

法規名稱：(終)IMPLEMENTING ARRANGEMENT #14 CONTINUING DEVELOPMENT OF THE LOCAL ANALYSIS AND PREDICTION SYSTEM 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 SYSTEM DEVELOPMENT

終止日期：民國 91 年 12 月 31 日

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

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

A 15 U.S.C. §§1525-1526, the DOC Joint Project Authority, whi-

ch provides the 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 #14 the FSL-CWB joint team will focus on four ongoing tasks. The four ongoing tasks are: 1) the Local Analysis and Prediction System (LAPS), which 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, and 4) continuing interaction on earlier cooperative projects. These cooperative activities, described in more detail in the Statement of Work, w-

will include the following four tasks:

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

FSL and CWB have developed basic LAPS analysis capability at CWB during Implementing Arrangement #13. For Implementing Arrangement #14, FSL will continue working on the analysis of remote sensing data and start the prediction part of the LAPS. FSL will apply the "hot start" technique using the balanced LAPS analysis on a forecast model for a Taiwan LAPS domain. FSL also will provide LAPS training and technical support during the running of LAPS at CWB.

Task #2 Warning Decision Support System (WDSS)

NSSL will lead the effort of the development of a warning decision support system for CWB. The WDSS consists of four components: 1) data integration and 3 - D mosaics, 2) quantitative precipitation estimation, 3) basin delineation, and 4) distributive hydrological model.

During IA #14, NSSL will focus on implementing an initial WDSS and Qflow system. It consists of rapid prototyping and development of the Qflow system. The QPE-SUMS (Quantitative Precipitation Estimation and Segregation Using Multiple Sensors) precipitation estimates will be input to the model and basin hydrographs simulation. This test will identify real-time simulation issues and operational needs. The real-time model testing, basin calibration, distributed flood level criteria development, and operational implementation will follow over the next three years.

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 the advantage of AWIPS' evolution path. FSL will support upgrading WINS II with AWIPS 5.2 Linux and provide the necessary training.

FSL and CWB will also integrate the GIS terrain database which will be available as part of Task #2. The important GIS background map display will provide forecasters with another dimension of viewing capability by combining the weather data with map backgrounds, watersheds and impact features.

FSL and CWB will integrate the outputs from QPE-SUMS as part of WINS II system. This is an initial SCAN (System for Convective Analysis and Nowcasting) related work. SCAN is an integrated suite of applications which detects, analyzes and monitors convection and generates short-term probabilistic forecast and warning guidance for severe weather and flash flood. For example, FFMP is the Flash Flood Monitoring and Prediction component of SCAN, which is provided by the current AWIPS (Build 5.1.2) workstation .

FSL will continue to provide training of CWB forecasters on the use of the AWIPS system including LAPS products, new features of AWIPS 5.2, and the GFE (Graphical Forecast Editor) of the Interactive Forecast Preparation technique (IFP). FSL will also provide technical support on D3D and GFE software customization to CWB, so that CWB can include these two 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, fore-

caster 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 by U.S. \$ 600,000.00. 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.

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, 2002.

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

FOR THE AMERICAN INSTITUTE IN
TAIWAN

Lyushun Shen
Deputy Representative

Barbara Schrage
Deputy managing Director

Date

Date

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 #14 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.

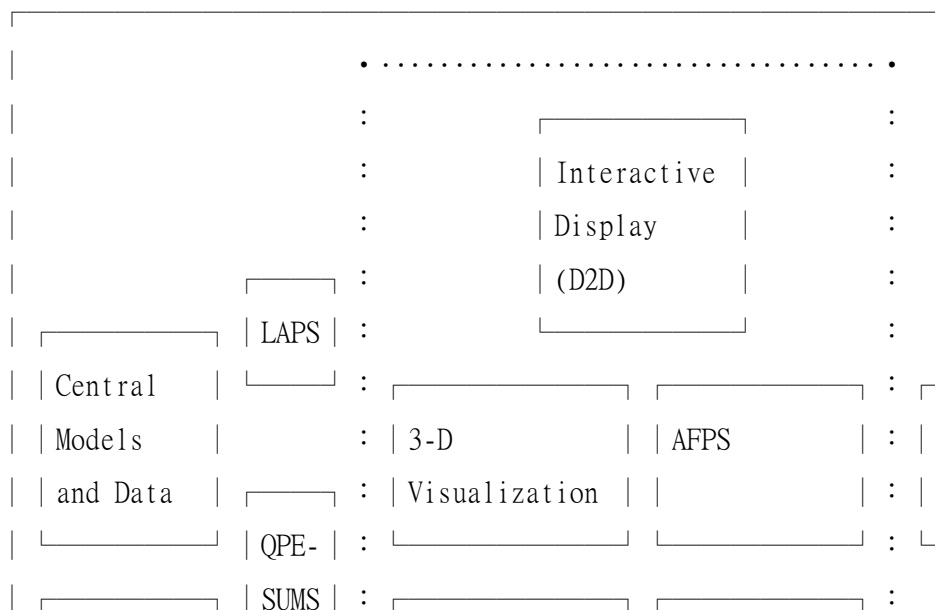
The WFO-Advanced system is a realization of the generic FX-Adva-

