

法規名稱：(終)IMPLEMENTING ARRANGEMENT #15 CONTINUING DEVELOPMENT OF THE LOCAL ANALYSIS AND PREDICTION SYSTEM AND DEVELOPMENT OF A WARNING DECISION SUPPORT SYSTEM PURSUANT TO THE AGREEMENT BETWEEN THE TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES AND THE AMERICAN INSTITUTE IN TAIWAN FOR TECHNICAL COOPERATION IN METEOROLOGY AND FORECAST SYSTEMS DEVELOPMENT

終止日期：民國 92 年 12 月 31 日

IMPLEMENTING ARRANGEMENT #15 Continuing Development of the Local Analysis and Prediction System and Development of a Warning Decision Support System Pursuant to the Agreement Between the Taipei Economic and Cultural Representative Office in the United States And the American Institute in Taiwan for Technical Cooperation in Meteorology and Forecast Systems Development

Article I - Scope

This Implementing Arrangement describes the scientific and technical activities to be undertaken by the American Institute in Taiwan (AIT), through its designated representative, the Forecast Systems Laboratory (FSL) of the National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce . It provides for continuing development of the forecast system being developed by the Joint Forecast Systems Project. This project is a cooperative effort between AIT's designated representative, NOAA/FSL, and the Central Weather Bureau (CWB), the designated representative of the Taipei Economic and Cultural Representative Office in the United States (TECRO).

Article II - Authorities

The activities described in this Implementing Arrangement will be carried out under the general terms and conditions established by the Agreement between the American Institute in Taiwan and the Taipei Economic and Cultural Representative Office in the United States for Technical Cooperation in Meteorology and Forecast Systems Development, and any subsequent revision as agreed to by the parties. This Implementing Arrangement is the fifteen-

th such arrangement under a succession of umbrella agreements between TECRO and AIT.

NOAA has authority to participate in the meteorology and forecast systems development project with AIT under:

A.15 U.S.C. 1525, the DOC Joint Project Authority, which provides that DOC may enter into joint projects with nonprofit, research, or public organizations on matters of mutual interest, the cost of which is equitably apportioned;

B.22 U.S.C. 3301 et seq., the Taiwan Relation Act of April 10, 1979, Public Law 96-8, which authorizes agencies of the United States Government to perform services for, and to accept funds in payment from AIT;

C.15 U.S.C. 313, the Weather Service Organic Act, which authorizes the Secretary to perform meteorological services;

D.49 U.S.C. 44720(b), the Federal Aviation Act, which authorizes the Department of Commerce to promote safety and efficiency in air navigation; and

E.An agreement between AIT and the Taipei Economic and Cultural Representative Office in the United States (TECRO), which authorizes AIT to provide technical assistance from a designated agency to an agency designated by TECRO. AIT has designated NOAA to provide technical assistance in meteorology and forecast systems development.

TECRO has designated the Central Weather Bureau (CWB) of Taiwan to receive such technical assistance.

This Implementing Arrangement is hereby attached to that Agreement and becomes part of the Agreement.

Article III- Services

During the period of Implementing Arrangement #15 the FSL-CWB joint team will focus on four ongoing tasks. The four ongoing tasks are: 1) the Local Analysis and Prediction System (LAPS), wh-

ich performs high-resolution analyses and provides short-range forecasts of the weather using both locally and centrally available meteorological observations, 2) the development of a Warning Decision Support System (WDSS), 3) the continuation of enhancing CWB's current forecast workstation including a new system called SCAN (System for Convective Analysis and Nowcasting), SCAN will provide short range forecasts of precipitation from remote-sensor observations, and 4) continuing integration on earlier cooperative projects.

