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Progress Reports for Period August 1-31, 1995
Joint UK/US Radar Program

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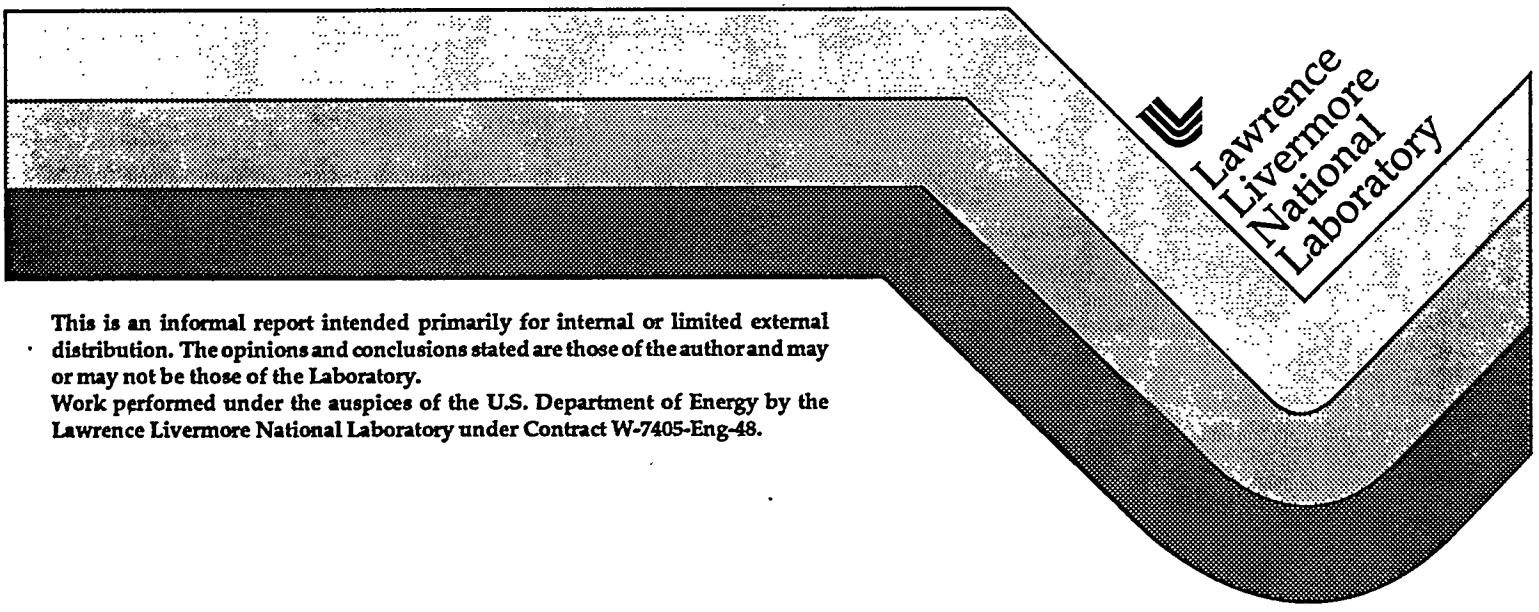

Progress Reports for period August 1-31, 1995

Joint UK/US Radar Program 9/20/95

Organization: LLNL
Program: P.LLN.1010 Airborne RAR/SAR
Principal Investigator: Rodney D. Kiefer

Current Objectives:
Modify Hughes x-band radar for airborne implementation.
Upgrade to polarimetry, high-power, and add SLAR mode.
Deploy in UK/US field experiments as needed.

Recent accomplishments:
A one page brochure summarizing the overall airborne test-bed specifications is being put together. The brochure will include a listing of the general (Hughes' A-3) aircraft, test-bed and SAR system specifications plus pictures and is scheduled to be completed in the October-November time frame.

Additional discussions were held with ETL in preparation for our participation in the Coastal Ocean Probe Experiment (COPE) off the Northern coast of Oregon in mid to late September. The airborne test-bed aircraft is scheduled to base and conduct flight operations out of Whidbey Naval Air Station (NAS) near Oak Harbor, Washington. Two or three data collection flights are being planned.

Minor modifications were made to the SAR navigation software and a short data collection flight was flown over the Bakersfield area in Southern California to further refine the characterization of the antenna gimbal stability. An upgrade to the navigation & real-time processing capability is being explored for FY96 to incorporate additional motion compensation capabilities.

Milestones for the reporting period:
None
Expected milestones for the ensuing period:
None
Other Issues:
None
Planned expenditures versus actuals:

FY95 Budget Plan:	$1500K
August 95 costs:	$-173.4K *
Year-to-date costs:	$1322.1K

* Note - Hughes costs from prior months have been backed out by LLNL procurement department — they are now liened but not costed pending LLNL approval of work.

