent Loran-C signal monitors will be located in existing VOR facilities and will perform three functions:

(1) Constantly monitor the quality of the Loran signal in space and provide an alarm when signals are not within tolerances required to support Loran instrument approaches.

(2) Provide the necessary information for Notice to Airmen (NOTAM) issuance by the FAA when a persistent signal outage occurs.

(3) Collect data on the Loran signal characteristics, store these data and permit its transmission to the FAA for preparation of periodic approach data updates (TD corrections).

The FAA has contracted to receive a total of 212 monitors. Of these, 196 were to be deployed according to the schedule shown in Appendix 2. Physical installations of them will be completed in January 1991. A run-in period of six months for each monitor will assure operational acceptability of the individual units and accumulate a baseline for local Loran performance data. The 16 remaining monitors will be used for training and as replacement units.

All Loran-C monitors are expected to be operational by 1991 however, they presently lack an essential interface board which is necessary to provide automated communication between the monitors and the FAA Remote Maintenance Monitor System. They will not be declared operational until the interface cards are deployed and six months of calibration data is collected.

The development schedule for the interface card is shown in Appendix 3. All monitors are expected to be fully operational, as integral elements of the NAS system, by the end of 1991.

3.1.4 Loran-C Site Evaluation System (LSES)

A requirement for establishing a nonprecision instrument approach to an airfield is the measurement of local Loran signal performance data. This is used to establish both the integrity of the signal and nominal information about the behavior of Loran signals at that particular location.

Twelve LSES systems are under procurement at this time. The first unit is scheduled for delivery in June 1991. The last unit is scheduled for delivery in May 1992.

A formal Operator's Training Program is to be available by March 1991, with the first class of operators scheduled to begin training in April 1991.

3.2 Approach Procedures

The installation of the transmitters, monitors, and automatic blink will provide the technical capability to approve Loran-C SIAP's at runways throughout the United States which meet applicable FAA terminal area procedures (TERPS) criteria.

The approval process is a complex one involving the FAA, the States and individual airports. The FAA plans to approve the procedures in stages:

I. Convert selected EIP procedures to public use.

II. Design and publish approximately 20 new procedures based on existing EIP signal monitors.

III. Begin work on the remaining 480 approaches nominated by the National Association of State Aviation Officials.

IV. Continue to approve approach procedures for qualified runways.

There are currently about 5,000 operational, public use instrument approach procedures in the 'nonprecision' category in the U.S. Loran-C approaches are described as nonprecision approaches because no electronic glide path is provided; the vertical flight path limits are specified by the air traffic control (ATC) assigned initial approach altitude, and the minimum descent altitude (MDA). The FAA will continue to approve additional Loran-C public approaches in accordance with published FAA guidelines.

3.2.1 Stage I: Convert EIP Site Procedures to Public Use

The FAA Administrator publicly announced that the first public use Loran-C instrument approaches would be established by November 15, 1990. They will be FAR Part 97 SIAP's and will be implemented at six of the 16 FAA EIP sites. A list of the six sites is shown in Appendix 4.

These sites were chosen because they had previously been in the Loran-C EIP. Therefore, such issues as Loran-C monitor proximity, signal quality and environmental impact has already been addressed. These sites have the means of ensuring the necessary integrity to support a nonprecision public approach.

Responsibilities for producing the Loran-C SIAP's are shown below. A schedule is shown in Appendix 5.

AND-30: [FAA Loran Program Office]

1. Take overall responsibility for the development of the approach procedures, including project coordination and schedule achievement.

2. Provide oversight, guidance and accountability for the project.

3. Establish and maintain a checklist of actions required to initiate development of a procedure.

4. Deliver an information package to NASAO, advising the group of actions required to have a procedure approved.

5. Manage the independent signal monitor and support contracts.

Regional AFS-220's: [Procedures Specialists]

1. Begin the standard development process for approach procedures at the selected airfields.

2. Submit completed packages to AVN-270 for formulation.

THE WILD GOOSE ASSOCIATION
P. O. Box 556
Bedford, Massachusetts 01730

(516) 862-7500

AVN-270: [Procedures Development]

1. Develop Loran-C SIAP's using TERPS chapter 15 criteria.

2. Coordinate with AVN-230 for flight inspection of the new approaches.

3. Coordinate with AVN-220 for application standardization.

AVN-250: [Data Branch]

1. Work with TSC (DTS-502) to obtain Loran Time Difference (TD) correction values for publication as 56 day calibration values.

2. Provide AVN-230 with flight inspection values.

3. Submit time difference correction values to the National Flight Data Center for publication (ATO-250).

AVN-230: [Flight Inspection Ops.]

1. Coordinate all routine, periodic flight inspection activities.

AVN-550: [Flt. Inspection Policy]

1. Update Loran-C flight inspection policy and standards as requirements change.

AFS-400: [Flt. Standards Tech. Programs]

1. Update the Airman's Information Manual (AIM) to reflect FAA support of Loran-C.

2. Distribute a mass-mailing to the aviation community advising when, where and how Loran-C can be used for nonprecision approaches.

3. Submit descriptive information through AND-30 to the International Civil Aviation Organization (ICAO), to update the Annex 10 data on Loran-C.

AFS-420: [Flight Procedures Standards]

1. Maintain a master location list for Loran-C SIAP's until procedure development is well underway.

ATO-1: [Air Traffic]

1. Review Loran-C integrity requirements, signal monitoring, and tower operations.

2. Activate and utilize a Loran-C signal monitor status NOTAM procedure and provide monitor status information.

AXR-1: [Exec. Dir. for Regulation]

1. Coordinate with AXD-1 to assure funding for the signal monitors and TD data gathering.

2. Coordinate with AXO-1 to assure ATC signal monitoring.

3.2.2 Stage II: Develop 20 New Public Use Instrument Approaches

The second stage of Loran-C SIAP development is to implement SIAP's at 20 new locations in calendar year 1991. A list of 20 potential locations, recommended by various states and NASAO, is given in Appendix 6. Final site selection is subject to verification of the Loran-C signal quality at each site. The procedures for these sites will be developed in 1991. Actions needed to develop and implement these procedures are shown in Appendix 7.

