

法規名稱：IMPLEMENTING ARRANGEMENT #26 DEVELOPMENT OF A HAZARDOUS WEATHER MONITORING AND FORECAST 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

簽訂日期：民國 103 年 08 月 18 日

生效日期：民國 103 年 08 月 18 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 Global System Division (GSD), (formally the Forecast Systems Laboratory) of the Earth System Research Laboratory (ESRL) 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 the Central Weather Bureau (CWB), the designated representative of the Taipei Economic and Cultural Representative Office in the United States (TECRO), and AIT ' s designated representative, NOAA/ESRL/GSD. This Implementing Arrangement is of mutual interest to both TECRO and AIT, hereafter referred to as the parties. The products of this Implementing Arrangement will provide substantial value through development of new and upgraded capabilities and applications that can be integrated into other NOAA/ESRL/GSD systems.

Article II

Authorities

The activities described in this Implementing Arrangement will be carried out under and is subject to the general terms and conditions established by 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 (TECRO-AIT Agreement), signed by all parties as of March 06, 2012, and any subsequent revision as agreed to by the parties. This Implementing Arrangement is the twenty-sixth such arrangement under a succession of umbrella agreements between TECRO and AIT.

Article III

Services

During the period of Implementing Arrangement #26 (IA #26), TECRO ' s and AIT ' s designated representatives respectively, the Taiwan Central Weather Bureau (CWB) and NOAA/ESRL/GSD, have started a new phase V program on hazardous weather monitoring and forecasting. Therefore the NOAA/ESRL/GSD-CWB joint team will expand work to address this hazardous weather theme. Six tasks are identified: (1) Development and improvement of satellite products for tropical storm monitoring and prediction; (2) High-Resolution Quantitative Precipitation Estimation and Quantitative Precipitation Forecast (HRQ2) Applications Improvement; (3) Enhancement of Nowcasting Decision Assistance Tools; (4) Development of High-Resolution Product Generation Assistance Tools for AWIPS II; (5) Development of intra-seasonal to inter-annual climate monitoring and forecast; and (6) Continuing Interaction on earlier cooperative projects. Tasks under this Implementing Arrangement range from full scale developmental collaboration to system upgrades and support that allow systems to operate with the latest technical and scientific capabilities and specifications. These ongoing activities, described in more detail in the Statement of Work, will include the following six tasks:

Task #1 - Development and Improvement of Satellite Products for Tropical Storm Monitoring and Prediction

During IA #26, AIT ' s designated representative, NOAA/ESRL/GSD, has agreed that STAR/SMCD will lead



this task. NOAA/STAR/SMCD will continue providing near real-time polar orbiting satellite global 1b radiance and products data from AMSU-A and MHS onboard NOAA-18, NOAA-19, MetOp-A, MetOp-B and MetOp-B satellites. Also STAR/SMCD will provide SSMIS onboard DMSP F16, F17, F18, blended TPW products, MetOp-A ASCAT winds products, WindSAT wind products and Global Data Assimilation System (GDAS) gridded data for MiRS. Remote technical support will be provided for satellite 1b data recovery.

For Microwave Integrated Retrieval System (MiRS), STAR/SMCD will provide an updated MiRS package and documentation for multiple satellite product retrieval and on-site or remote technical support for MiRS implementation.

STAR/SMCD will continue the effort to implement the HWRF satellite data assimilation system for the Pacific region during IA #26. It includes an updated HWRF package and technical support and documentation on upgraded systems, on-site or remote technical support for HWRF implementation and direct broadcast ATMS BUFR data for HWRF. Two CWB staff will visit STAR/SMCD for evaluation of HWRF performance, polar orbit satellite data assimilation and community radiative transfer application.

Task #2 - High-Resolution Quantitative Precipitation Estimation and Quantitative Precipitation Forecast (HRQ2) Applications Improvement

During IA #26, AIT ' s designated representative, NOAA/ESRL/GSD, has agreed that NOAA/NSSL (National Severe Storms Laboratory) will continue research



towards maintenance, refinement, and improvement of the High-Resolution Quantitative Precipitation Estimation and Quantitative Precipitation Forecast (HRQ2) applications required for TECRO ' s designated representatives, CWB, the Water Resources Agency (WRA), and the Soil and Water Conservation Bureau (SWCB).

This task will include integration of two new radars: one RCWF polarimetric radar, and one Japanese C-band single-pole radar at the Ishigaki-jima island which is about 200 km east of Taiwan. For the RCWF radar data, NSSL will test polarimetric radar algorithms and integrate QPE into QPESUMS, and also integrate RCWF hydrometeor classification into the 3D mosaic. For the Japanese radar data, NSSL will decode the data and develop reference data sets, and integrate the data into a reflectivity mosaic and QPESUMS.

