

# Answering the Call for Houston's Middle-Skills Worker: Stephen F. Austin High School for Maritime Studies



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## Executive Summary

Educators, politicians, and philosophers have published much on what they think is wrong with public education. Others have written extensively of a “middle skills” worker shortage and tight labor in the United States. This is especially true for Houston’s growing economy. Stephen F. Austin High School for Maritime Studies (SFAMS) and community leaders are working to address both issues with an innovative approach that ties industry to education to prepare the next generation’s workforce.

The Greek philosopher, Plato, is credited with the quote, “Necessity is the mother of invention.” The reinvention of Stephen F. Austin High School came about of two primary needs. The first, improvement of performance metrics for the inner-city school, was accomplished following the arrival of Principal Steve Guerrero and Lead Maritime Instructor John Buchanan. The two worked together to define the school’s purpose, mission, and strategy. With a new plan in place, the school began pivoting toward a more effective approach in producing workforce-ready graduates. It is in this setting that SFAMS is developing Houston’s future workforce to add value for the second need: a hungry “middle-skills” economy whose expansion will serve this region’s trade, energy, and construction industries. The City of Houston boasts a multitude of strengths, but two of the most notable are a culturally diverse population and a growing economy based on, among other things, trade. Stephen F. Austin High School for Maritime Studies has a 99% minority student body and is located just a few miles from the Houston Ship Channel’s Turning Basin allowing it to take full advantage of both those strengths.

SFAMS is particularly well suited to produce not only college-bound graduates for Texas and beyond, but also direct-to-workforce graduates closer to home. Accordingly, Stephen F. Austin’s recent growth has centered on creating the right environment to address Houston’s growing middle-skills shortage. One of the most obvious industries to benefit from this shift is the domestic maritime industry, from shipyard workers to tug boat crews and stevedores to offshore laborers. These high paying jobs are in-demand and do not require a college education. In many cases, these jobs require a technical education that was not previously accessible to many high school students. SFAMS is now offering many industry certifications and credentials that were difficult to obtain without detailed career counseling or job-seeking advice from within this industry.

“In today’s global economy, hundreds of millions of people all over the world rely on ships to transport the great multitude of commodities, fuel, foodstuffs, goods and products on which we all depend. Yet, for most of them, shipping, not to mention the huge range of related maritime activities...do not register a particularly strong echo on their personal radar.”

—International Maritime Organization’s Year of the Seafarer, 2010

The maritime industry is truly an invisible giant with much of our population living within a few miles of a major port. However, most people never consider where the commodities they use every day originated. Houstonian’s are no exception to this phenomenon: “As one of the world’s busiest ports, the Port of Houston is a large and vibrant component of the regional economy. A 2015 study by Martin Associates reports that Houston Ship Channel-related businesses contribute **1,174,567** jobs throughout Texas, up from more than 1 million jobs cited in a 2012 study. This activity helped generate more than **\$264.9** billion in statewide economic impact, up from nearly \$182.6 billion. Additionally, more than **\$5 billion** in state and local tax revenues are generated by business activities related to the port, up from \$4.5 billion.” (1)

## Career and Technical Education Department (CTE)

Students enrolled at SFAMS will have the opportunity to immerse themselves in pathways specific to the maritime industry. In so doing, these students will be prepared to earn valuable certifications that will make them work-ready upon graduation. Graduates of Stephen F. Austin High School for Maritime Studies who seek to continue their education will be years ahead of their peers who enroll in one of the local post-secondary maritime programs, should they choose to pursue that path. SFAMS's Career and Technical Education Department (CTE) has undergone a major redesign. The department now has seven vertically aligned career pathways divided into direct maritime careers and maritime-themed pathways. The pathways all culminate with industry accredited experience similar to on-the-job training and/or industry-recognized certifications. The direct maritime pathways are also part of the Houston Independent School District (HISD) School Choice Magnet program allowing students from any HISD-zoned area to attend SFAMS.