These 20 procedures will be developed before the automatic blink capability is available and before the local area monitors are fully operational. Therefore, sites for stage II procedure development are limited to those locations that have access to EIP monitors with signal status annunciators, and real time communications through the appropriate air traffic facility, to the pilot.

TSC has contracted for additional EIP monitors, to permit flexibility during final site selection for stage II approach procedures.

3.2.3 Stage III: Develop Procedures at 480 NASAO-Recommended Sites

After publication of the 20 procedures identified in stage II, the FAA will continue to publish procedures at selected sites throughout 1991-1992. Sites will be selected at which sufficient integrity can be provided with EIP monitors. These sites will be selected from the NASAO-recommended list of 500 Loran-C sites (480 remaining).

Upon operation of automatic aviation blink (tentatively scheduled for June 1992) and the installation of interface cards in all independent Loran-C monitors (scheduled for July 1991), the FAA will begin to publish up to 275 Loran-C approaches per year. Approaches will be published as requests are received from the regions. A schedule for completion of Stage III is shown in Appendix 8.

3.2.4 Other SIAP'S Approval Issues

Some other issues remain that impact upon Loran-C approach approval. These issues are now being addressed within the FAA.

o **Power Line Carrier (PLC) Interference.** Tests conducted at the FAA Technical Center have indicated that power line radio frequency carrier systems used to control system electrical loads and for private communications may interfere with the Loran-C signal. The carrier systems use radio frequencies in and near the Loran frequency band. This interference could occur near airports where aircraft are flying at low altitudes parallel to power lines. There are several actions needed to address this problem:

- ACT-210 [FAA Technical Center] has provided a data base of potential interference sources.

- AFS-420 to chair a working group to determine corrective or protective actions and to establish procedures to deal with the problem in the interim.

- AND-30, ASM-500 [FAA Spectrum Management], AFS-420 to negotiate with electric companies to change to non-interfering frequencies.

- ASM-500 to work for FCC restriction of the 90-120 Kilohertz band to navigation only, in contrast to the present noninterference permission granted to PLC users.

o **Publication of Loran-C Section of TERPS Chapter 15.** Criteria for Loran-C TERPS is published in Chapter 15 of the TERPS document.

o **Potential Variation in Loran-C Monitor Range.** Studies have been conducted in four areas of the United States to determine the effective range of the Loran-C monitors. Results indicated that the monitor range limit is 90 miles. However, the studies were not conducted in areas with large mountain ranges (e.g., Rocky Mountains). Concerns exist about whether TD data can be accurately forecast in mountainous areas from monitors 90 miles apart. The concerns will be resolved in the normal data collection and correlation analysis which is to be done with operational monitors in the mountain areas.

o **After-Accident Check Procedures.** The established FAA after- accident procedures, in general, apply to Loran-C just as for any other navigation system. The main differences are:

a. The need for immediate notification to the Coast Guard, by the FAA, when an accident with potential Loran involvement occurs, and inclusion of a Coast Guard report on the chain/transmitter status in the after-accident report.

b. The need for FAA Airways Facilities to include the applicable Loran-C local area monitor in recertification testing activities after an accident.

c. The requirement to obtain the local area monitor TD correction input and output data for the Loran approach facility involved, and the inclusion of this data in the after-accident report.

The applicable FAA orders are being reviewed and necessary modifications will be recommended. The FAA will maintain a letter of agreement with the Coast Guard which implements a notification and response procedure.

o **Loran-C Operations After a Cockpit Communications Radio Failure.** Federal Aviation Regulations (FAR's) provide guidance for pilot communications if radio failure occurs. Investigation is underway to identify any necessary changes in the use of Loran instrument approaches under such conditions.

o **Periodic Receiver Check Procedures.** The need for Loran-C receiver check procedures, similar to the required 30 day VOR receiver check for IFR use, is being investigated.

o **Size of the Protected Zone Around Loran-C Transmitters.** As an initial criterion, a 30 nm circle around each transmitter was established. This was to prevent receiver operation during approach procedures where signal strengths exceed the Technical Standard Order (TSO) test limit of +110 dB(uV/m). While some receivers may work well with such high signal levels, TSO testing does not assure this.

Subsequent measurements have shown that the 30 nm circle is too small for the very high power transmitters, and too large for the lower powered transmitters. It is planned to modify the 30 nm criterion to provide a protection circle which depends on the transmitter power.

Wild Goose Association: Charter

"The Wild Goose Association is a professional organization of individuals and organizations having an interest in loran radionavigation and who wish to foster and preserve the art of loran. It is named after the majestic bird that navigates thousands of miles with unerring accuracy. Its membership represents many interests including those of planners, promoters, designers and users of loran equipment throughout the world."