nced (FSL X-window Advanced) system. Figure 1 illustrates the WFO-Advanced components:

- National and local data feeds
- FSL's Local Analysis and Prediction System (LAPS)
- Quantitative Precipitation Estimation and Segregation Using Multiple Sensors (QPE-SUMS)
- Geographic Information System (GIS) data
- The interactive display system (D2D)
- The AWIPS Forecast Preparation System (AFPS)
- 3-D visualization
- Hydrological applications developed the NWS Office of Hydrology
- A component that contains General X applications
- Local Data Acquisition and Dissemination System (LDAD)

The QPE-SUMS is new component included as part of a new development of a warning decision support system during Implementing Arrangement # 14.

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.



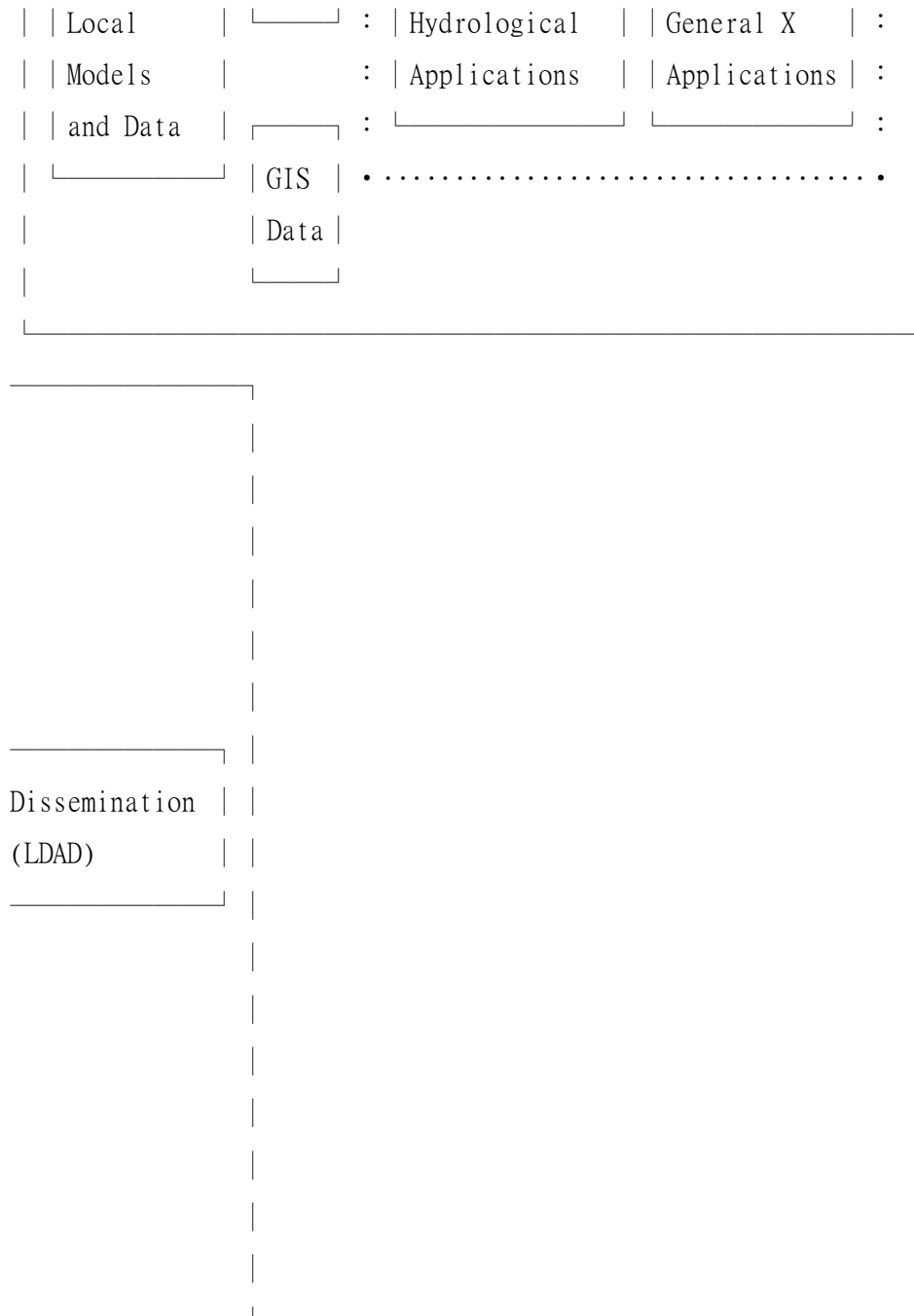


Figure 1 WFO-Advanced

Tasks will be undertaken by the FSL-CWB Joint TEAM working at the 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 for 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 #14 It describes the performance-

nce 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, 2002, 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 Predication System (LAPS)(25 %)
- Task #2 - Warning Decision Support System (WDSS) (40%)
- Task #3 - Forecast Assistant System (30 %)
- Task #4 - Continuing interaction on earlier cooperation projects (5 %)

These four tasks are described in more detail below.

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

The Local Analysis and Prediction System performs high - resolution analyses and forecasts of the weather using both locally and centrally available observations.

LAPS is a resizable, relocatable system that utilizes a wide range of meteorological data, and near universal UNIX portability. FSL and CWB have developed basic LAPS analysis capability at CWB during Implementing Arrangement #13. The LAPS analyses include remote sensing data of narrowband radar, wideband radar the GMS satellite for both IR data and visible data. Other data such as RAOBs, ACARS and cloud-drift winds were also included in the LAPS analyses. Providing improvement and refinement to the cloud analysis are critical parts of the planned modeling implementation.

For Implementing Arrangement #14, FSL will continue working on the analysis of remote sensing data from satellite and radars and start the prediction part of the LAPS. With the LAPS cloud analysis at CWB there is an opportunity for diabatic initializati-

