

Paul Bienhoff and Jeffrey Smart
 Johns Hopkins University Applied Physics Laboratory,
 Laurel, Maryland, USA

1. INTRODUCTION

FAST TACTIC is a roll-on/roll-off laptop-based system to automatically collect, process/edit, and use operational and environmental data on-board a submarine or ship or other platform. It is designed to store, retrieve, and display ship-collected, historical, and gridded environmental data using a Java GUI and a relational database. New data may be compared to historical data from the same geographic area and time period. Fast Tactic performs the following tasks:

- Plot ownship, historical, and gridded-database vertical profile (point) data (e.g. from CTDs, XBTs, sound velocity sensors)
- Plot along-track data (e.g., sound velocity, bathymetry, sediment thickness, ice thickness)
- Compare ownship and historical data
- Generate statistics to determine if data are within normal bounds
- Automatically extract profiles when a submarine or UUV conducts a depth change

By providing access to all data acquired within a cruise, the user is able to synthesize a broad picture of a survey area. When a ship loiters in a particular region, the FAST TACTIC graphical displays enable the user to see how the environment changes over time and across the region. A *statistics* function summarizes environmental conditions for mission/cruise reports.

To date the system has been successfully installed on two US Navy submarines. In each

installation, ownship sensor data were automatically extracted from an existing local area network.

2. FAST TACTIC KEY CAPABILITIES

FAST TACTIC provides the following key capabilities:

- Easy access to and display of current and past data
- Automated data storage in a relational database (facilitates post-cruise data handoff)
- Comparison of various data sources is made simple
- Visual and numerical data presentation

Manipulation of FAST TACTIC displays is simple: selection of parameters for display on a chart/graph is made with the mouse, without typing on the keyboard.

3. PUBLIC DEMONSTRATION SYSTEM SOARED

A demonstration system, called the Submarine Operational And Research Environmental Database (SOARED) is provided at <http://wood.jhuapl.edu/soared> (Figure 1).

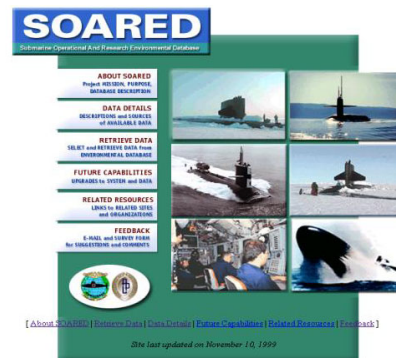


Figure 1. SOARED Home Page
 (<http://wood.jhuapl.edu/soared>)

* Corresponding author addresses: Paul Bienhoff, Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel MD 20723-6099; MS/24-W445; e-mail: paul.bienhoff@jhuapl.edu

** Jeffrey Smart, Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel MD 20723-6099; MS/8-314; e-mail: jeff.smart@jhuapl.edu

SOARED is populated with the following publicly-available datasets (Figures 2 and 3):

- Science Ice Exercise (SCICEX) '95 CTD Data
- National Oceanographic Data Center (NODC) Historical CTDs
- Generalized Digital Environmental Model (GDEM) Winter & Spring T, S, sound speed (Note – sub-sampled to a 30 nmi grid to compensate for the approach to the North Pole, where 5 minutes of longitude asymptote to zero nautical mile spacing)
- SCICEX '95 Bathymetry (sampled once/minute)
- SCICEX '96 Hi & Lo Resolution Ice Keel Data

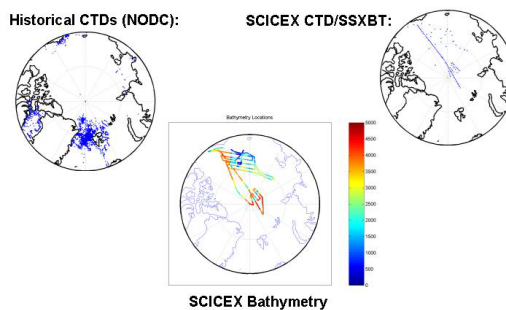


Figure 2 – SOARED Data Locations – CTD, SSXBT and Bathymetry

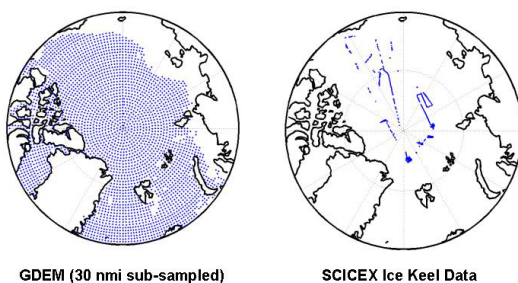


Figure 3 – SOARED Data Locations – GDEM, Ice Draft

The user can “click & drag” with the mouse to select the desired region, or type explicit latitude and longitude bounds into the numeric query screen (Figure 4).

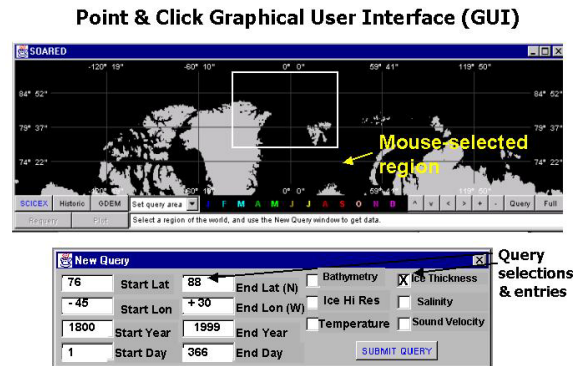


Figure 4 – Sample SOARED Query Screen

The concept for FAST TACTIC is that it be used as an environmental tool for evaluating conditions that affect submarine operational decisions. Its particular focus is for submarines operating under ice in the Arctic. The capability to examine ice draft data over a track or operating area for thin ice is considered to be a particularly useful feature – this feature will allow the submarine crew to quickly locate areas of thin ice where surfacing can be done safely (Figure 5).

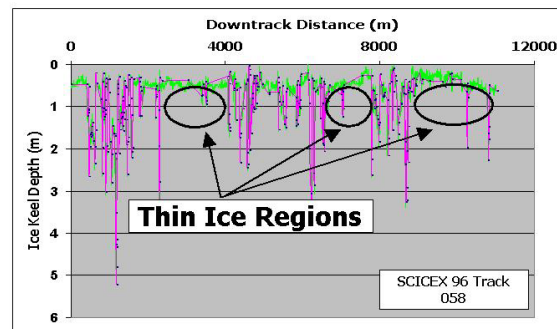


Figure 5 – Use of Ice draft data – Finding Surfaceable Features

3.1 SOARED Interface Features

The SOARED graphical user interface (GUI) is designed to facilitate access to the underlying database using simple mouse operations (Point, Click, and Drag). For example, defining a region is quickly and easily accomplished by using the “click and drag” technique. Additionally, various data display options are available by simply clicking a checkbox option. For example, by selecting the PLOTS option, a color-coded X-Y plot is automatically displayed on the screen.

When displaying multiple data parameters at once, each parameter can be removed from and returned to view by simply clicking on a toggle key. Similarly, individual depth profiles or along-track

data segments can be highlighted using the mouse: this capability allows one to quickly identify data and associated regions of special interest, such as thin or no ice cover locations.