3.3 Approval of Loran-C Approach Avionics

There are currently no FAA-approved Loran-C nonprecision approach avionics available for use in the United States. Many actions are necessary to complete the avionics approval. They are listed below:

Airport Check Points for Receivers

- Define Requirements
- Develop Standard

Documents Review

- Radio Technical Commission for Aeronautics (RTCA) Minimum Operational Performance Standards (MOPS)
- Technical Standards Order

Airborne Data Base Update

- Define Requirements
- Size update data base problem
- Define long-term FAA responsibilities
- Review update concepts

FAA tests of new avionics before approval for IFR use

- Create rule requiring FAA tests of avionics
- Development of standard tests
- Establish FAA designated test facility

3.4 User Education and Information

Loran-C users and those affected by its implementation require information about program status, schedules, and regulations governing the use of the system. To facilitate this process, several efforts will be undertaken to release as much information as possible in a timely manner. Actions to be undertaken are shown below:

Action	Point of Contact
Complete and release Loran-C film for pilots	AND-30 [Loran-C Program Office]
Conduct Loran-C User Forum	AND-30
Publish Loran-C Newsletter	AND-30
Publish Receiver Information Sheet	AFS-410 [Flight Standards]
Release NOTAM	ATO-252 [Air Traffic Operations]
Advisory Circular	AFS-400 [Flight Standards]

APPENDIX 1

MID-CONTINENT TRANSMITTER EXPANSION SCHEDULE

South Central Chain

BOISE CITY, OKLAHOMA **
DEC 1990

GILLETTE, WYOMING **
APR 1991

SEARCHLIGHT, NEVADA
JUL 1990

RAYMONDVILLE, TEXAS
FEB 1990

GRANGEVILLE, LOUISIANA
APR 1990

LAS CRUCES, NEW MEXICO **

**SOUTH CENTRAL U.S. CHAIN OPERATIONAL*
JAN 1991**

North Central Chain

BAUDETTE, MINNESOTA
JUL 1990

WILLIAMS LAKE, BRITISH COLUMBIA
TBD

HAVRE, MONTANA **
APR 1991

**NORTH CENTRAL U.S. CHAIN OPERATIONAL
APR 1991**

** NEW LORAN-C TRANSMITTER STATION. OTHER STATIONS ARE UNDERGOING DUAL RATING MODIFICATIONS

* EXCEPT LAS CRUCES, NM, WHICH WILL BE ADDED IN 1991

APPENDIX 2: APR 1991

LORAN-C MONITOR INSTALLATION SCHEDULE

[This schedule is not presented here for brevity; all NFOLDS data-collection monitors are scheduled for installation before the end of 1990. The full listing of monitors is available from the FAA Loran-C Program Office Ed]

APPENDIX 3

LORAN-C MONITORS

INTERFACE CARD DEVELOPMENT SCHEDULE

Interface card delivered to first operational site	2/91
Interface card delivered to last operational site	6/91
All sites operational	1/92

Note: Six months calibration data required per site before systems become operational

APPENDIX 4

EIP SITES FOR IMMEDIATE LORAN-C NONPRECISION PUBLIC APPROACH PROCEDURE DEVELOPMENT

Burlington International (BTV), Burlington, VT, runways 15 and 33
Columbus/Ohio State University (OSU), Columbus, OH, runways 27L and 9R
New Orleans/Lakefront (NEW), New Orleans LA, runway 18R
Orlando Executive (ORL), Orlando, FL, runways 7 and 25
Portland International (PDX), Portland, OR, runways 10R and 28R
Venice/Point-in-Space, Venice, LA

APPENDIX 5

ACTION SCHEDULE FOR FIRST TEN LORAN-C SIAP'S AT EIP SITES

Action	FAA Point of Contact	Date
Checklist of actions to institute procedures	AND-30	8/1-8/15
Guidance to affected FAA elements	AND-30	8/1-8/15
Regional procedure packages developed	AFS-220	8/15-9/15
Loran-C TD Values determined	AVN-250	8/15-9/10
Procedure development	AVN-270	7/27-9/6
Flight Inspection	AVN-230	10/1-11/1
Educational material issued	AFS-400	10/15
Publication	Nat'l Ocean Service	11/15

APPENDIX 6

POTENTIAL SITES FOR 20 NEW LORAN-C NONPRECISION APPROACHES

Bartow, FL (BOW)
Michigan City, IN (MGC)
Houma, LA (HUM)
North Adams, MA (2B6)
Frederick, MD (FDK)
Carroll Co., Westminster, MD (W54)
Holland-Tulip City, MI (C19)
Howell-Livingston Co., MI (3HE)
Princeton, NJ (39N)
Burlington Co., NJ (7MY)
Columbia Co., NY (1B1)
Union Co., Marysville, OH (I78)
Aurora State, OR (3S2)
Wings, PA (N67)
Warrenton-Fauquier, VA (W66)
Leesburg, VA (JYO)
Rutland, VT - 01 (RUT)
Toledo, WA (TDO)
Kelso-Longview, WA (KLS)
Kalamazoo, MI (AZO) (tentative site)

News Item: Loran-C User Forum Coming

On May 15, 1991, the Wild Goose Association will host, in cooperation with the **U. S. Department of Transportation**, the **FAA** and the **Coast Guard**, a Loran-C Mid-Continent User Forum. The Forum will be held in El Paso, TX.

Attendance will be by pre-registration only, and more information will be forthcoming in later issues of the *Gazette.*

Comments?

FAA solicits reader comment on the Loran-C Implementation Plan. Write to:

Loran-C Implementation Plan; AND-30
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

APPENDIX 7

ACTION SCHEDULE FOR 20 NEW LORAN-C APPROACHES IN 1991

Action	POC	Begin	End
Determine if EIP monitor integrity information is available at recommended sites (Appendix 6).	TSC (DTS-502)	8/90	9/30/90
Determine final list of sites.	AND-30	10/1/90	10/15/90
Checklist of actions to institute procedures	AND-30	8/15/90	10/15/90
Guidance to affected FAA elements	AND-30		10/15/90
Airport Signal Measurements	(TSC-DTS-52)		?
Regional procedure packages developed	AFS-220	11/1/90	12/15/90
TD Values determined	AVN-250	1/19/91	4/1/91
Procedure development	AVN-270	1/1/91	4/1/91
Flight Inspection	AVN-230	4/15/91	6/15/91
Educational material issued	AFS-400		by 1991
Publication	National Oceanic Service		1991

APPENDIX 8

SCHEDULE FOR PUBLICATION OF STAGE III LORAN-C STANDARD INSTRUMENT APPROACH PROCEDURES (SIAP'S)

Milestone	Date
1. Interface cards operational at all Loran-C monitors	7/91
2. 30 Approaches published at selected sites at which manual aviation blink is available	9/91-6/92
3. Automatic aviation blink available nationwide	7/92
4. Remaining 450 NASAO-recommended approaches published	7/92-4/94

This is the end of the complete text of the FAA Loran-C Implementation Plan. Ed.