NOAA/NSSL will make available to TECRO ' s designated representative, CWB, as requested, software source code for the integration of the new polarimetric RCWF data and the Japanese radar into the QPESUMS.

NOAA/NSSL will also make available to CWB, as requested, the implementation of the aforementioned modules in the real-time HRQ2 system as part of QPESUMS technical support.

Task #3 - Enhance of Nowcasting Decision Assistance Tools

As part of IA#26, AIT ' s designated representative, NOAA/ESRL/GSD, has agreed that MDL will continue to provide technical support and training to TECRO ' s designated representative, CWB, to enhance CWB ' s WINS in the area of nowcasting decision assistance



tools that have already been implemented. This support includes source code modification and configuration appropriate for CWB's use of the tools which have been already ported.

After customizing most of MDL's decision assistance tools, the implementation of FFMP (Flash Flood Monitoring and Prediction) on WINS became one of the major tasks during IA #25. FFMP conducts precipitation analyses over the area of small basins and thus is an integrated suite of multi-sensor applications which detect, analyze, and monitor precipitation and generate short-term warning guidance for flash flooding automatically. During IA #25, the MDL assisted the CWB in customizing FFMP to process and display various data sources such as radar Digital Hybrid Reflectivity (DHR), SCAN (System for Convection Analysis and Nowcasting) QPF, sampled Flash Flood (FFG), CWB 's QPESUM data and rain gauge observations. During IA #26, the MDL will continue to provide the CWB with more thorough customization and training support on MDL 's decision assistance tools, especially on FFMP to support its operational use at CWB 's Forecast Center.

During IA #26, the second task will be to provide CWB 's Meteorological Satellite Center (MSC) with software and training so that MSC can tune CWB 's ANC (AutoNowCaster) automatically in a flexible and timely manner. Tuning ANC automatically involves choosing data sets, employing an objective forecast verification technique, and devising a fitness function to create forecasts using weights iteratively generated by the genetic algorithm. Automatic tuning is done in a fraction of the time that it takes



experts to analyze the data and tune the weights manually.

In the past, CWB used ANC to provide objective guidance for the prediction of afternoon thunderstorms in northern Taiwan during the warm season and found that there was a tendency for the forecasters to over-forecast the number of days on which afternoon thunderstorms actually occurred. To improve CWB's forecast of convective storm initiation and evolution during a field experiment in northern Taiwan, MSC wants to learn the automatic ANC tuning methodology.

Task #4 - Development of High-Resolution Product Generation Assistance Tools for AWIPS II

The National Weather Service (NWS) has been developing AWIPS II for several years. This replacement for the original AWIPS (the basis of the current CWB Weather Integration and Nowcasting System (WINS) tools) is intended to provide essentially the same appearance and function (“ look and feel ”)to reduce the need for extensive forecaster training. The underlying software is written largely in Java and loosely follows a services-oriented architecture (SOA) design.

During IA#25, AIT's designated representative, NOAA/ESRL/GSD, received permission from NWS to provide an evaluation copy of the AWIPS II software to CWB. GSD also provided training for CWB developers in how to navigate the AWIPS II software repository and how to write plugins to add function to the baseline code.

For IA#26, GSD will continue to support CWB developers by providing updated versions of the software. GSD



will do a test installation and configuration before sending updates to CWB, provide support to CWB staff in setting up the new versions, and prepare and deliver additional training on site in Taipei.

AIT's designated representative, NOAA/ESRL/GSD, has developed for AWIPS II a CAVE (Common AWIPS Visualization Environment) Annotation Tool (CAT) that allows NWS forecasters to create and save drawings, including graphics such as Nowcasts and weather stories to publish on the web. NOAA/ESRL/GSD will assist a CWB visiting scientist in understanding the AWIPS II architecture to begin to extend CAT to support CWB's annotation requirements.

During IA#26, AIT's designated representative, NOAA/ESRL/GSD, will provide technical support for the Graphical Forecast Editor (GFE), GFE Smart Tools (techniques to automate or semi-automate grid editing), and the text formatters (TF) used in CWB's Forecast Information Editing System (FIES).

In conjunction with NWS, NOAA/ESRL/GSD continues to work on improvements in Smart Tools, and is developing new forecast monitoring and ensemble-based forecast support tools. NOAA/ESRL/GSD will prepare and provide on-site GFE training for CWB forecasters. GSD also anticipates hosting a visitor from CWB in 2014 who will participate in this work, thus gaining experience and expertise that will apply to FIES improvements and adaptation for AWIPS II.

NOAA/ESRL/GSD will continue to support CWB's development and customization of BOIVerify by facilitating interaction between visiting CWB

forecasters and developers and users of the software.