### *Maritime Career Pathways (Magnet)*

- **Maritime Logistics**—Management of the flow of goods from Point A to Point B.  
*Jobs: material handling, production handling, inventory, transportation and warehousing.*
- **Piloting and Deck Operations**—Acquire the skills and certifications necessary to launch a career aboard a ship.  
*Jobs: deck hand, ordinary seaman, and bridge watch.*
- **Maritime Systems Engineering**—Operate, maintain, and repair ship propulsion engines, boilers, generators, pumps, and other machinery.  
*Jobs: diesel engine mechanic, ship engineer, and tankerman.*

### *Maritime-Themed Career Pathways*

- **Maritime Human Resource and Business Management**—This pathway teaches students how to recruit, develop, and retain a diverse and talented maritime workforce or prepare for a career in general management in the maritime industry or peripheral businesses.  
*Jobs: human resources, payroll, recruiting, and management.*
- **Maritime IT Systems**—Students explore computer-based electronics that are critical to the operation of modern vessels, including: mastering the common operating system, software applications, and hardware installation.  
*Jobs: computer hardware engineers and IT services in shipbuilding and recreational boating.*
- **Naval Architecture and Engineering Design**—Students learn essential engineering concepts, allowing them to practice naval engineering design by surveying, scaling, measuring, and constructing a model engine room and suspension bridge.  
*Jobs: naval architect, marine engineer, and transportation engineer.*
- **Ship Building and Repair**—Students in this pathway to learn about welding in various industries around Houston including the very lucrative shipbuilding and repair industry. Throughout this pathway, students have the opportunity to earn Basic Core NCCER Certifications and OSHA Safety Certification. Students will also have the opportunity to receive a welding certificate by preparing and demonstrating skills in various projects as they earn a Pipefitter Certification.  
*Jobs: structural welder, pipefitter, sheet metal fabricator.*

## *Hands-On Training*

A critical component to SFAMS is the ability to produce a realistic training environment. Students need to be effectively trained while in school to ensure they are not only ready to enter jobs upon graduation, but that they are the type of employees with the appropriate skills that industry representatives want to hire.

For a deckhand, that means opportunities for marlinspike seamanship, shipboard sanitation, watchkeeping, steersman and lookout duties, and eventually, bridge resource management, navigational rules of the road, and watch officer duties. For engineers, the program will need hand tools, major machinery models, systems learning, development of machinery rounds skill sets, understanding of environmental stewardship, up to and including a live engine room in which to operate and learn. For tankermen, the program will need demonstration equipment, a tank transfer mockup, and eventually, a setting in which to conduct actual ship-to-ship and ship-to-shore transfers.

With these resources and educational objectives in hand, submitting the curriculum to the Coast Guard's National Maritime Center for Approval of Training for credentialing purposes should follow shortly. In the near future, Stephen F. Austin High School for Maritime Studies will be graduating young men and women with the technical and interpersonal skills to succeed in the demanding environment in which seagoing vessels operate with the necessary credentials to show up ready and able to work.

## **Mariner Credentialing Program**

### *National Merchant Mariner Credential*

In 1920, Congress passed the Merchant Marine Act with stringent requirements that only Americans build the ships, man the vessels, and move the cargo between U.S. ports. Also known as the Jones Act, the legislation was crafted with the aim of promoting both economic and national security. Congress reiterated support for the Jones Act as recently as December 2014 for the "strong domestic trade maritime industry, which supports the national security and economic vitality of the United States and the efficient operation of the United States system." (2)

The Coast Guard began regulating maritime safety of the domestic fleet during World War II. Today, the National Maritime Center of the Coast Guard services more than 250,000 US mariners with individual licenses known as the Merchant Mariner Credential (MMC). The MMC is a U.S. Coast Guard-issued license required for all active mariners to denote their qualifications, and it is valid for a five-year period. Similar to a passport in its appearance, each page is marked with the additional licenses, certifications, competencies, and endorsements earned by the mariner to indicate his qualifications and status. The MMC encompasses the international Standards of Training, Certification, and Watchkeeping (STCW) required for mariners on certain large vessels that operate outside U.S. borders.

To earn an MMC and, the appropriate credentials as he or she advances along a career path, mariners must complete regular training from course providers approved by the U.S. Coast Guard. This is required of mariners ranging from able seamen and mates to captains and engineers. Licenses also periodically expire and require additional training, as new requirements are placed on mariners. For example, all mariners working on ships with U.S. flags are required to obtain a Transportation Worker's Identification Credential (TWIC) from the U.S. Department of Homeland Security (DHS) to verify their citizenship and pass a security screening. (3) In addition to necessary training, the following illustrates the experience required on a sample career path to captain:



*Stephen F. Austin for Maritime Studies Credentialing Program*

The merchant mariner credentialing minimum age requirement is 18, however, regulations permit application by 16 year olds with parental consent. Because of this constraint, the program is structured to provide foundational course work to freshmen and sophomores with the actual credentialing process available to juniors and seniors. As juniors, students will be credentialed (if otherwise eligible) and obtain qualifying training in Basic Safety and Proficiency in Survival Craft—a 68- hour course load—in the first semester and PIC-Tankerman training while beginning National Able Seafarer (deck or engine) coursework—also a 68-hour course load—in the second semester. Senior year will involve completing the coursework to support Able Seafarer (deck or engine) credentialing, bridge resource management, and bridge simulator experience; leaving time for internships at towing companies, offshore supply companies, shipyards, and heavy industrial firms in the Houston area.

