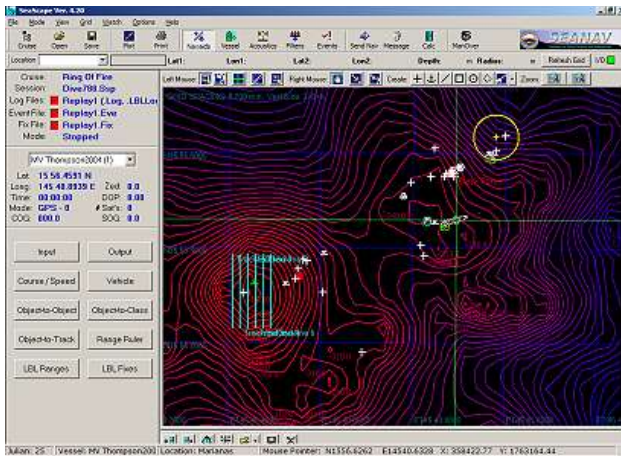




SeaScape tm

by Software Engineering Associates



Operations - SeaScape is designed to be the operational workhorse when navigating surface vessels and their submersibles with concurrent acoustic Long Baseline (LBL), UltraShort Baseline (USBL), Doppler Velocity Log (DVL) and GPS systems. It provides the navigator with powerful tools to productively unite a large team of people to achieve mission objectives. Resulting from over 15 man-years of work associated with deep-ocean ROV's, SeaScape has the nuts-and-bolts that serious navigators need to get their work done.

Mobilization – SeaScape is designed to be mobilized in minutes. Select your cruise, session and log file names, determine where you are on the planet, check and adjust your serial port settings, and connect your inputs and monitor your data while you begin regular navigation. Adjust your vessel dimensions and various offsets, etc. Setting up SeaScape itself for combined LBL, USBL and DVL operations normally takes experienced navigators less than an hour.

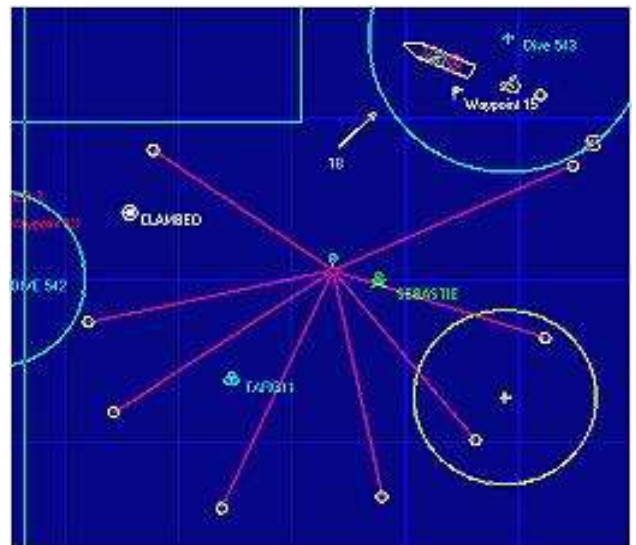
LBL Operations - SeaScape provides the navigator with unprecedented control of LBL operations from the deployment and calibration of up to 15 LBL bottom transponders to the navigation of up to 12 LBL relays. Hardware and software range gates, real-time ray path bending support, velocity and Kalman filters, track histories, custom shapes, sensor input, active LOP graphics, DXF CAD file displays, bathymetry contours....and more...are all standard features, including simultaneous support of USBL and DVL with no conflicts. And, dual vessels are supported, each with it's own complete object set

(e.g., dual LBL arrays, multiple USBL vehicles, DVL).

USBL Operations – support for IXSEA GAPS, SIMRAD HPR, ORE Trackpoint II and LXT, and custom input support for the three standard methods for range/bearing systems. USBL systems may possess their own attitude and position sensors or use the ship's for compensation. USBL op's are easily combined with LBL and DVL systems for truly advanced tracking.