Organization: LLNL

Program: P.LLN.1020 Radar Data Processor

Principal Investigator: James M. Brase

Current Objectives:
Integration and test of the real-time SAR processor for the Hughes airborne radar; define and develop the SAR Doppler and related analysis software for this unique system; develop the similar system for the UK testbed (OITB).

Recent accomplishments:
The major activities are implementation of a full resolution off-line processing mode and initial definition of an RDP version for the UK Experimental Surveillance Radar (ESR). Operation of the full-resolution mode was demonstrated in August, subsequently the system had to be returned to the AETB aircraft in preparation for COPE. Processing of AUTEC data will resume following COPE.

A preliminary interface definition and development plan was prepared for the UK ESR system. This will be discussed with DRA Malvern at our September meeting and finalized by October.

Milestones for the reporting period:
Demonstration of ground-based full-resolution SAR processing with RDP.

Expected milestones for the ensuing period:
Resumption of full-resolution processing after COPE (Sept.)
Meet with UK to discuss ESR RDP implementation
Establish final interface and development plan for ESR RDP (Oct.)

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$750K
August 95 costs:	$25.7K
Year-to-date costs:	$528.4K

Organization: LLNL

Program: P.LLN.1030 Ground-based SAR Signal Processing Workstation

Principal Investigator: James M. Brase

Current Objectives:
Develop capabilities for motion compensation and autofocus for Hughes SAR and UK system. Enhance SAR processors with multi-look software. Analyze the low-grazing angle (LGA) processing steps and improve performance of LGA processing.

Recent accomplishments:
Our major continuing activities are development of PSAR with full motion compensation and development of software for LGA image enhancement and analysis. In PSAR development we have completed the AETB SAR input interface, did demonstrated range compression. The full motion compensation algorithms have been designed and tested. The major remaining tables are incorporation of the motion compensation algorithms into the PSAR code and implementation of frequency domain azimuth compression.

In August we implemented a new program to display target tracks and radar footprints on images for the July AUTEC experiment. One of these maps will be produced for each reconstructed image.

Work on processing of LGA imagery is continuing. An informal signal processing group meeting was held at SMS on Aug. 24 where several potential new approaches to image enhancement software were discussed.

A meeting report is being prepared at SMS.

Milestones for the reporting period:
Map generation software completed.

Expected milestones for the ensuing period:
Operational demonstration of map production software (Sept.)
Completion of azimuth correlation software for PSAR (Oct.)

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$750K
August 95 costs:	$19.3K
Year-to-date costs:	$331.5K

Organization: LLNL

Program: P.LLN.1040 Static Airborne Radar

Principal Investigator: Rodney D. Kiefer

Current Objectives:
Procure GFE excess equipment including aerostats, platforms, and ancillary systems. Perform checkout of hardware. Assess options for stabilized real-aperture radar experiments using these aerostats systems.

Recent accomplishments:
The refurbishment & reconfiguration of the aerostat ground stations and support enclosures continues although at a slower pace with vacations, etc. All three enclosures were painted inside. The electrical power distribution runs (conduit runs, circuit breaker panels, etc.) on the three enclosures are complete. The heat pumps, for heating and cooling, have been installed on all three shelters and verified to be operational. The operator consoles have been installed in the State of Health ground station. The shelter targeted for the State of Health hardware and the maintenance shelter are both nearing completion.

Received information from Mike Yelverton that they are looking into a new pedestal design for the mooring platform being stored in the Bollanger shipyard near New Orleans. The platform is scheduled to be mounted on one of the AUTEC ships later this fall when the ship comes out of dry-dock. Our plans call for this platform to serve as our East coast ship-board aerostat mooring platform for future AUTEC experiments.

A small group of Air Force Officers from NORAD involved in US Customs and counter-drug operations visited LLNL to discuss the status of the aerostat hardware and our operational capabilities.

Milestones for the reporting period:
None

Expected milestones for the ensuing period:
None

Other Issues:
None

Planned expenditures versus actuals:

FY95 Budget Plan:	$1000K
August 95 costs:	$147.8K
Year-to-date costs:	$855.1K

Organization: LLNL

Program: P.LLN.1050 **Multi-Aperture Space-Time Array Radar**

Principal Investigator: James M. Brase

Current Objectives:
Perform feasibility study and preliminary design of a multi-aperture radar for high resolution, in both range and azimuth, imaging of the ocean surface.

Recent accomplishments:
A report is being prepared which recommends that we propose to field U. Massachusetts FOPAIR (Focused Phased-Array Imaging Radar) at a field experiment in FY96. The system will provide high-resolution range-azimuth imagery with good temporal resolution. The principal objective is to evaluate the azimuth extent of scatterers which contribute to LGA scattering processes.