The Goose Gazette

The Goose Gazette is an official publication of The Wild Goose Association (WGA). Period of publication is quarterly, with cutoff dates of 1 March for the Winter issue, 1 June for the Spring issue, 1 September for the Summer issue and 1 December for the Fall issue. Special issues are released as conditions warrant.

WGA members and other interested parties are encouraged to submit material for publication. Materials should be sent directly to the Editor. All other correspondence for the WGA should be addressed to the Association at:

Wild Goose Association
P. O. Box 556
Bedford, Massachusetts 01730
(516) 862-7500

Editor:

Robert W. Lilley
20 Woodside Drive
Athens, Ohio 45701

(614) 592-1282

Publication Office:

Ohio University
Avionics Engineering Center
Athens, Ohio 45701

(614) 593-1514 (voice)
(614) 593-1604 (fax)

Printed by:

Messenger Publication Services
Athens, Ohio 45701

The Loran-C Expansion

LtJG Roger D. Barnett, USCG

Loran (LOng RAnge Navigation) has been around since the mid- 1940s in one form or another as a navigation requirement of the Department of Defense (DoD). In recent years, there has been less DoD interest in Loran-C. However, there is a strong civil interest in continuing the operations of Loran-C chains worldwide. The list of Loran-C uses includes aviation, marine, vessel and vehicle tracking services, and precise time. The 1988 Federal Radionavigation Plan (FRP) estimates there are over 530,000 users of Loran-C.

A major shift in this previous maritime use system occurred when the Federal Aviation Administration (FAA) decided to incorporate Loran-C as an authorized aid in enroute navigation and non-precision approaches. This will allow the pilot of an aircraft to fly from one point to another point directly, instead of flying along crowded routes. By flying point-to-point, the pilot can enhance the safety of others in the air and can save time and fuel. The FRP estimates that there are over 84,000 Loran-C equipped aircraft in the U.S. By encouraging the use of Loran-C, the FAA expects to reduce the number of aircraft flying in the present routes. The use of Loran-C in a non-precision approach will allow the pilot to fly to within a minimum distance and altitude from a certified airport. This use of Loran-C will allow access to about 4,000 additional airports when the pilot usually would not be permitted because of weather or visibility.

In 1985 the FAA and USCG signed an agreement to expand Loran- C coverage in the Central U.S. The FAA is providing funding under the National Airspace System Plan to improve airway safety. The USCG is responsible for the construction, operation, and maintenance of the addition to the Loran-C system. As the agency responsible for Loran-C, the USCG is working with the FAA to construct two new Loran-C chains. The coverage gained from these two new chains will close the present "gap" in coverage in the mid-continental U.S. This also will expand the coverage in the Western Great Lakes and the Gulf of Mexico around Houston, Texas.

These two new chains will be the North Central U.S. (NOCUS) and South Central U.S. (SOCUS) Loran-C chains. The group repetition rates for these chains are 82,900 microseconds for NOCUS and 96,100 microseconds for SOCUS. These chains are being established by constructing four new transmitter stations. The new stations will be located in Havre, Montana; Gillette, Wyoming; Boise City, Oklahoma; and Las Cruces, New Mexico. We have also dual-rated five existing stations. When a station is dual-rated it can transmit in two different chains. These five dual-rated stations are located in Raymondville, TX; Grangeville, LA; Searchlight, NV; Baudette MN; and Williams Lake, Canada.

Each of these new stations will have a four or five person crew to maintain its Loran-C transmitting equipment; all stations will have solid state transmitters installed.

The two new chains operational dates are; The SOCUS chain, excluding Las Cruces, will be operational in December 1990. The Las Cruces station will be added to the SOCUS chain in April 1991. The NOCUS chain will become operational in April 1991.

The FAA has indicated that they desire to have Loran-C operations into the next century. The Coast Guard plans to continue Loran-C operations in North America through the next century.

Several nations are completing plans to incorporate or expand Loran-C as their long range navigation system. These nations include: Canada, India, Britain, Venuseula, The Republic of Korea, Saudi Arabia, and numerous European countries. Also, the Soviet Union operates a system called "Chayka" that is compatible with most Loran-C receivers. In 1986, the Soviets and the Coast Guard signed an agreement to create a joint Loran/Chayka chain in the Bering Sea between Alaska and the Soviet Union. This "Bering Sea chain" expected to be completed in 1991.

Additional information on Loran and other radionavigation systems is provided in the FRP. The 1988 edition of the FRP is current, but the 1990 edition of the FRP is scheduled for distribution in December 1990.

Status of the Loran-C Mid-Continent Expansion Project (November, 1990)

The Coast Guard and the Federal Aviation Administration (FAA) are establishing two new Loran-C chains to complete Loran-C coverage over the mid-continental area of the United States. This expanded coverage will allow aircraft to use Loran-C for enroute navigation and non-precision approach purposes. Also, marine, terrestrial, and other users of the Loran-C system will gain expanded coverage.

Two new mid-continent chains will consist of four new transmitting stations. Two of these will be dual-rated.

(Continued on page 11)

The new transmitting stations will use 400 kilowatt (kW) solid-state transmitters (except for Boise City, OK, which will use an 800 kW transmitter). Each of these stations will be controlled by the remote operating system in an unattended mode.

The two new Loran-C chains are the North Central U.S. (NOCUS) and South Central (SOCUS) chains. Estimated operational dates for the new chains are; late December 1990, for SOCUS (operations at Las Cruces will be added in April 1991), and April 1991 for NOCUS). The station at Boise City, OK, is also dual-rated as the (Z) secondary to the Great Lakes chain rate 8970, so that its coverage will extend into the Central U.S.; this addition is expected to be operational in April 1991.