DVL Operations – SeaScape automatically supports TRDI's Workhorse Navigator in PD-6 sentence output format. Features include complete initialization control, homing the DVL to any dynamic, associate object in the SeaScape system and the ability to display a DVL log file while generating one. Like LBL and USBL fix objects, the DVL object has it's own customizable symbol and/or special shape and generates snail trails.

Mooring Calibrations - "Boxing" (also known as "box-in") support for five transceivers: Benthos DS7000 and ATM880, EdgeTech 8011A and PS8000, and, LinkQuest. Range corrections use average speed of sound, sound velocity profile averaging, or and ray path bending. Import / export Sound Velocity Profile's. Control fix generation including 2D / 3D fixing, seeding, use of ranges, etc. Load / view / resume past calibrations. Full access to files generated. Use SeaScape's "Calibrate Mooring"



feature to calibrate an entire LBL array if you want -

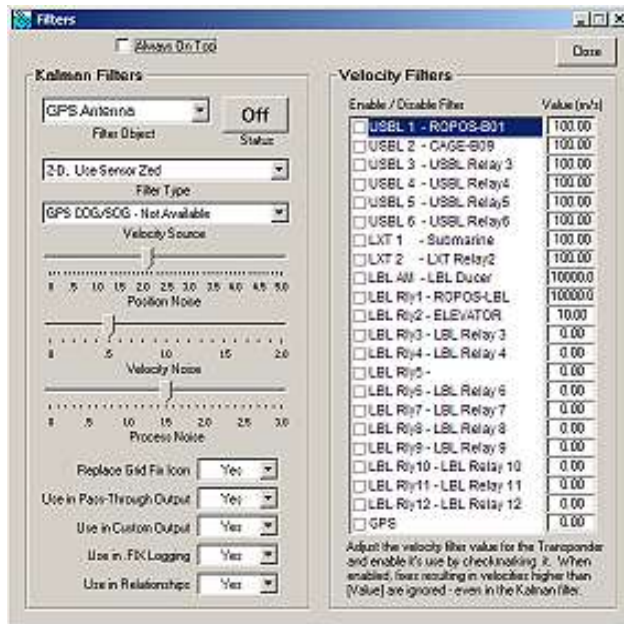


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or use its comprehensive statistical "steam the array" methodology - proven to be mathematically correct. Use it for normal or emergency location of any device with a compatible transponder or acoustic release.

Advanced Filtering – the use of velocity and Kalman filters are available for every dynamic object in the SeaScape system: vessel GPS, LBL transducer, LBL relays, USBL transducer, USBL transponders, and the DVL. Filter parameters are adjustable as is their downstream use: grid, relationships, pass-through and custom outputs, and, special fix history file output.

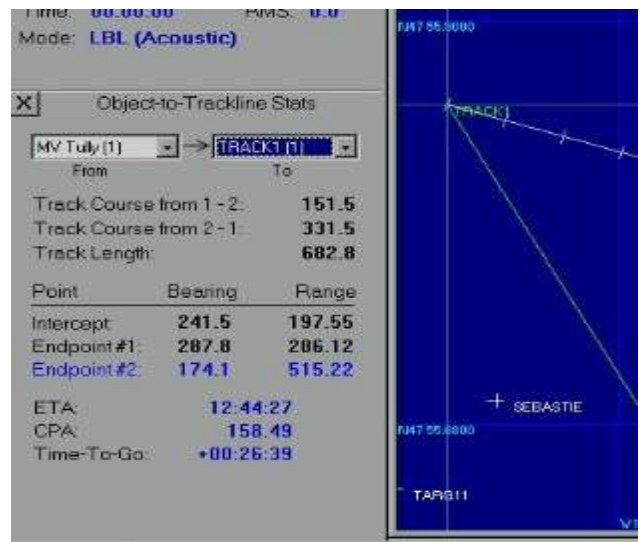


Powerful Graphical Tools – including mouse zooming, grid dragging, click-and-drop navaid creation, crosshair, range ruler, snapping, multiple survey trackline creation....all the features you need to work fast. SeaScape with its companion WorkBoat make an ideal ROV console tactical display system. Combined USBL and LBL and DVL fixes, ships always drawn to scale with ghosting options (helpful for non-DP vessels), watch circle, snail trails, track histories, navaids, custom symbols and complex shapes, DXF CAD drawings, bottom contours, relational tools, advanced filtering, and more. All the features serious operators want - and

NEED - to get their work done on the bottom.