Milestones for the reporting period:
Chose FOPAIR as principal option for field experiments in FY96.
Report preparation begun.

Expected milestones for the ensuing period:
Report completed in Sept. 95.

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$200K
August 95 costs:	$0K
Year-to-date costs:	$1.8K

Organization: LLNL

Program: P.LLN.1060 Radar Field Experiments

Principal Investigator: David Mantrom

Current Objectives
Complete Project Overview Test Operations Report. Continue planning for LLNL participation in COPE Experiment.

Recent Accomplishments
Dave Mantrom completed final draft of Project Overview Test Operations Description Report. It is about 60 pages in length and contains numerous summary tables and photos and some sample data. This report will be distributed next month.

We are gearing up for a 3 day data collection with the AETB/SAR at COPE 14-16 September. The aircraft will be based at NAS Whidbey Island, Washington, about a 20 minute flight from the COPE site. We will fly multiple passes over FLIP (to be moored 13 miles offshore and be the platform for most of the sea-truth measurements) from different directions and we will fly nearer shore, parallel to the coastline where internal waves have been observed visually. We will fly once in the morning, once at mid-day, and once in the late afternoon to take advantage of any diurnal variability in tides and winds. Dave Mantrom has written a draft test plan document for LLNL's participation and sea-truth data requirements.

Milestones for the Reporting Period

Expected Milestones for Ensuing Period
Project Overview Test Operations Description Report
COPE data collection with AETB SAR

Other Issues

Planned expenditures vs. actual:

Budget Plan:	$2000K
August 95 costs:	$-197.8K *
Year-to-date costs:	$K

* Note - Hughes costs from prior months have been backed out by LLNL procurement department — they are now liened but not costed pending LLNL approval of work.

Organization: LLNL

Program: P.LLN.1070 Data Analysis and Detection Theory

Principal Investigator: James M. Brase

Current Objectives:
Complete baseline analysis of Loch Linnhe data.
Complete report on MTF for LGA data (1989-94 data sets).
Continue Doppler analysis and detection implications.
Analysis of UCSB data as it comes in.

Recent accomplishments:
The major activities for August were the following:

A database analysis was completed which looked at the consistency of favorable detection conditions with imaging results. A report is being written and the results will be presented at the DRA Malvern meeting in September.

A new detection approach based on non-gaussian statistical model has been developed based on the work begun with Dr. D. Middleton. It was initially presented at the August 24 SMS meeting and will be discussed at the DRA Malvern meeting. We are currently applying the algorithm to experimental data and beginning a systematic performance analysis.

Detection analysis of July AUTEC imagery is beginning and initial results will be ready by November.

Milestones for the reporting period:
Completed detection analysis of database.
Presented non-gaussian detection approach at SMS.

Expected milestones for the ensuing period:
Present detection analysis of database at DRA Malvern; complete report (Sept.)
Present non-gaussian detection approach at DRA Malvern (Sept.)
Complete detection analysis of AUTEC data (Nov.)

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$1100K
August 95 costs:	$70.4K
Year-to-date costs:	$1084.8K

Organization: LLNL

Program: P.LLN.1080 Management

Principal Investigator: Richard E. Twogood

Current Objectives:
Provide ongoing management oversight and support for the Joint UK/US Radar Program (Twogood) and staff support in Washington for the ASAP program office (Chocol), in addition to other consultant and management services (Wells, Manasse, etc.). All administrative support for UK/US program included (clerical, administrator, facilities).

Recent accomplishments:
All management functions for the UK/US Radar Program, plus the related functions and contract management, were successfully performed. Additional activities supported (principally Wells) at request of ASAP program manager. Planning and coordination for FY96 proposed work began in earnest. Preparation for a September meeting in the UK was performed.

Milestones for the reporting period:
None.

Expected milestones for the ensuing period:
Ongoing support to ISSO office by program office staff.

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$1100K
August 95 costs:	$107.1K
Year-to-date costs:	$1776.8K

Organization: LLNL

Program: P.LLN.1090 E-2C Radar Data Analysis

Principal Investigator: Charles Rino

Inputs to be provided separately to ISSO directly by Vista Research.

<u>Planned expenditures versus actuals:</u>

FY95 Budget Plan:	$100K
August 95 costs:	$0K
Year-to-date costs:	$100K

Organization: LLNL

Program: P.LLN.1110 Modeling and Analysis (LLNL)

Principal Investigator: David Chambers

Current Objectives:
Completion of report on environmental data collected at August experiment at AUTEC.
Preliminary analysis of Loch Linnhe image using model-based processing scheme.
Refinement of models of internal wave generation by turbulent wakes.

Recent accomplishments:
Finished development of two time-varying source models for internal wave generation by turbulent wakes. Both models agree well with both IAP and LLNL stratified tank data for towed spheres.

