

法規名稱：(終)IMPLEMENTING ARRANGEMENT #7 CONTINUING DEVELOPMENT OF THE OPEN CENTRAL FACILITY & OPERATIONAL WORKSTATION TO THE AGREEMENT FOR TECHNICAL COOPERATION IN METEOROLOGICAL AND FORECAST SYSTEMS DEVELOPMENT BETWEEN THE COORDINATION COUNCIL FOR NORTH AMERICAN AFFAIRS AND THE AMERICAN INSTITUTE IN TAIWAN (AD.1994.08.18)

終止日期：民國 84 年 06 月 30 日

ARTICLE I-SCOPE

This Implementing Arrangement describes the scientific and technical activities to be undertaken by the American Institute in Taiwan (AIT) and its representative, the Forecast Systems Laboratory (FSL) of the National Oceanic and Atmospheric Administration (NOAA). It provides for the continuing system development of the Forecast System being developed by the Joint Forecast Systems Project between the Central Weather Bureau (CWB), the designated representative of the coordination Council for North American Affairs (CCNAA), and NOAA/FSL.

ARTICLE II-AUTHORIZATION

The activities described in this Implementing Arrangement will be carried out under the general terms and conditions established by the Agreement between CCNAA and AIT for Technical Cooperation in Meteorology and Forecast Systems Development. This Implementing Arrangement is hereby attached to that Agreement and becomes part of the Agreement.

ARTICLE III-SERVICES

The Forecast System is composed of two primary subsystems: a Central Facility and a Forecaster Workstation Subsystem. Emphasis will be placed in this Implementing Agreement on the continuing development of an operational Forecaster Workstation and an open Central Facility. Besides these two development tasks, there are tasks addressing Doppler radar data interface support and forecaster training.

A new Numerical Weather Prediction development task will be initiated during this period. This task is to jointly develop improved satellite data assimilation techniques for CWB models. These activities, described in more detail in the Statement of Work

, will include the following five tasks:

Task #1-Implementation of the FX-ALPHA Workstation

The FX Workstation project within FSL was expanded to the FX-ALPHA (FSL X window AWIPS-Like Prototype of Hydrometeorological Applications) in June of 1993. This development will satisfy National Weather Service (NWS) requirements for a modernized Weather Forecast Office(WFO). It will also satisfy CWB requirements that can be tailored at CWB by CWB personnel. The basic system will be installed in Denver WFO during I.A. #7 time period.

The basic FX-ALPHA workstation will have the normal display functionality that is part of the FSL workstation (e.g. PC workstation). Additional capabilities will be added in future software releases. FSL will also provide available FX-ALPHA documentation

Task #2-Development of the Open System Central Facility

Transition of the FSL Central Facility into an open system is the major activity for the Facility Division of FSL. The transition activities include development of an open system central facility, replacing the VMS-based system by a UNIX/RISC system, upgrading networking capabilities, and improving the data acquisition facility.

CWB has plans for transition to an open system which is very similar system to FSL's Open System Central Facility. FSL has gained a great deal of experience in open system implementation and will provide planning and design information to CWB on Nowcasting System related issues. CWB must then incorporate this information in their overall facility planning and scheduling efforts.

Task#3-Implementation ofWSR-88D narrowband data for FX-ALPHA

CWB will install its first ~SR88D in 1996 at Wu-Fen-Shan (north-east of Taipei). CWB also plans to install three more WSR-88D's in the Taiwan area by the year of 2000. The network of Doppler radars and existing conventional radars will provide important data for the Nowcasting System and mesoscale meteorology.

FSL will draw upon its experience in radar hardware issues, handling and using radar data, acquisition of narrowband data, and

mosaic display to support the CWB radar team. FSL will provide technical advice and support as requested to meet specific CWB needs, rather than having specific system development responsibilities.

Task #4-Forecaster training in the use of FX-ALPHA workstation
CWB will begin to tailor the FX-ALPHA workstation to meet their own requirements during this time period. The transition for the forecasters using the new FX-ALPHA workstation will be far easier than the initial introduction of the PC workstation into the Forecast Center. There will, however, be significant differences that CWB forecasters must understand about operating multiple window workstations.