The Coast Guard has accepted three of four new transmitter stations. The electronics installations are underway (Boise City is complete). The stations will use 700 foot Loran-C towers. The station positions, coding delays (CD), and emission delays (ED) are shown in the table on page 15.

Positions are in World Geodetic System 84 (WGS 84) at an achieved accuracy of 1 meter. Coding delays and emission delays are in microseconds (usec).

The dual-rating of the five existing stations is complete (Searchlight, Raymondville, Grangeville, Baudette, and Williams Lake, Canada). Dual-rated operation (excluding Williams Lake) of these stations on either 9610 or 8290 began in early 1990. They are transmitting signals, as their previously assigned function, on the selected rates. These 9610 and 8290 signals are for test purposes and are subject to sudden shifts and changes as the stations involved use them for training and testing. DO NOT use these test signals for any navigational or timing purpose. The standard signals are operating normally and are fully usable for navigation and timing. If any interference or difficulty is experienced with the 7980, 8970, or 9940 signals, please contact the Coordinator of Chain Operations;

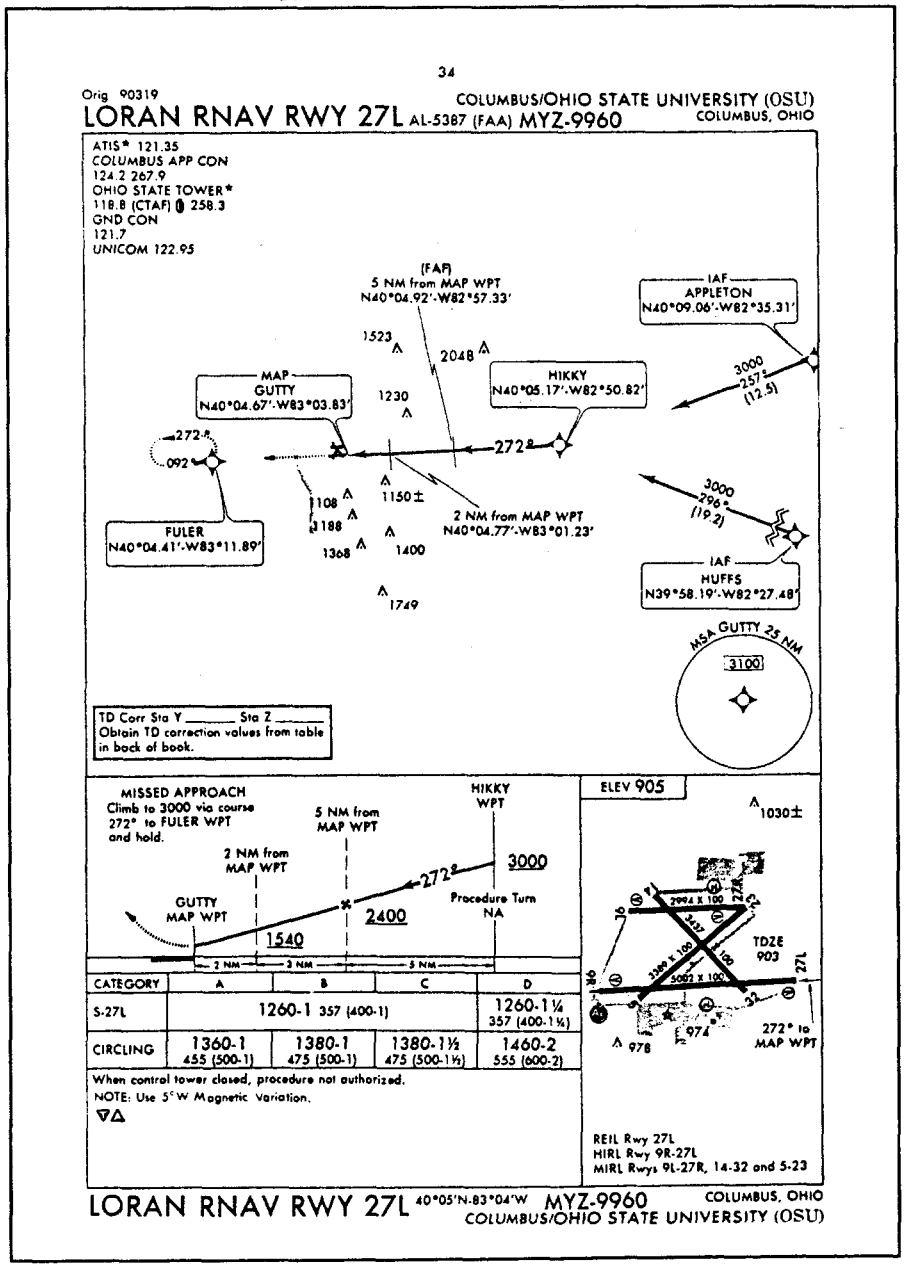
Southeast U.S. (7980)
South Central U.S. (9610)
(904) 569-2223

U.S. West Coast (9940)
North Central U.S. (8290)
(707) 987-2911

Great Lakes (8970)
Northeast U.S. (9960)
(607) 869-1334

Here's an example of what the talkin' is about.