ion using a mesoscale model. Work at FSL with the MM5 model has demonstrated the value of starting the model with existing LAPS clouds and precipitation. This initial condition is termed "hot start" referring to latent heat generating processes present in the initial condition at model start time. Work in the US has shown that the model does not need to spin-up precipitation and therefore predicts weather more accurately in the first 6 hours. FSL will apply the hot start technique using the balanced LAPS analysis on a forecast model for a Taiwan LAPS domain. FSL also will provide LAPS training, documentation and technical support during the running of LAPS at CWB.

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

Performance Period:

- | | |
|---|-----------------|
| 1 Complete hot start demonstration (run at FSL) | 1/1/02-12/30/02 |
| 2 Continue LAPS II analysis | 1/1/02-12/30/02 |
| 3 Provide LAPS user training, and documentation | 7/1/02-12/30/02 |

Resources Required: 25 % FSL/CWB Joint Team

Deliverables:

- | | |
|--|----------|
| 1 Improved cloud and precipitation analysis | 11/30/02 |
| 2 LAPS II and MM5 model software with hot start, code ported | 11/30/02 |
| 3 LAPS training materials | 11/30/02 |

Task #2 - Warning decision support System (WDSS)

NSSL will lead the effort of the development of a warning decision support system for CWB. The WDSS is a suite of advanced algorithms and models that utilize radar and satellite data, integr-

ated with other weather sensor data (e.g., rain gauge, lightning, surface data, satellite imagery) to provide hydrological guidance in addition to identification of severe weather for short term forecasting and warnings.

The WDSS consists of four components: 1) data integrating and 3-D mosaics, 2) quantitative precipitation estimation, 3) basin delineation, and 4) distributive hydrological model.

During IA #14, NSSL will focus on implementing an initial WDSS and Qflow system. It consists of rapid prototyping and development of the Qflow system. The Qflow is a distributive hydrological run-off model using QPE-SUMS results. The QPE-SUMS (Quantitative Precipitation Estimation and Segregation Using Multiple Sensors) algorithm Utilizes a multi-sensor approach to generate improved

precipitation estimates and subsequently the identification of conditions leading to flash floods. The QPE-SUMS will be input to the model and basin hydrographs simulation. This test will identify real-time simulation issues and operational needs.

The real-time model testing, basin calibration, distributed flood level criteria development, and operational implementation will follow over the next three years.