While SFAMS has a solid foundation through the use of curriculum materials and industry partnerships, there is a limiting factor: unfettered access to the water. Until the school is sufficiently endowed with this access and subsequent training vessel, it intends to partner with the Port of Houston Authority (PHA) and local vessel operators to assist students in acquiring the sea time needed to pursue their intended career paths. Most commercial maritime training is done in time-constrained blocks where students are often absent from paying jobs to attend training. By implementing this training at the high school level, the program has the advantages of time and focus that commercial training cannot replicate.

## Maritime Industry Workforce

### Gulf Coast Leads the Nation in Maritime Jobs

The U.S. Bureau of Labor Statistics (BLS) estimates the median pay for the 81,600 water transportation workers as \$53,130 per year or \$25.54 per hour (13). Sector jobs are predicted to grow at a rate of 13 percent by 2024 with an additional 7,200 maritime jobs (14). According to an article in the Houston Business Journal, “Houston is the No. 2 city for jobs related to moving cargo between American ports—second only to New Orleans—and Texas is the No. 3 state” overall (4).

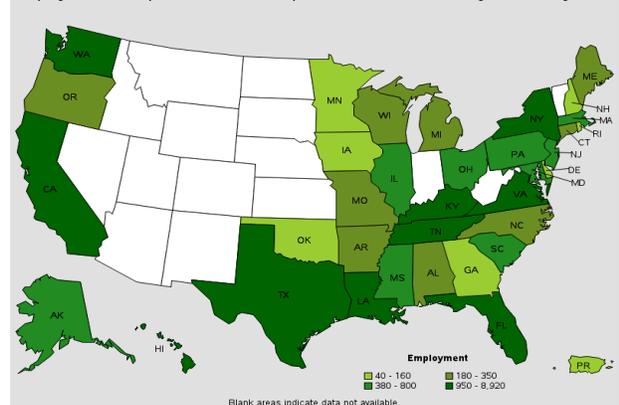
The tables below illustrate the number of employed workers in each position in the Gulf Coast region, the anticipated growth for each position, annual wages, and requirements for education, training, and certification. (5) Occupational projections show double-digit growth of maritime jobs in the years ahead. This anticipated growth illustrates the need and rationale for additional high-quality training outlets.

Table 1. Employment by Occupation

Occupation	Employment	Employment RSE	Employment per 1,000 jobs	Location Quotient	Mean Hourly Wage	Annual Mean Wage	Mean Wage RSE
Sailors and Marine Oilers	1,770	19.40%	0.602	2.72	\$22.42	\$46,620	11.30%
Captains, Mates, and Pilots of Water Vessels	2,050	16.80%	0.700	2.92	\$50.78	\$105,620	5.60%
Ship Engineers	510	24.10%	0.173	2.40	\$39.09	\$81,310	6.10%

Note: A location quotient indicates the ratio of area concentration of occupational employment to national average concentration.

Employment of captains, mates, and pilots of water vessels, by state, May 2015



Employment of captains, mates, and pilots of water vessels, by area, May 2015

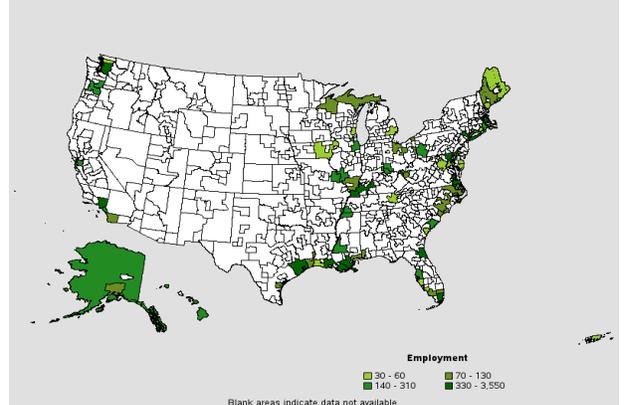


Table 2. Captains, Mates, & Pilots—Employment by State, May 2015

State	Employment <sup>1</sup>	Hourly Mean Wage	Annual Mean Wage <sup>2</sup>
Texas	2,890	\$49.46	\$102,870
Louisiana	8,920	\$47.31	\$98,400

1  
2

Table 3. Captains, Mates, & Pilots—Employment by Area, May 2015.