These ongoing activities, described in more detail in the Statement of Work, will include the following four tasks:

Task #1 - Local Analysis and Prediction System (LAPS)

FSL and CWB have demonstrated the LAPS hot start capability at CWB during Implementing Arrangement #14. For Implementing Arrangement #15, FSL will focus on the 0 to 12 hr. forecast using hot start implementation as part of CWB operation and to ensure good cloud analysis with full radar coverage. FSL will apply the hot start technique using the balanced LAPS analysis on a forecast model for the Taiwan LAPS domain. FSL also will provide LAPS training and technical support during the running of LAPS hot start at CWB.

Task #2 Warning Decision Support System (WDSS)

NSSL (National Severe Storms Laboratory) will lead the effort of the development of a warning decision support system for CWB and the WRA (Water Resources Agency).

CWB and the WRA will collaborate to develop a strategy and systems to improve the quantitative precipitation estimation and flood forecasting in Taiwan. The WDSS consists of four components: 1) data integration and 3-D mosaics, 2) quantitative precipitation estimation, 3) severe storm algorithms, and 4) the distributive hydrological model.

During IA #14, NSSL has delivered an initial WDSS system to CWB.

The initial system has radar data ingest with quality control, initial development of QPE-SUMS (Quantitative Precipitation Estimation and Segregation Using Multiple Sensors) and a rapid prototyping and development of the Vflo system which is a distributive hydrological run-off model. NSSL also provided initial WDSS application training to CWB and WRA.

During IA #15, NSSL will focus on refining the Vflo model, enhancement of QPESUMS, and radar data communication assistance. NSSL will also continue to assess and perform field testing to identify real-time simulation issues and further operational needs

Vflo model will be refined, and the refinements include improvements in the model physics and in product display. New parameters will be added in the model and improved GIS reference data will be incorporated.

Task #3 Forecast Assistant System

FSL and CWB will continue to enhance CWB's current forecast workstation, the Weather Integration and Nowcasting System (WINS), to take advantage of continued AWIPS Modernization. FSL will support enhancement of WINS II in the area of severe weather warning and forecast capability. SCAN (System for Convection Analysis and Nowcasting) is a continuing activity for the AWIPS modernization within the U.S. National Weather Service (NWS). SCAN is an integrated suite of multi-sensor applications which detects, analyzes and monitors convection and generates short-term probabilistic forecast and warning guidance for severe weather and flash floods. SCAN will provide more accurate, timely, and consistent severe weather and flash flood warnings. For example, FFMP (version 2.0) is the Flash Flood Monitoring and Prediction component of SCAN, which is provided by the current AWIPS (Build 5.1.2) workstation.

During IA #15, FSL and CWB will collaborate to develop a strategy for the short range forecasts of precipitation from remote-s-

ensor observations using statistical extrapolative techniques.

During IA #15, FSL will also support CWB in the porting of SCAN code to WINS II. The initial SCAN component will have a series of severe weather detection and prediction algorithms plus data integration techniques for CWB forecasters to use during severe weather warning operations.

During IA #15, FSL will also provide technical support on GFIE, D3D and FX-C software customization to CMTB; so that CWB can include these components as part of WINS II.

Task #4 - Continuing Interaction on Earlier Cooperative Projects
Several earlier cooperative tasks have been completed. Technology has been transferred successfully and is beginning to be used operationally at CWB. FSL's development in these areas continues, and further CWB/FSL interaction is important to keep CWB staff up-to-date on current developments. This task will allow continuing interaction at an appropriate level, including new software releases of the forecast information system including the internet-based forecast workstation, data assimilation, forecaster training, exchange of visits, copying papers and reports, and e-mail interaction.

Article IV-Financial Provisions

In accordance with the Agreement, NOAA/FSL is undertaking this work as the designated representative of AIT. TECRO is required to reimburse AIT for all costs incurred by AIT's designated representative, NOAA/FSL, in association with the project covered by this Implementing Arrangement. AIT will transfer to NOAA/FSL all payments made by TECRO to AIT for costs incurred by NOAA/FSL in association with this Implementing Arrangement. The total cost for activities described in this Implementing Arrangement is mutually agreed to be U.S. \$900,000.00. TECRO agrees to transfer fifty percent of the funds to AIT in advance, with the remaining



fifty percent to be transferred upon completion of the year's activities.