The CWB forecasters will spend a few weeks at FSL, receiving training in the new features of the FX-ALPHA workstation and in working with FSL forecasters in the use of the system.

Task #5-Development of Improved Data Assimilation Techniques

Scientists from the CWB and the FSL Mesoscale Analysis and Prediction System (MAPS) team will work together to develop improved data analysis and assimilation techniques appropriate to oceanic regions. A primary emphasis in this work will be the direct use of radiances from polar-orbiting satellites. A secondary emphasis will be the development of an improved analysis technique that allows for an explicit estimate of the divergent wind component, especially important for tropical regions.

These techniques will be jointly developed and tested by FSL and CWB scientists within the MAPS environment. The same techniques will then be transferred to CWB for use within their own data assimilation systems to initialize CWB models.

ARTICLE IV-FINANCIAL PROVISIONS

In accordance with the Agreement, NOAA/FSL is undertaking this work on behalf of AIT for CCNAA. CCNAA will reimburse AIT, and its designated representative NOAA/FSL for all costs incurred in association with this Implementing Agreement.

The total cost for activities described in this Implementing Arrangement is mutually agreed to be US \$450,000. It is also agreed

ed that fifty percent of the funds will be transferred in advance, with the remaining 50 percent transferred within 30 days of the acceptance of the final report by CCNAA, and its designated representative, CWB.

ARTICLE V-INTELLECTUAL PROPERTY CONSIDERATIONS

No intellectual property considerations are expected to arise in conjunction with activities described in this Implementing Arrangement. Existing system designs and computer software of the F-SL Forecast System are in the public domain. Reports, specifications, and computer software prepared under this Implementing Arrangement will also be in the public domain once they have been approved in a final form by CCNAA, CWB, AIT, and NOAA.

ARTICLE VI-EFFECTIVE DATE, AMENDMENT, AND TERMINATION

This Implementing Arrangement is effective on the date of the last signature hereafter. This Implementing Arrangement may be amended and/or terminated in accordance with the terms of the Agreement. The estimated completion date for the activities described in this Implementing Arrangement is June 30, 1995.

FOR THE COORDINATION COUNCIL
FOR NORTH AMERICAN AFFAIRS

[Signed]

James Wen-Chung Chang
Deputy Representative
August 18, 1994

FOR THE AMERICAN INSTITUTE
IN TAIWAN

[Signed]

J. Richard Rock
Deputy Managing Director
August 15, 1994

Statement of Work for Implementing Arrangement #7 Continuing Development of the Operational Central Facility \$ Operational Workstation between The Coordination Council for North American Affairs and The American Institute in Taiwan

1.0 Background and Objectives

The agreement between the Coordination Council for North American Affairs (CCNAA) and the American Institute in Taiwan (AIT) provides for technical cooperation between the Central Weather Bureau (CWB) and the National Oceanic and Atmospheric Administra-

tion's Forecast Systems Laboratory (NOAA/ FSL) in meteorology and forecast system development.

The new Forecast System that CWB is implementing has two primary subsystems: the Central Facility and the Forecaster Workstation subsystems. Both subsystems will be modeled after systems developed at FSL.

A master plan of the Forecast Systems for CWB was provided in the Project Implementing Plan as part of Implementing Arrangement #1 (I.A.#1). I.A.#2 and #3 provided the functional specification of the Forecast System and development of the prototype workstation. The prototype workstation was completed and operated during I.A.#4. The basic operational system was begun to prototype in I.A.#5. I.A.#6 focused on development of the basic operational workstation and an initial open system central facility.

This Statement of Work addresses the tasks that will be undertaken by the joint team of CWB and FSL personnel in accordance with the terms of Implementing Arrangement #7. The goal is to complete the basic operational workstation development during this period and allow CWB to begin to modify and evaluate its basic operational workstation. A new Numerical Weather Prediction Task will be initiated during I.A.#7. The objective of this task is to develop improved satellite data assimilation techniques.