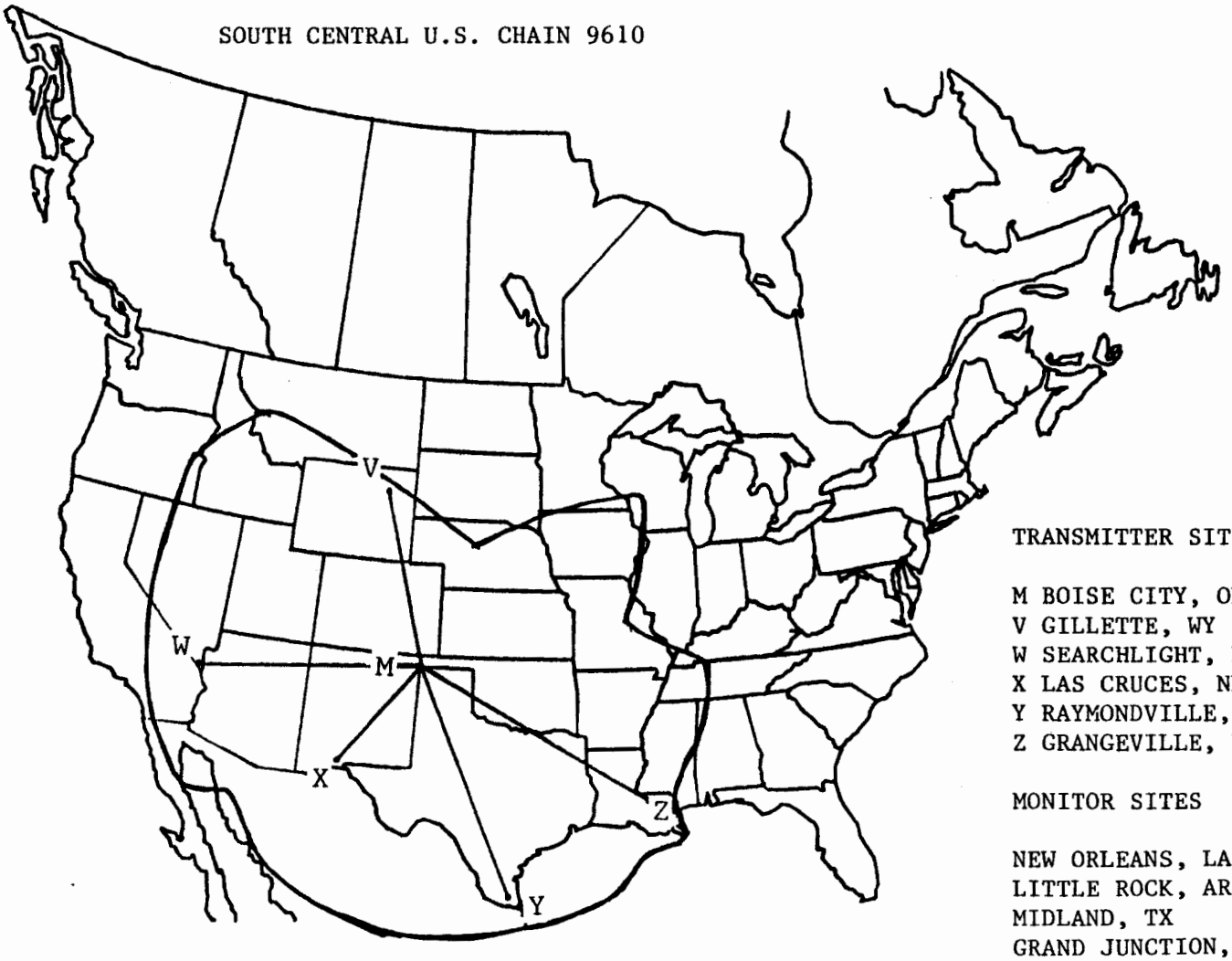
This copy not to be used for navigation



CATEGORY	A	B	C	D
S-27L	1260-1 357 (400-1)			1260-1¼ 357 (400-1¼)
CIRCLING	1360-1 455 (500-1)	1380-1 475 (500-1)	1380-1½ 475 (500-1½)	1460-2 555 (600-2)

When control tower closed, procedure not authorized.
NOTE: Use 5°W Magnetic Variation.