The funding arrangement represents an equitable apportionment of project costs. NOAA's performance of activities under this Implementing Arrangement is subject to the availability of funds .

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 FSL Forecast System are in the public domain. Reports, specifications, and computer software prepared under this Implementing Arrangement also will be in the public domain once NOAA and CWB have approved them in final form.

Article VI - Effective Date, Amendment, and Termination

This Implementing Arrangement is effective on the date of the last signature hereto. 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 December 31, 2003.

FOR THE TAIPEI ECONOMIC AND
CULTURAL REPRESENTATIVE
OFFICE IN THE UNITED STATES

FOR THE AMERICAN INSTITUTE IN
TAIWAN

Barbara Schrage
Deputy Managing Director

Date

Date

Statement of Work For Implementing Arrangement #15 Continuing Development of the Local Analysis and Prediction System and Development of a Warning Decision Support System Between the Taipei Economic and Cultural Representative Office in the United States and The American Institute in Taiwan

1.0 - Background and Objectives

This Statement of Work addresses tasks that will be undertaken by the joint team of FSL and CWB personnel in accordance with the terms of Implementing Arrangement #15 of the Agreement Between the Taipei Economic and Cultural Representative Office in the United States (TECRO), and the American Institute in Taiwan (AIT) for Technical Cooperation in Meteorology and Forecast Systems Development, which provides for technical cooperation between TECRO's designated representative, the Taiwan Central Weather Bureau (CWB) and AIT's designated representative, the U.S. National Oceanic and Atmospheric Administration's Forecast Systems Laboratory (NOAA/FSL). The two designated representatives cooperate on the development of meteorology and forecast systems

The WFO-Advanced system currently under development at the NOAA's Forecast Systems Laboratory (FSL) in Boulder Colorado has been deployed as an essential part of AWIPS (Advanced Weather Interactive Processing System) for the U.S. National Weather Service (NWS). The WFO-Advanced system development has been a very important cooperative activity between FSL and CWB.

The WFO-Advanced system is a realization of the generic FX-Advanced (FSL X-window Advanced) system. Figure I illustrates the WFO-Advanced components:

- National and local data feeds
- FSL's Local Analysis and Prediction System (LAPS)
- Quantitative Precipitation Estimation and Segregation Using M-

ultiple Sensors (OPE-SUMS)

- Geographical Information System (GIS) data
- The interactive display system (D2D)
- The AWIPS Forecast Preparation System (AFPS)
- 3-D visualization
- Hydrological applications developed at the NWS Office of Hydrology
- A component that contains General X applications
- Local Data Acquisition and Dissemination System (LDAD)

Four tasks are included in the Statement of Work: 1) the Local Analysis and Prediction System (LAPS), 2) Warning Decision Support System (WDSS), 3) Forecast Assistant System, and 4) continuing interaction on earlier cooperative projects, such as data assimilation for a numerical weather prediction model.