Tasks will be undertaken both by the CWB-FSL Joint Team working at the FSL facility in Boulder, Colorado and by CWB staff at the CWB facility in Taipei, Taiwan, as appropriate. This Statement of Work addresses only tasks that will be undertaken by the CWB-FSL Joint Team under the terms of I.A.#7 and establishes the performance schedule, deliverables, and resources requirements.

2.0 Task Descriptions

In terms of the overall program schedule, the following five tasks are identified as being critical in the July 1, 1994 to June 30, 1995 time period:

- Task #1-Implementation of the FX-ALPHA workstation
- Task #2-Development of the Open System Central Facility
- Task #3-Implementation of WSR-88D narrowband data for FX-ALPHA

■Task #4-Forecaster Training in the use of the FX-ALPHA workstation

■Task #5-Development of Improved Data Assimilation Techniques

These five tasks are described below:

Task#1-Implementation of the FX-ALPHA workstation

FSL expanded the FX Workstation project to FX-ALPHA (FSL X window AWIPS-Like Prototype of Hydrometeorological Applications) in June of 1993. The broad mission of this project is to develop modern environmental system capabilities on an "Open" platform. This development satisfies NWS requirements to demonstrate integrated hydrometeorological capabilities and techniques For a modernized Weather Forecast Office(WFO). FX-ALPHA meets all CWB requirements for a system that can be tailored at CWB by personnel that are sufficiently knowledgeable.

The preliminary design of the FX-ALPHA was completed in September of 1993. The prototype of the FX-ALPHA was demonstrated in the 74th American Meteorological Society (AMS) Meeting in January of 1994 in Nashville, TN. The FX-ALPHA team will finish the detail design of all workstation functional components by June of 1994. Implementation of the workstation for Denver WFO deployment is scheduled to be completed in February of 1995. This workstation will also be used for daily weather briefings at the next AMS annual meeting in January of 1995 in Dallas, Texas.

The initial release of the basic FX-ALPHA workstation will have the equivalent capability of the DARE-II workstation, which is currently used in the Denver WFO. The FSL team will need the CWB team to perform some workstation development tasks in Taipei. The description of these tasks will become available after the completion of the detailed design of the system. FSL will provide the CWB workstation team with support in system design, software implementation, and use of the commercial-off-the-shelf software .

A CWB visiting scientist will participate in this workstation development task. FSL will provide a complete software documentation Of the FX-ALPHA as soon as it becomes available with its i-

nitial release. FSL will also provide support to the CWB workstation team in installation of the DI ALPHA software.

Performance Period:

1. Development of basic FX-ALPHA software July 1, 1994-October 1, 1994
2. Testing and debug of basic software October 1, 1994-Jan. 31, 1995
3. Preparation of FX-ALPHA documentation Feb. 1, 1995-June 30, 1995

Resources Required: 30%

CWB-FSL Joint Team

Deliverable:

1. Software release of initial prototype FX-ALPHS July 31, 1994
2. Software release of the basic FX-ALPHA February 28, 1995
3. Documentation of the basic FX-ALPHA June 30, 1995

Task #2-Development of the Open System Central Facility

Transition of the FSL Central Facility into an "open" system began during 1992. The Facility Division is responsible for this transition. Their activities include development of an open system central facility called NIMBUS, replacing VMS-based system by UNIX-based systems, upgrading networking, improving data acquisition facility, and using standard data formats such as WMO and NetCDF. Over the next several years, the development of NIMBUS will continue and new application software will be developed on the new computer systems.

CWB also has many VMS-based systems. The transition of the FSL open central facility has many advantages to CWB. For example, FSL has found that the UNM/RISC processors provide an excellent distributed computing capability, software portability and hardware flexibility for the central facility. CWB has already planned for a transition to a new open system. In the Phase III, CWB will develop its own open system architecture, called NICE (Network Information exchange Environment), a similar system to NIMBUS, as their central facility. With the experience in NIMBUS implementation, FSL will provide planning and design information of NIMBUS, so CWB can incorporate this information in their over-

rall facility planning and scheduling efforts.