Task #5 - Development of Intra-seasonal to Inter-annual Climate Monitoring and Forecast

During IA #26, AIT ' s designated representative, NOAA/ESRL/GSD, has agreed that NWS/NCEP ' s (National Centers of Environmental Prediction) /Climate Prediction Center (CPC) and Environmental Modeling Center (EMC) will lead this task. NCEP will continue to support CWB in advancing the monitoring and forecast capabilities, in particular for the intraseasonal to interannual time scales.

Meteorological services around the world all are facing the emerging requirements for providing, and improving, climate services. The services subjects could range from providing extended range forecasts, historical data, hazard outlooks, to tailored derivative information requested by government agencies and industrial sectors for national interests. It mandates the meteorological services, such as CWB, to layout a new strategic plan, developing new capabilities in human talents, absorbing scientific discoveries, devising new tools, and implementing technical advances.

During IA #26, NOAA will continue to assist CWB in developing climate services capabilities, by 1) providing training through NCEP ' s International Monsoon Training Desk Program; 2) providing planning and scientific expertise to the Taiwan-West Pacific Climate Forecast System (TWPCFS) Workshop; and 3) Assisting and facilitating CWB professionals to attend scientific conferences and meetings in the US.

Task #6 - 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 the facilities of TECRO ' s designated representative, CWB. The task for AIT ' s designated representative, NOAA/ESRL/GSD, in this area is the development of new tools that extend and enhance the forecast applications. Further NOAA/ESRL/GSD interaction with CWB is critical to keep CWB staff up to date on current AWIPS II developments. This task will directly improve and update CWB ' s current forecast assistant and decision making systems at appropriate levels, including ALPS (AWIPS Linux Prototype System) which is an upgrade of AWIPS with ensemble forecast products.

NOAA/ESRL/GSD has U.S. export control approval to provide CWB with AWIPS II software as released by the contractor. The software was first made available to CWB in 2013. During IA #26, NOAA/ESRL/GSD will continue provide updated versions and training to CWB visiting scientists on the new AWIPS II extended/enhanced forecaster applications such as GFE improvements and Collaboration that are being developed by NOAA/ESRL/GSD.

NOAA/ESRL/GSD will continue to provide the NOAAPORT data feed and data transmission support for CWB ' s data assimilation and forecasting purposes during IA #26. This continuing interaction task will benefit TECRO ' s designated representative, CWB, with the updated knowledge of the forecast assistant and decision making systems developed at NOAA including

AWIPS II. Throughout the period of IA #26, NOAA/ESRL/GSD will provide necessary training and support to CWB visitors and forecasters, continue the exchange of visits, provide necessary papers and reports, attend annual meetings, and continue e-mail interactions, as applicable.

Article IV

Responsibilities of AIT

In addition to participation in the joint project team, AIT, through its designated representative, NOAA/ESRL/GSD, shall:

- A. Provide overall coordination project activities at the NOAA/ESRL/GSD facility in Boulder, Colorado;
- B. Provide administrative support for preparing reports for delivery to TECRO ' s designated representative, CWB, in accordance with this Implementing Arrangement;
- C. Assign appropriate staff to perform the activities defined in this Implementing Arrangement and provide support in accordance with the terms of the umbrella agreement; and
- D. Fulfill its responsibilities under the Statement of Work for Implementing Arrangement #26.

Article V

Responsibilities of TECRO

In addition to participation in the joint project team, TECRO through its designated representative, CWB, shall:

- A. Provide overall coordination project activities at the CWB facility;
- B. Assign appropriate staff to perform the activities defined in this Implementing Arrangement and provide support in accordance with the terms of the umbrella agreement; and
- C. Fulfill its responsibilities under the Statement of Work for Implementing Arrangement #26.

Article VI

Financial Provisions

In accordance with the TECRO-AIT Agreement, TECRO is required to reimburse AIT for all costs incurred by AIT ' s designated representative, NOAA/ESRL/GSD, in association with the project covered by this Implementing Arrangement. AIT shall transfer to NOAA/ESRL/GSD all payments made by TECRO to AIT for costs incurred by NOAA/ESRL/GSD in association with this Implementing Arrangement.

The total cost for activities described in this Implementing Arrangement is mutually agreed to be U.S. \$1,173,000. 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, to the extent that funds for this purpose have been provided by TECRO.

NOAA Information

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The performance by AIT ' s designated representative, NOAA/ESRL/GSD, of activities under this Implementing Arrangement is subject to the availability of funds.

Article VII

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 forecast system of AIT's designated representative's, NOAA/ESRL/GSD, 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 VIII

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, 2014, and the termination date of this Implementing Arrangement is June 30, 2015

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

FOR THE
AMERICAN
INSTITUTE IN
TAIWAN

Anne Hung
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Aug 18, 2014

June 6, 2014

Date

Date