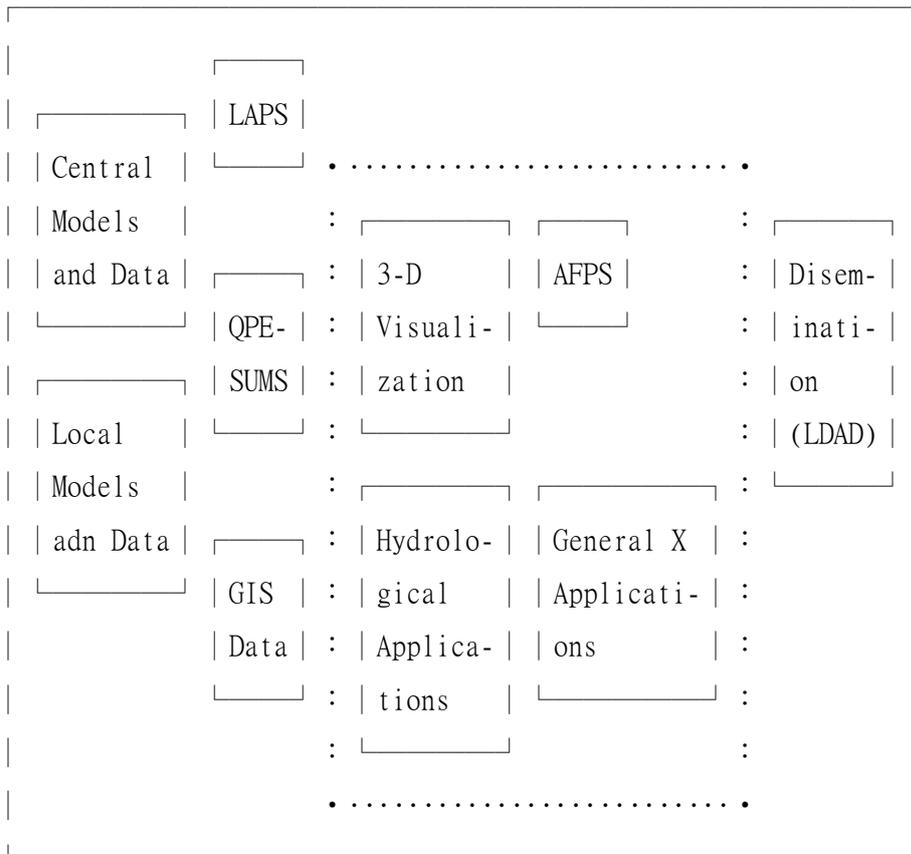


Figure WFO-Advanced

Tasks will be undertaken by the FSL-CWB Joint Team working at t-

he FSL facility in Boulder, Colorado, the NSSL-CWB Joint Team working at the NSSL facility in Norman, Oklahoma 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 FSL-CWB Joint Team and the NSSL-CWB Joint Team under the terms of Implementing Arrangement #15. It describes the performance period, deliverables, and resource requirements.

2.0 - Task Descriptions

In terms of the overall program schedule, the following four tasks have been identified as being critical during the January 1 to December 31, 2003, time period. These are listed below, along with the proportion of resources that is to be allocated to each task.

- Task #1 - Local Analysis and Prediction System (LAPS) (20%)
- Task #2 - Warning Decision Support System (WDSS) (40%)
- Task #3 - Forecast Assistant System (35%)
- Task #4 - Continuing interaction on earlier cooperative projects (5%)

These four tasks are described in more detail below.

Task #1 - Local Analysis and Prediction System (LAPS)

FSL and CWB have demonstrated the LAPS hot start capability at CWB during Implementing Arrangement #14. For Implementing Arrangement #15, FSL will focus on the 0 to 12 hr. forecast using hot start implementation as part of CWB operation and to ensure good cloud analysis with full radar coverage. FSL will apply the hot start technique using the balanced LAPS analysis on a forecast model for the Taiwan LAPS domain. FSL also will provide LAPS training and technical support during the running of LAPS hot start at CWB.

The following summarizes the schedule and resources required for Task #1:

Performance Period:

1.Work on initial hot start MM5 model 1/1/03 -12/30/03

implementation

2.Continue LAPS II analysis with surface QC 1/1/03 - 12/30/03

3.Provide LAPS user training, and 8/1/03 - 12/30/03

documentation

Resources Required: 20% FSUCWB Joint Team

Deliverables:

1.Improved cloud and precipitation analysis 11/30/03

2.LAPS II and MM5 hot start implementation with 11/30/03
surface QC at CWB

3.LAPS training materials 11/30/03

Task #2 - Warning Decision Support System (WDSS)

NSSL (National Severe Storms Laboratory) will lead the effort of the development of a warning decision support system for CWB and the WRA (Water Resources Agency). CWB and the WRA will collaborate to develop a strategy and systems to improve the quantitative precipitation estimation and flood forecasting in Taiwan.