A CWB visiting scientist will participate in the FSL Central Facility software development. FSL will provide CWB the central facility software as it becomes available over the next several years. This includes the NIMBUS, Process Manager, data transition routines, and various system management programs.

Performance Period:

1.Development of NIMBUS software July 1, 1994-June 30, 1995

2.Preparation of FSL Central Facility documentation
Feb. 1, 1995-June 30, 1995

Resources Required: 20% CWB-FSL Joint Team CWB-FSL Joint Team

Deliverable:

1.NIMBUS software June30,1995

2.Documentation of NIMBUS June30,1995

Task #3-Implementation of WSR-88D narrowband data for FX-ALPHA

CWB will have its first WSR-88D installed at Wu-Fen-Shan(northeast of Taipei) in 1996. CWB also plans to install three more WSR-88D's in the Taiwan area between 1996 and 2000. These Doppler radar network and conventional radar systems will provide important and high resolution data for the Nowcasting System and mesoscale meteorology. CWB's Telecommunication and Radar Division will take the lead responsibility in implementing radar capability at CWB.

During I.A.#6, CWB has assigned one visiting scientist working with the FX-ALPHA team on WWSR-88D narrowband data front end communications and NEXRAD product interface subsystem. This work is very important for CWB's future Doppler radar network interface with forecaster workstations. The bulk of the NEXRAD product interface work and radar applications will be carried out at FSL during I.A.#7. So it is necessary for CWB to assign another visiting scientist for this task during I.A.#7. FSL will draw upon its experience in radar hardware issues, handling and using radar data, acquisition of wide-band data, and mosaics display to support the CWB radar team. FSL will also be responsible for providing support as requested to meet CWB's specific needs.

After the initial survey of potential wind profiler sites during I.A.#6, FSL will be responsible for providing further information for CWB's future wind profiler network.

Performance Period:

1.Develop NEXRAD product interface software

July 1, 1994-February 28, 1995

2.Develop product generation software

March 1, 1995-June 30, 1995

Resources Required: 10% CWB-FSL Joint Team

Deliverables:

1.Radar data ingest and product generation software June 30, 1995

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Task #4-Forecaster training in the use of the FX-ALPHA workstation

FSL will provide training for CWB forecasters in the use of the new workstation after FSL completes the basic version of the FX-ALPHA workstation. This transition for forecasters using the new FX-ALPHA workstation will be far easier than the initial introduction of the PC workstation into the Forecast Center. There will, however, be significant differences that the forecasters must understand about operating multiple window workstations. Also, it is an excellent opportunity for CWB forecasters to provide user feedback about the new workstation to the system designers. Tentative plans call for CWB forecasters to spend three weeks at FSL to receive training in these new features and in working with FSL forecasters in the use of the system. The CWB forecasters would combine the visit to FSL with a NCi9R COMET training class.

Performance Period:

1.Prepare FX-ALPHA user guide

February 1, 1995-April 1, 1995

Resources Required: 10% CWB-FSL Joint Team

Deliverables:

1.FX-ALPHA Workstation User Guide May 31, 1995

Task #5-Development of Improved Data Assimilation Techniques

FSL has developed a high-frequency (at least every 3 hours) data assimilation system, the Mesoscale Analysis and Prediction System (MAPS), which runs in real time covering the lower 48 United States. This domain has relatively dense data coverage. For extension of the MAPS domain beyond its current boundaries under the cooperative effort with CWB, it will be necessary to use remotely sensed data from satellites. The MAPS development team has done preliminary testing of methods of directly incorporating satellite radiances into initial conditions for numerical prediction models.

CWB plans to make a major upgrade of their data assimilation capabilities in Phase III of their modernization program. This upgrade will require development of the same techniques for use of satellite data. It will also require use of improved analysis techniques for estimation of the divergent wind field.