Milestones for the reporting period:
Development of first successful time-varying models of internal wave generation by turbulent wakes.

Expected milestones for the ensuing period:
Completion of environmental data report for August AUTEC experiment.

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$330K
August 95 costs:	$16.7K
Year-to-date costs:	$178.3K

Organization: LLNL

Program: P.LLN.1150 Modeling and Analysis (Vista)

Inputs to be provided to ISSO directly by Vista Research.

Planned expenditures versus actuals:
FY95 Budget Plan: $135K

Organization: LLNL

Program: P.LLN.1160 Vista Research

Inputs to be provided to ISSO directly by Vista Research.

<u>Planned expenditures versus actuals:</u>
FY95 Budget Plan: $135K

Organization: LLNL

Program: P.LLN.1170 Current Meter Array

Principal Investigator: David Mantrom

Current Objectives
Loch Linnhe '94 CMA data analysis and documentation

Recent Accomplishments
None. We chose not to participate in the poster session for the ERIM-sponsored conference, Third Thematic Conference on Remote Sensing for Marine and Coastal Environments due to a conflict with COPE data collection.

Milestones for the Reporting Period
None

Expected Milestones for Ensuing Period
None

Other Issues
None

Planned expenditures vs. actual:

FY95 Budget Plan:	$300K
August 95 costs:	$-0.3K (prior month adjustment)
Year-to-date costs:	$77.1K

Organization: LLNL

Program: P.LLN.1410 UCSB Wave Tank

Principal Investigator: James M. Brase

Current Objectives:
Continue hydro measurements program at UCSB.
Install radars in tank: initially UCSB's C-band and LLNL's existing wideband; later TRW's x-band. Conduct radar LGA experiments with simultaneous optical and hydro systems. Analyze and report on wave tank results.

Recent accomplishments:
Wind tunnel development has been completed and its performance characterized. Initial radar imagery from wind waves is qualitatively consistent with field data. The UCSB radar has been extended and tested at transmitter frequencies up to 86 Hz.

An initial design for the surface current generating "bump" has been completed. Permanent wave wire diagnostics have been installed. Interface work on the high speed diagnostic camera is continuing.

Milestones for the reporting period:
Initial radar imagery of characterized wind wave spectra was acquired.

Expected milestones for the ensuing period:
A report on breaking long waves experiments is being prepared by DRA Malvern, UCSB and LLNL (Oct.)

Other Issues:
No invoice from UCSB this month ($751.7 lien still exists).

Planned expenditures versus actuals:

FY95 Budget Plan:	$800K
August 95 costs:	$10.7K
Year-to-date costs:	$421.1K

Organization : LLNL

Program: P.LLN.1420 Stratified Flow Facilities

Principal Investigator: Harry Robey

Current Objectives:
Examine internal wave generation by a turbulent wake with an enlarged test section.

Recent Accomplishments:
No additional work was performed during the month of August.

Milestones for the reporting period:
None.

Expected Milestones for the ensuing period:
None.

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$200K
August 95 costs:	$0K
Year-to-date costs:	$186.2K

Organization: LLNL

Program: P.LLN.1430 Institute of Applied Physics, Russia

Principal Investigators: Harry Robey

Current Objectives:
At IAP, current emphasis is still on the last phase of the experiments, internal wave generation and propagation in a stratified flow with shear.

At LLNL, the current objective is now twofold. One objective is to document the work which has been done with the towed sphere experiments, and the other is to begin experiments on internal waves generated by ellipsoidal slender bodies.

Recent Accomplishments:
At IAP, the experiments on internal wave generation by a towed sphere in a shear environment are continuing and are nearly completed. The final report will probably be delivered in October.

At LLNL, a series of experiments aimed at repeating the initial IAP experiments has been completed using a 10cm sphere towed at a range of velocities. The results are in complete agreement with the IAP results. Numerical simulations of all experimental results have been done, and agreement between experiment and simulation are very good.

Milestones for the reporting period:
No specific milestones.

Expected Milestones for the ensuing period:
A report on the towed sphere experiments at LLNL should be nearly completed by the end of September.

Other Issues:
None.

Planned expenditures versus actuals:

FY95 Budget Plan:	$350K
August 95 costs:	$48.8K
Year-to-date costs:	$213.5K

Organization: LLNL

Program: P.LLN.1210 IR Sensor Systems

Principal Investigator: Jerry Belyea

Inputs to be provided to ISSO directly by ERIM.

Budget Status

We have received the $406K MIPR and are awaiting DOE approval. With that, sufficient funds are in hand to complete FY95 within the existing funds received.

This work was performed under the auspices of the Department of Energy by the Lawrence Livermore National Laboratory under contract W-7405-Eng-48.

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