Metropolitan Area	Employment <sup>1</sup>	Location Quotient	Annual Mean Wage <sup>2</sup>
Houma-LA	3,550	152.57	\$101,470
New Orleans	3,030	22.67	\$101,580
Houston	2,050	2.92	\$105,620

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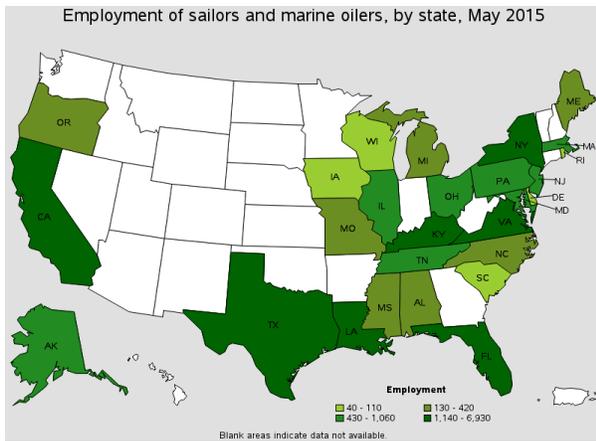


Table 4. Sailor & Marine Oilers—Employment by State, May 2015

State	Employment <sup>1</sup>	Hourly Mean Wage	Annual Mean Wage <sup>2</sup>
Texas	2,600	\$21.75	\$45,230
Louisiana	6,930	\$21.75	\$44,470

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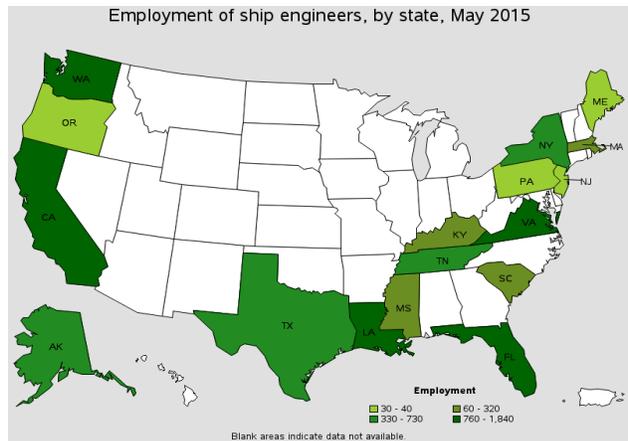


Table 5. Ship Engineers—Employment by State, May 2015

State	Employment <sup>1</sup>	Hourly Mean Wage	Annual Mean Wage <sup>2</sup>
Texas	1,460	\$32.52	\$67,630
Louisiana	1,840	\$49.96	\$103,910

1

2

### *Sustainable Maritime Workforce Complicating Factors*

The U.S. Bureau of Labor Statistics (BLS) has recognized that maritime positions will be in high demand in the next five years. There are two key issues that could further compound the workforce shortage: an aging workforce and the Panama Canal expansion.

Globally, much like other industries, the maritime sector is preparing to face the challenges of an aging workforce that is not being replaced by new qualified employees. The International Maritime Organization notes: “It has been widely predicted that, unless something is done rapidly, shipping will soon face a manpower crisis; there simply will not be enough properly qualified officers to run a world fleet that continues to increase in size.”

The Port of Houston is expecting the expansion of the Panama Canal to further increase the number of shipping containers moving through Houston. “Throughput increased 12 percent year-over-year, to 2.1 million TEUs. Of this total, exports made up 53 percent and imports 47 percent. Houston already controls 67 percent of all containerized shipments handled by U.S. Gulf Ports and expects that share to grow after the Panama Canal’s new locks open in May or June.” (6)

## Conclusion

Over the past year, SFAMS has taken solid steps toward our goal of providing a truly unique and effective maritime education. We opened two new maritime CTE pathways—Piloting and Deck Operations and Maritime Systems Engineering—at the beginning of the 2015-16 school year. These pathways were designed to prepare students for the rigorous Merchant Mariner Credential process while building the skills necessary to succeed in a lucrative shipboard career. A curriculum had to be developed prior to the inception of these new pathways. In a collaborative effort, HISD’s CTE Department and SFAMS developed five new innovative courses that were subsequently submitted to the Texas Educational Agency (TEA) for statewide approval. In June of 2015 the TEA approved the following courses:

### *Piloting and Deck Operations*

**Principles of Maritime Science**—The Principles of Maritime Science course is designed to instruct students in the principles of maritime science as outlined by the Code of Federal Regulations (CFR) directly related to the National Maritime Center and the Merchant Mariner Credentialing Program. Students enrolled in this course will identify specific career opportunities, skills, abilities, tools, certifications, and safety measures. Students will also understand components, systems, equipment, production and safety regulations associated with maritime industries. A baseline understanding of ships and maritime systems is developed to support assessment of the impact, benefit, and risk of decisions involving the design, acquisition, operation, regulation, law enforcement, damage control, maintenance, and salvage of ships and maritime systems. This course will also inform students on the most effective and efficient manners to assure a safe, economically efficient and environmentally sound maritime system.