Bathymetry and CAD Drawings- SeaScape supports the generation and display of contour line sets from your bathymetry files and the display of . DXF CAD files. SeaScape lets you "Export Grid as . DXF Drawing" for input into CAD programs. All navigation aids, transponders, track histories, contours, even embedded drawings themselves can be output. Use these features to build, maintain and navigate on sophisticated site drawings for many purposes: underwater construction, geological renderings, archeology, etc.

Navigation Aids - Waypoints, Anchors, Track Lines, Area Boxes, Area Circles and Regions. They're all so easy to create, edit, archive to libraries and "relate to" in SeaScape's various "anything-to-anything" buttons (Object-to-Object, Object-to-Trackline, Object-to-Class). Ranges and bearings are available in "UTM grid" or "Great Circle" basis.



Advanced Networking - Typical operations involve SeaScape acting as the master navigation station connected to our WorkBoat program running on multiple stations standing together on the network: Chief Navigator, ROV Console, Bridge, Lab, etc. Both programs can route data ANYWHERE on a local area network: any string type, any custom string, any pass-through data. And they support "instant messaging" for communicating with busy bridge personnel. Users can even "plug-in" (like LAN game parties) and request primary device data from



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ANYWHERE on the network. Input devices (GPS, ship's heading, wind, USBL transceivers, vehicle sensors, etc.) can be spread out anywhere on the navigation LAN where there are serial ports available. Supports both TCP and UDP input protocols.

I/O Intelligence - SeaScape recognizes any and all (multiple) strings on any and all ports ALL the time. Just plug it in. There's instant access to port settings for setting baud rates, etc., on up to 12 COM ports. In addition, data may be received by UDP and/or TCP protocols on network ports of your choosing. View your data, watch the string "mnemonics," etc. SeaScape is very quick to mobilize. It's got the I/O intelligence you need to be up and running in minutes.

For interfacing unusual devices, both programs support user-defined, **custom input** with both ASCII and Binary support. Fixed- or variable-length records and fields may be loaded into any system navigation variable with a large list of data conversion methods which also include mathematical operators and bounds checking. Unsigned bytes, 2- and 4- byte integers and 4- and 8-byte IEEE-754 floating point support is standard in both most- and least-significant-byte-first formats.

Want to **pass-through** data out of SeaScape / WorkBoat to other computer stations? Not a problem. You can route any and all data from any and all ports (including Network) to any serial port or any destination on the Network, including the World Wide Web. In this sense, SeaScape and WorkBoat are true NMEA-0183 data routers. If you want, you can view your output data - just like viewing your input data - all the time during setup and navigation.

And, you can interactively setup any kind of **custom output** to serial port, network or file - even while navigating. As many definitions as you want under your control with a click of the mouse. Save definitions for future cruises. Custom Output supports all dynamic objects with a full set of "items" for each object, with control of fixing conventions, time formats, precision, delimiter, header, terminator, literal strings, etc.

Faithful Data Logger with Log File Playback—
SeaScape logs all non-interactive data arriving on its

input ports (serial and network) for later playback. Even non-recognized data is logged. Playback may be paused while other features of SeaScape are performed, like printing a Grid plot, adjusting filters, loading contour files, setting up custom output, etc.

Shareware Version - Install SeaScape as you like for training and post-processing. Install the SeaScape "License" on the CPU you take to sea. The only difference is real-time, "Regular Navigation" doesn't function in the non-licensed version. You can still simulate, train, replay log files, create contour files, etc. - do most of the things you normally would.

Computer System - recommended: Windows 2000, or XP (Windows NT and Windows 95 are NOT supported) running on a 1 GHz Pentium III or better with 256 Mbytes of RAM or better and reasonably fast graphics card. Plan for the number of serial ports you'll need. Networking if desired.

