

Time

Time—1) the indefinite continued progress of existence and events that occur in apparently irreversible succession from the past through the present to the future. 2) the thing that is measured as seconds, minutes, hours, days, years, etc. (Webster’s New World College Dictionary)

In July I had a once in a lifetime opportunity to travel back in time and to experience again the thrill of sailing on the U.S. Coast Guard’s training ship EAGLE. Each summer the EAGLE offers a few berths to a limited number of alumni in the 50-, 40-, and 30-year anniversary classes.



EAGLE under full sail with 22,280 square feet of sail area.



Doug Taggart
President
Overlook
Systems
Technologies, Inc.

This past June marked my 40-year anniversary of graduation from the U.S. Coast Guard Academy. I was one of only four from my class, selected by lottery, to sail on-board EAGLE July 16–22 from Hamilton, Bermuda, to Norfolk, Virginia. The last time I sailed on her was in the summer of 1975 as a first class cadet crossing the Atlantic from Roda, Spain, to New London, Connecticut, with a port call in the Madeira Islands.

The EAGLE is a 295-foot barque (a sailing vessel with the fore and mainmasts rigged square and only the mizzen rigged fore-and-aft) used as a training ship for future officers of the United States Coast Guard. She is the only active commissioned sailing vessel in the United States, and one of only two commissioned sailing vessels for the U.S., the other being the *USS Constitution* located in Boston, Massachusetts.

Built at the Blohm + Voss Shipyard in Hamburg, Germany, in 1936 and commissioned as *Horst Wessel*, EAGLE was one of three sail-training ships operated by the pre-World War II German navy. At the close

of the war, the ship was taken as a war reparation by the United States and re-commissioned as the U.S. Coast Guard Cutter EAGLE.

While on board EAGLE, cadets receive training on life at sea which includes navigation, seamanship, ship and boat maneuvering, line handling, sailing, first aid, weather, damage control, engineering, career development, teamwork, and leadership.

In the summer of 1975 as a cadet, I served as the mainmast captain, and during this summer’s return I had the opportunity to once again contribute to the mainmast sail station’s process including a return to the rigging, helping with harbor furling prior to arrival in Norfolk.

I was extremely impressed with the exchange of navigation detail planning information that took place between the cadets, the crew, and the officers. These navigation training and workup sessions were held on the mess deck in advance of leaving Bermuda and entering port in Norfolk.

Modern Technology Incorporates Traditional

The EAGLE of today is outfitted with all of the current navigation technology to include two radars, an electronic chart display and information system (ECDIS), GPS, gyrocompass/repeaters, a magnetic compass and fathometer. Communication technology includes VHF-FM and SATCOM. Reflecting back on my own memories of 40+ years ago, the Loran-A receivers and the then-new Loran-C receivers, as well as the MF & HF radio transceivers, have all been removed.

I was extremely pleased to see a very energetic return to celestial navigation as part of the summer training program and also to learn that it is once again part of training received during the academic year, paralleling the Naval Academy’s recent announcement that it was also bringing back basic instruction in celestial navigation theory. These changes acknowledge a growing awareness that we are becoming overly reliant on GPS because of its readily available benefits and that such reliance can be detrimental if no alternatives are available should GPS services be disrupted for any reason.

Although the cadets of today rely on computers for doing sight planning and reductions, the underlying principles of learning and practicing alternative navigation techniques rather than simply relying on GPS is not only prudent but, in my view, absolutely

necessary. The enthusiasm displayed by the cadets, armed with sextant and stop-watch while recording their evening stars, was a great ending to each of the days we were at sea.

To assist the cadets with sight reductions, the EAGLE had a number of ruggedized laptops equipped with the latest copy (Version 3.0) of a U.S. Naval Observatory (USNO) Windows-based software routine (being beta-tested by the cadets for USNO) titled System To Estimate Latitude and Longitude Astronomically (STELLA).

In addition to providing a very user-friendly sight reduction routine, the program includes tools for doing sight planning and compass/gyro error determination as well as transit planning and voyage recording.

To calculate a fix using STELLA, the entering arguments are: an estimated latitude and longitude, ship's course and speed, the height of eye above the water

Special Sea Detail leaving Bermuda. Pilot and cadet OOD on top of the open-air pilot house with a paper chart still at the ready.



line, the sextant error, the body being observed, e.g., Sun, Moon, planet or star; the observed angle above the horizon of each celestial body in degrees and decimal minutes, and the time of each observation in coordinated universal time (UTC) to a whole number second.