**Maritime Science I**—Students will build on the foundational knowledge acquired previously in the Principles of Maritime Science course. This course is designed to instruct students on advanced aspects of vessel navigation, safety, and voyage planning. Students will learn safety expectations, laws, and environmental and human factors involved in the maritime industry. Course focus is on organizational processes and personnel administration. Search and rescue, evaluations, advancements, promotions, collateral duties and other personnel management issues are discussed in depth. Lab assignments and simulator experiences reinforce critical thinking and decision-making skills in navigation, shiphandling, collision avoidance, risk assessment and mitigation, and Coast Guard operations. Navigation instruction including chart projections, chart preparation, and various distance, speed, and time relationships, positioning techniques, compass computation, calculation of tides and currents, anchor selection, tactical characteristics, coastal and transoceanic voyage planning, and aids to navigation will be explored.

**Maritime Science II**—Students will develop new skills such as advanced navigation coordination, collision avoidance, briefing the command, electronic navigation theory, routine and emergency ship handling procedures, external communications, and Maritime Science II knowledge, skills, and techniques. Upon successful completion of this course, students will be able to plan and execute safe vessel navigation. Students will be efficient with all bridge navigation (TRANSAS, ECDIS, and Paper Charts) equipment and procedures. Using case studies and real-world simulations, students will identify the contributing factors involved in maritime accidents. Theoretical classroom discussions will be reinforced and applied in various simulator experiences.

### *Maritime Systems Engineering*

**Shipboard Engineering**—This course is designed to provide students training for entry-level employment

or continuing education in shipboard engineering and merchant mariner credentialing. This course will build on the foundational knowledge previously acquired in the Principles of Maritime Science course. Shipboard engineering includes knowledge of the functions, troubleshooting, maintenance and repair of the systems and components of maritime engines such as centrifuge engines, outboards, and portable dewatering pumps. In addition, students will receive instruction in safety, emergency procedures, and shipboard auxiliary systems.

**Advance Shipboard Engineering**—The Advanced Shipboard Engineering course includes advanced knowledge of the function, design, and relationships of the systems and components of propulsion and habitability systems. This course will build on knowledge and skills established in the Principles of Maritime Science and Introduction to Shipboard Engineering courses. This course is designed to provide advanced training for employment, licensures, or continuing degrees in the shipboard engineering industry. Instruction includes functions and components of cooling, fuel, lubricating, electrical, AC&R, propulsion, and mechanical systems of maritime diesel engines. In addition, the students will receive instruction in safety, engine instruments, and environmental compliance.

#### *TRANSAS Bridge Simulator*

In April 2015, SFAMS christened a TRANSAS bridge simulator, making it one of only two high schools in the nation with this type of equipment. The simulator allows students to gain creditable underway experience toward their MMC without leaving the school. Creditable work experience is a critical part of the credentialing process making this addition invaluable to student success.

SFAMS is currently providing quality maritime-specific training and Houston’s maritime employers are seeking out our students. However, there is still much work to be done. SFAMS requires unfettered access to the water, along with a training vessel, in order to truly develop work-ready students to meet the maritime industry’s dire need for middle-skills worker. With this access, our instructors can conduct realistic training that will enable us to produce certified and experienced able seafarer deckhands, engineers, tankermen, and technicians. Without this access, SFAMS will only be able to produce ordinary seaman and wipers with a starting salary of \$135 per day as compared to able seafarers and qualified engineers with a starting salary of \$270 per day. An educational institution should always strive to prepare their students to achieve the highest levels in a career, and with a waterfront facility, SFAMS will become the foremost maritime high school training program in the nation.

#### ENDNOTES

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01 <http://www.portofhouston.com/about-us/economic-impact/>

02 [http://www.uscg.mil/nmc/about\\_us/brochures/MMC\\_brochure.pdf](http://www.uscg.mil/nmc/about_us/brochures/MMC_brochure.pdf)

03 <https://www.congress.gov/bill/113th-congress/house-bill/3979>

04 U.S. Bureau of Labor Statistics (BLS)

05 <http://www.joc.com/users/peter-t-leach>.