SOUTH CENTRAL U.S. CHAIN 9610

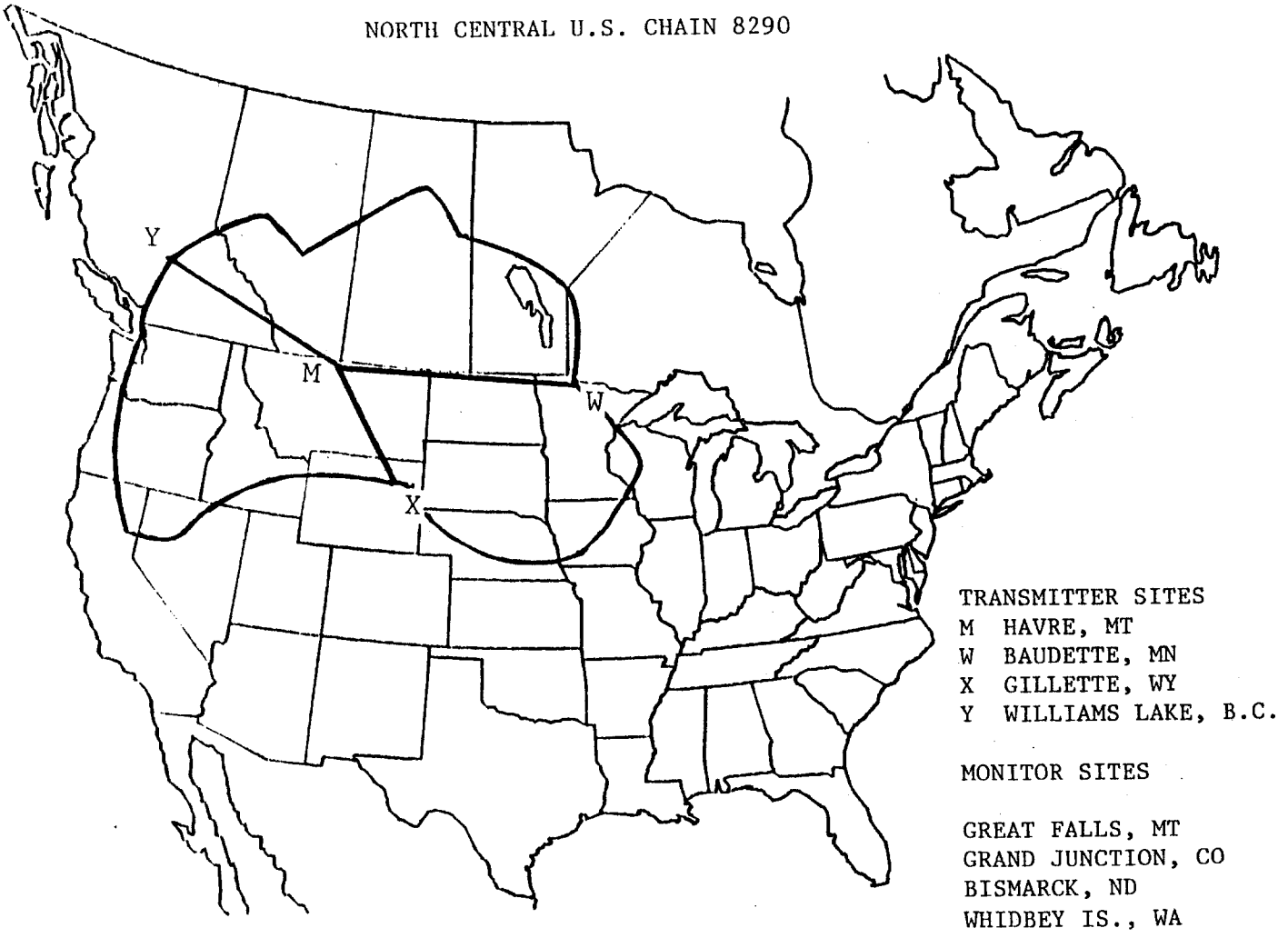


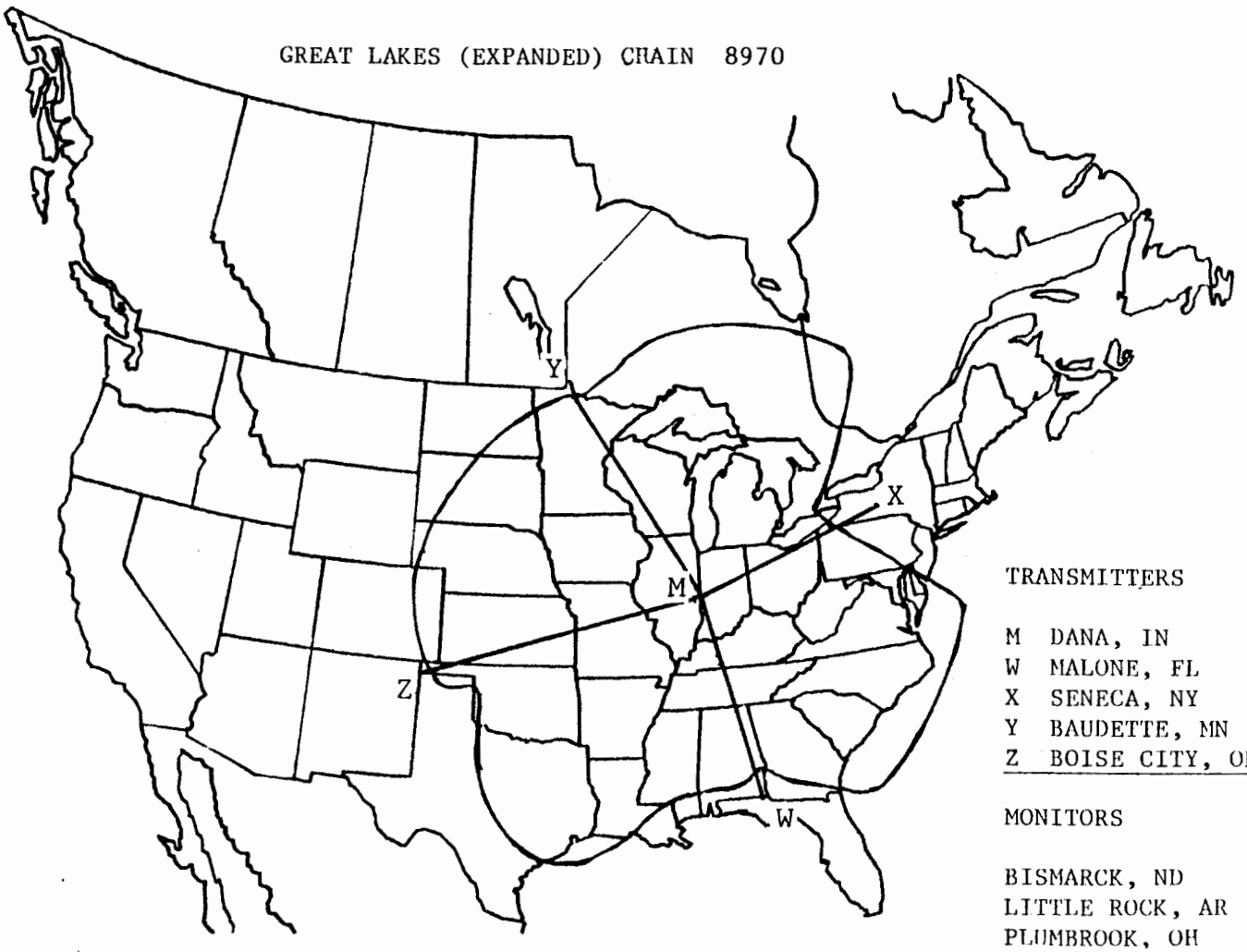
TRANSMITTER SITES

M BOISE CITY, OK
V GILLETTE, WY
W SEARCHLIGHT, NV
X LAS CRUCES, NM
Y RAYMONDVILLE, TX
Z GRANGEVILLE, LA

MONITOR SITES

NEW ORLEANS, LA
LITTLE ROCK, AR
MIDLAND, TX
GRAND JUNCTION, CO
BISMARCK, ND


NORTH CENTRAL U.S. CHAIN 8290
Y
M
W
X
TRANSMITTER SITES
M HAVRE, MT
W BAUDETTE, MN
X GILLETTE, WY
Y WILLIAMS LAKE, B.C.
MONITOR SITES
GREAT FALLS, MT
GRAND JUNCTION, CO
BISMARCK, ND
WHIDBEY IS., WA