The resulting output (the Solution) is a graphical display on a latitude and longitude grid that shows the observed lines of position (LOPs) for each celestial body, with a resulting latitude and longitude that is developed by advancing each LOP (using the course

ION GNSS+ 2017



September 25-29, 2017

Oregon Convention Center • Portland, Oregon

Tutorials: September 25-26 • Show Dates: September 27-28



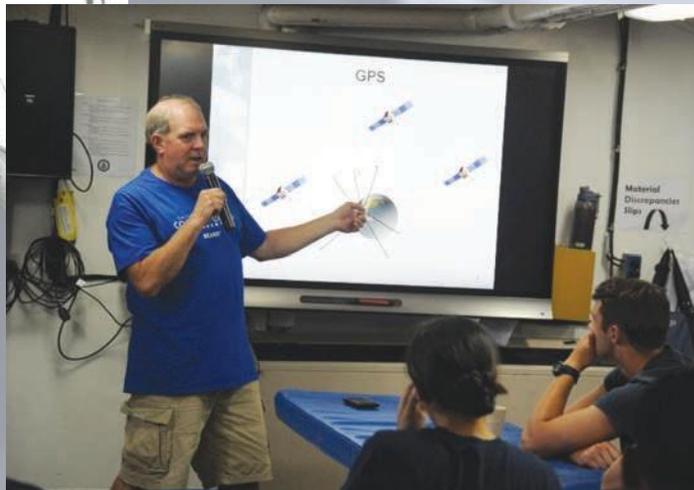
The World's Largest Technical Meeting and Showcase of GNSS Technology, Products and Services



Aloft helping cadets and crew harbor furl sails before arriving in Norfolk. Doug second from the left.



Shooting a Sun line from the fantail of EAGLE



Presentation on radionavigation and emphasizing the role of Time

and speed) to the final observation time.

The displayed latitude and longitude also includes an error ellipse. The accuracy and ease of computing a fix using STELLA in comparison to the handwritten reduction sheets from 40+ years ago is impressive.

It's about Time

I'd like to now return to my choice of a title for this article, *Time*, and to its two-part dictionary definition. The first part, reflecting on the passage of time, is a means for me to convey my sense of tremendous fortune to go back and experience once again a time of sailing ships and navigating by the stars. This was a great opportunity, and I was very lucky to have been able to do it.

The second, and perhaps most relevant part of the definition, is directly related to the challenge of determining longitude at sea. From that aspect, I must expose one troubling fact that I am somewhat embarrassed and disappointed to reveal (given my own strong feelings of pride in the Coast Guard's history as a seagoing service anchored in a tradition of producing prudent navigators). The former daily tradition of making a noon entry in the ship's log and reporting to the captain prior to ringing eight bells on the fore-

noon watch change, indicating that the navigator had wound and compared the chronometers, didn't occur during this cruise. On investigating why this was so, I was dismayed to learn – *the EAGLE didn't have a chronometer!*

So, you ask, how did the cadets get a time hack each night for their star sights in order to determine the ship's position? The answer to that question — as I asked it on the first night underway — “We go to ECDIS and note the UTC time as it is displayed in the upper right-hand corner of the display”. To which I replied (remembering the basic objective of navigating without GPS), “But ECDIS uses GPS.” Without any embarrassment or recognition of the logical flaw in play, the quick retort I received: “But we don't look at the latitude and longitude.”

I did have an opportunity later in the week to make a presentation to the cadets on my own experiences in and after the Coast Guard. I spoke about the role of time in celestial navigation, Loran-C, and GPS. I emphasized a message of not being overly reliant on single information sources (for position OR for time) and the need to be aware of how systems are designed and the hidden interdependencies they contain.

I also encouraged the cadets to get involved in professional organizations such as the Institute of Navigation following graduation. It was a well-attended presentation, one I was happy to provide, and one that I hope broadened the awareness of these future Coast Guard officers to the inextricable linkages between Position and Time.

Epilogue

I am proud and privileged to have been able to return to sail on EAGLE again after 40+ years and observe firsthand the contributions that she and her crew are continuing to make in fulfilling the US Coast Guard Academy's mission: “*To graduate young men and women with sound bodies, stout hearts and alert minds, with a liking for the sea and its lore, with that high sense of honor, loyalty and obedience which goes with trained initiative and leadership; well grounded in seamanship, the sciences and amenities, and strong in the resolve to be worthy of the traditions of commissioned officers in the United States Coast Guard in the service of their country and humanity.*” **ION**