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

Performance Period:

1 Data integration and 3-D mosaics	1/1/02-12/30/02
2 Quantitative precipitation estimation	1/1/02-12/30/02
3 Basin Delineation	1/1/02-12/30/02
4 Distributive hydrological model	1/1/02-12/30/02
5 Training for Qflow application	1/1/02-12/30/02
6 Forecast system design	1/1/02-12/30/02
7 Model verification	1/1/02-12/30/02

Resources Required:

40 % NSSL/CWB Joint Team

Deliverables:

1 Initial Qflow model	11/30/02
2 Initial QPE-SUMS	11/30/02
3 3-D mosaice and radar QC software	11/30/02

Task #3 - Forecast Assistant System

FSL and CWB will continue to enhance CWB's current forecast workstation, the Weather Integration and Nowcasting System (WINS II), to take advantage of AWIPS' evolution path. FSL will support upgrading WINS II with AWIPS 5.2 Linux and provide necessary training.

FSL and CWB will integrate the outputs from QPE-SUMS as part of the WINS II system. This is an initial SCAN (System for Convective Analysis and Nowcasting) related work. SCAN is an integrated suite of applications which detects, analyzes and monitors convection and generates short-term probabilistic forecast and warning guidance for severe weather and flash flood.

FSL will continue to provide training of CWB forecasters on the use of the upgraded AWIPS system including LAPS products, new features of AWIPS 5.2, and the GFE (Graphical Forecast Editor) of the Interactive Forecast Preparation technique (IFP). FSL will also provide technical support on D3D and GFE software customization to CWB so these two components can be included as part of WINS II.

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

Performance Period:

1 Upgrade WINS with AWIPS 5.2	1/1/02-12/30/02
2 Integrate QPE-SUMS	1/1/02-12/30/02

- 3 Provide D3D and GFE customization support 1/1/02-12/30/02
- 4 Provide forecaster training of AWIPS including 9/30/02-12/30/02
GFE

Resources Required: 30% FSL/CWB Joint Team

Deliverables:

- 1 AWIPS software 11/30/02
- 2 QPE-SUMS component 11/30/02
- 3 D3D and GFE software 11/30/02
- 4 AWIPS/GFE training material 11/30/02

Task #4 - Continuing interaction on earlier cooperative projects

During the Implementing Arrangement #13 period, several earlier cooperative projects were completed and technology has been transferred successfully and is being used operationally at CWB. Examples of these earlier cooperative projects are the WFO-Advanced workstation and data assimilation. This task will allow continuing interaction in these mentioned areas at an "appropriate" level, plus forecaster training, exchange of short-term visitors, 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 1/1/02-12/30/02

Resources Required: 5 % FSL/CWB Joint Team

Deliverables:



1 Relevant documents, reports and electronic information	(as needed)
2 3DVAR software	11/30/02
3 FX-Net software	11/30/02

3.0-Schedule

Functions	Milestones
1 Provide LAPS II software with hot start model	12/02
2 Provide Qflow model as an initial WDSS	12/02
3 Provide update AWIPS software with QPE-SUMS	12/02
4 Provide relevant document and update release of 3DVAR software	12/02

	Schedule by month											
	1	2	3	4	5	6	7	8	9	10	11	12
	/	/	/	/	/	/	/	/	/	/	/	/
TASKS	1	1	1	1	1	1	1	1	1	1	1	1

Task 1 (LAPS) →

LAP II and MM5
with hot start
Provide train-
ing and docum-
ent

→

Task 2 (WDSS)

Complete Qflow
model

Provide train- →

ing and docum-
ent

Task 3 (Forec-
ast Assistant
system)

Upgrade AWIPS

with

QPE-SUMS

Provide train-
ing and docum-
ent

Task 4 (inter-
action on ear-
lier projects)

4.0 Budget

The following are the estimated costs for Implementing Arrangem-
ent #14

Tasks	Personnel	Travel/Training	Total
Task #1	\$130,000	\$ 20,000	\$150,000
Task #2	\$220,000	\$ 30,000	\$250,000
Task #3	\$150,000	\$ 20,000	\$170,000
Task #4	\$ 25,000	\$ 5,000	\$ 30,000
Total	\$525,000	\$ 75,000	\$600,000

As stated in Implementing Arrangement #14, the funds available from CWB to support the tasks, traveling and meeting expenses described in this Statement of Work, will be US\$ 600,000. 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 FY91, 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 normal NOAA benefit, leave, and overhead charges. FSL professional staff 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 #14 period will be directed toward developing the LAPS hot start software and QPE-SUMS. It is important that one or two CWB staff members be available to work at FSL and NSSL facilities during the period. In addition, two WRA (Weather Resources Agency) staff and one WRA consultant will visit NSSL to study and investigate the Qflow model. This activity is supported by a separate WRA budget. 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 (at FSL)
- Development of the WDSS model (at NSSL).