GREAT LAKES (EXPANDED) CHAIN 8970
Y
X
M
Z
W
TRANSMITTERS
M DANA, IN
W MALONE, FL
X SENECA, NY
Y BAUDETTE, MN
Z BOISE CITY, OK
MONITORS
BISMARCK, ND
LITTLE ROCK, AR
PLUMBROOK, OH
EGLIN, FL
MAYPORT, FL

SOCUS/NOCUS POSITIONS, CODING DELAYS, AND EMISSION DELAYS

SOUTH CENTRAL U.S. CHAIN, RATE 9610

Station		Position (WGS 84) Latitude	Longitude	Coding Delay	Emission Delay *
M	Boise City	36° 30′ 20.783″N	102° 53′ 59.487″W		
V	Gillette	44° 00′ 11.305″N	105° 37′ 23.895″W	11000	13884.48
W	Searchlight	35° 19′ 18.305″N	114° 48′ 16.881″W	25000	28611.81
X	Las Cruces	32° 04′ 18.130″N	106° 52′ 04.388″W	40000	42044.93
Y	Raymondville	26° 31′ 55.141″N	97° 49′ 59.539″W	52000	56024.80
Z	Grangeville	30° 43′ 33.149″N	90° 49′ 43.046″W	65000	69304.00

NORTH CENTRAL U.S. CHAIN, RATE 8290

Station		Position (WGS 84) Latitude	Longitude	Coding Delay	Emission Delay
M	Havre	48° 44′ 38.589″N	109° 58′ 53.613″W		
W	Baudette	48° 36′ 49.947″N	94° 33′ 17.915″W	11000	14786.56
X	Gillette	44° 00′ 11.305″N	105° 37′ 23.895″W	27000	29084.44
Y	Williams Lake	51° 57′ 58.876″N	122° 22′ 01.686″W	42000	45171.62

EXPANDED GREAT LAKES CHAIN, RATE 8970

Station		Position (WGS 84) Latitude	Longitude	Coding Delay	Emission Delay
M	Dana	39° 51′ 07.658″N	87° 29′ 11.586″W		
W	Malone	30° 59′ 38.870″N	85° 10′ 08.751″W	11000	14355.11
X	Seneca	42° 42′ 50.716″N	76° 49′ 33.308″W	28000	31162.06
Y	Baudette	48° 36′ 49.947″N	94° 33′ 17.915″W	44000	47753.74
Z	Boise City	36° 30′ 20.783″N	102° 53′ 59.487″W	59000	63669.46

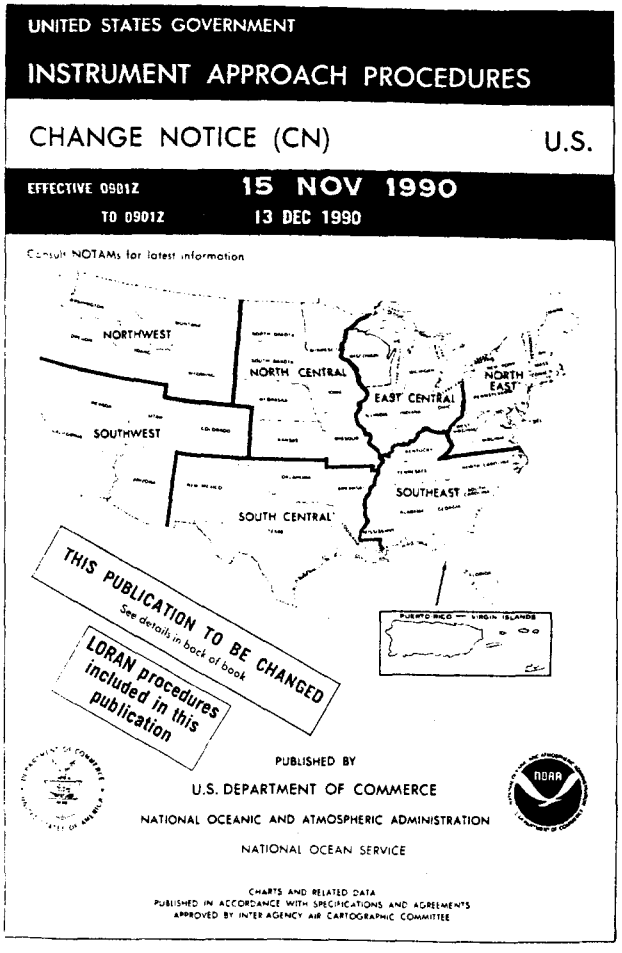
Good Press!

This cover from the NOAA's booklet of Standard Instrument Approach Procedures features the announcement that many of us have awaited -- the publication of the first public-use Loran-C approaches. Six approach locations are included:

Burlington, VT
Columbus, OH
New Orleans, LA
Orlando, FL
Portland, OR
Venice LA

This special issue of the *Goose Gazette* is devoted to Loran-C aviation applications, notably the advent of instrument- approach use.

As the FAA's draft implementation plan states, more approach procedures are on the way, as are the final supporting documents and policies which will integrate Loran-C into the National Airspace System.



The Goose Gazette
Wild Goose Association
P. O. Box 556
Bedford, Massachusetts 01730

Bulk Rate
U.S. Postage
PAID
Permit No. 9
Athens, Ohio
45701