The WDSS consists of four components: 1) data integration and 3-D mosaics, 2)

quantitative precipitation estimation, 3) severe storm algorithms, and 4 the distributive hydrological model.

During IA #14, NSSL has delivered an initial WDSS system to CWB. The initial system has radar data ingest with quality control, initial development of QPE-SUMS (Quantitative Precipitation Estimation and Segregation Using Multiple Sensors) and a rapid prototyping and development of the Vflo system which is a distributive hydrological run-off model. NSSL also provided initial WDSS application training to CWB and WRA.

During IA #15, NSSL will focus on refining the Vflo model, enhancement of QPESUMS, and radar data communication assistance. NSSL will also continue to assess and perform field testing to identify real-time simulation issues and further operational needs . Vflo model will be refined, and the refinements include impro-



vements in the model physics and in product display. New parameters will be added in the model and improved GIS reference data will be incorporated.

The following summarizes the schedule and resources required for Task #2:

Performance Period:

1.Radar coverage data and radar quality control improvement	1/1/03-12/30/03
2.Radar mosaic algorithm refinement	1/1/03-12/30/03
3.QPE-SUMS enhancement and training	1/1/03-12/30/03
4.Vflo model enhancement and training with case studies	1/1/03-12/30/03
5.WDSS deployment and configuration	1/1/03-12/30/03
6.Vflo display enhancement	1/1/03-3/30/03
7.Case studies and model verification	1/1/03-12/30/03

Resources Required: 40% NSSLICWB Joint Team

Deliverables :

1.Radar data processing and algorithm software	11/30/03
2.WDSS software including initial QPE-SUMS, documents and training sessions	11/30/03
3.3-D mosaics and radar QC software	11/30/03
4.Vflo model software, documents and training sessions	3/30/03
5.Vflo web display enhancement	3/30/03
6.Vflo Version 2.0 training and users manual	11/30/03
7.Vflo quarterly progress reports and annual review (presentation)	3/31/03, 6/30/03, 9/30/03, 11/30/03

Task #3 - Forecast Assistant System

FSL and CWB will continue to enhance CWB's current forecast workstation, the Weather Integration and Nowcasting System (WINS), to take advantage of continued AWIPS Modernization. FSL will su-

support enhancement of WINS II in the area of severe weather warning and forecast capability.

SCAN (System for Convection Analysis and Nowcasting) is a continuing activity for the AWIPS modernization within the U.S. National Weather Service (NWS). SCAN is an integrated suite of multi-sensor applications which detects, analyzes and monitors convection and generates short-term probabilistic forecast and warning guidance for severe weather and flash floods. SCAN will provide more accurate, timely, and consistent severe weather and flash flood warnings. For example, FFMP (version 2.0) is the Flash Flood Monitoring and Prediction component of SCAN, which is provided by the current AWIPS (Build 5.1.2) workstation.

During IA #15, FSL and CWB will collaborate to develop a strategy for the short range forecasts of precipitation from remote-sensor observations using statistical extrapolative techniques.

During IA #15, FSL will also support CWB in the porting of SCAN code to WINS II. The initial SCAN component will have a series of severe weather detection and prediction algorithms plus data integration techniques for CWB forecasters to use during severe weather warning operations.

During IA #15, FSL will also provide technical support on GFE, D3D and FX-C software customization to CWB; so that CWB can include these components as part of WINS II.

The following summarizes the schedule and resources required for Task #3:

Performance Period:

- | | |
|---|-------------------|
| 1. Develop strategy for short term precipitation forecast and begin statistical development | 1/1/03 - 12/30/03 |
| 2. Port SCAN code to WINS | 1/1/03 - 12/30/03 |
| 3. Provide technical support on D3D and FX-C | 1/1/03 - 12/30/03 |



Resources Required: 35% FSL/CWB Joint Team

Deliverables :

- | | |
|----------------------------|----------|
| 1. SCAN software | 11/30/03 |
| 2. Initial QPF development | 11/30/03 |
| 3. D3D and FX-C software | 11/30/03 |

Task #4- Continuing interaction on earlier cooperative projects
Several earlier cooperative tasks have been completed. Technology has been transferred successfully and is beginning to be used operationally at CWB. FSL's development in these areas continues , and further CWB/FSL interaction is important to keep CWB staff up-to-date on current developments. This task will allow continuing interaction at an appropriate level, including new software releases of the forecast information system including the internet-based forecast workstation, data assimilation, forecaster training, exchange of visits, copying papers and reports, and e-mail interaction.