CWB will send a scientist to work at FSL with the MAPS team on development of techniques in processing satellite data, and also on extending of the MAPS domain over oceanic regions for future testing.

Performance Period:

1. Develop satellite data processing capabilities

July 1, 1994-June 30, 1995

2. Extend MAPS domain over oceanic region for testing of new data assimilation techniques

January 1, 1995-June 30, 1995

Resources Required : 30% CWB-FSL Joint Team

Deliverable:

1. Initial version of MAPS for training and experimentation in CWB environment January 15, 1995

2. Documentation of initial satellite processing techniques June 30, 1995

3.0 Schedule

The following milestones are consistent with the overall program requirements:



| Functions | Milestones |
|--|-------------------|
| 1. Provide a final report of FSL-CWB project for Phase II | December 31, 1994 |
| 2. Provide initial prototype FX-ALPHA software | July 31, 1994 |
| 3. Provide initial basic FX-ALPHA software | February 28, 1995 |
| 4. Provide FX-ALPHA documentation | June 30, 1995 |
| 5. Provide available NIMBUS software | June 30, 1995 |
| 6. Provide available NIMBUS documentation | June 30, 1995 |
| 7. Provide radar data ingest and product generation software | June 30, 1995 |
| 8. Complete FX-ALPHA workstation user guide | May 31, 1995 |
| 9. Provide initial version of MAPS software | January 15, 1995 |
| 10. Provide documentation of satellite processing techniques | June 30, 1995 |

TASKS 7/18/19/110/111/112/11/12/13/14/15/16/16/30

Task 1(FX-ALPHA) _____

1. initial s/w _____
development

2. testing _____

3. documentation

Task a(Open

Central

Facility)

1. NIMBUS _____
development

2. documentation _____

Task 3(WSR-88D)

1. NEXRAD product _____
interface

2. product _____
generation

Task 4(Forecast

Training)

1.training _____

2.user guide _____

Task 5(data

Assimilation)

1.satellite data _____

assimilation

2.documentation _____

4.0 Budget

The following are the estimate costs for I.A.#7.

| TASKS | Personnel | TravelTraining | Total |
|---------|-----------|----------------|--------|
| Task #1 | \$120K | \$30K | \$150K |
| Task #2 | \$80K | \$10K | \$90K |
| Task #3 | \$20K | \$10K | \$30K |
| Task #4 | \$20K | \$10K | \$30K |
| Task #5 | \$140K | \$10K | \$150K |
| Total | \$380K | \$70K | \$450K |

As stated in I.A. #7, funds available for the tasks described in this Statement of Work will be US \$450,000. All budget figures are estimates. Actual amounts will be accrued for purposes of fulfilling the financial arrangements described in the Implementing Arrangement, in accordance with the terms of the Agreement. All programs within the Forecast Systems Laboratory use the same budget procedures, whether they are base-funded programs or externally-funded programs. Beginning in FY'91, a facility charge has been applied to all programs to cover management and administrative costs, and the use of the FSL facility and all equipme-

nt and data associated with it.

FSL staff time is charged at the employee's salary plus the normal NOAA benefit, leave and overhead charges. FSL professional staff are primarily in the civil service grade scales of GS11 to GS-14. Contract staff are in equivalent categories.

5.0 CWB Joint Team Assignments at FSL

CWB staff at FSL during I.A. #3, 4, 5, and 6 were able to contribute significantly to the overall development. In addition, they were able to obtain an understanding of the overall system development that valuable for CWB own developments and operations in the future. The cooperative effort between CWB and FSL has been successful and will continue during I.A. #7. Four tasks (#1, #2, #3 and #5) require CWB staff in residence at FSL. The primary effort of CWB staff at FSL during this period will be directed toward development of an operational workstation, open central facility, WSR-88D radar data interface, and data assimilation techniques. Assignments for the CWB staff will be as follows:

- Development of the FX-ALPHA
- Development of the NIMBUS
- Work with FSL staff in radar applications
- Development of polar-orbit satellite radiance data ingest and comparison with synthetic radiances from forecast model