The following summarizes the schedule and resources required for Task #4:

Performance Period:

- | | |
|--|-------------------|
| 1. Continuing interaction on earlier cooperative projects | 1/1/03 - 12/30/03 |
| 2. Provide support on CWB HPC procurement and benchmark (attend the HPC procurement planning meeting and attempt to port the NFS operational model to FSL Linux cluster) | 5/1/03 - 12/30/03 |

Resources Required: 5% FSUCWB Joint Team

Deliverables:

- | | |
|---|-------------|
| 1. Relevant documents, reports and electronic information | (as needed) |
| 2. AWIPS upgrade software | 11/30/03 |



- 3.HPC reports (a trip report of FSL recommendations on CWB HPC procurement and a short working report to discuss the initial NFS porting effort) 11/30/03
- 4.Satellite data receiving system consultation 11/30/03

3.0- Schedule

Functions	Milestones
1.Provide LAPS II software with hot start model	12/03
2.Provide an initial WDSS including QPE-SUMS, and Vflo model	12/03
3.Provide SCAN software and initial short-term QPF	12/03
4.Provide HPC technical support and relevant document and technical support on WINS II	12/03

Schedule by Month

TASKS	1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1
_____	—	—	—	—	—	—	—	—	—	—	—	—

Task 1

(LAPS)

LAP II and MM5 with hot start →

Provide training and document →

Task 2

(WDSS)

Initial V- →



flo model
and QPESU-
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Provide t-
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Task 3

(Forecast
Assistant
system)

Initial S-
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support on
WINS II



Task 4

(interac-
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arlier ro-
jects)



Provide HPC
technical
support



4.0 Budget

The following are the estimated costs for Implementing Arrangement #15

Tasks	Personnel	Travel/Training	Total
Task #1	\$ 150,000	\$ 20,000	\$ 170,000
Task #2	\$ 320,000	\$ 30,000	\$ 350,000
Task #3	\$ 270,000	\$ 20,000	\$ 290,000
Task #4	\$ 70,000	\$ 20,000	\$ 90,000
Total	\$ 180,000	\$ 90,000	\$ 900,000

As stated in Implementing Arrangement #15, the funds available from CWB and the WRA (Water Resources Agency) to support the tasks, traveling and meeting expenses described in this Statement of Work, will be a total of US\$ 900,000, of which US\$650,000 will be provided by CWB and \$250,000 by WRA. 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 EY91, a facility charge has been applied to all programs to cover management and administrative costs as well as the use of the FSL facility and all associated equipment and data.

FSL staff time is charged at the employee's salary plus the nor-



mal NOAA benefit, leave, and overhead charges. FSL professional staff people are primarily in the civil service grade scales of GS-11 to GS-14. Contract staff is in equivalent categories. 5.0 CWB Joint Team Assignments at FSL and NSSL Several tasks require CWB staff in residence at FSL and NSSL. The primary effort of CWB staff at FSL/NSSL during the Implementing Arrangement #15 period will be directed toward developing the LAPS hot start software, QPE-SUMS and short term QPF.

It is important that two or three CWB staff members be available to work at FSL and

NSSL facilities during the period. Specific assignments will be made to most efficiently use the available personnel resources. Assignments for the CWB staff members would be as follows:

- Development of the LAPS software and short term QPF (at FSL)
- Development of decision tools (SCAN) (at FSL)
- Development of the WDSS model (at NSSL).