



The Michigan School

of Boat Building & Marine Technology

BUSINESS PLAN

MARCH 24, 2011



Our Mission

The Michigan School of Boat Building and Marine Technology will, through classroom instruction, lectures, internships and hands-on technical projects in the workshop, teach the skills, business, art and science of Composite Construction, Marine Systems and Wooden Boat Building and Restoration necessary for employment opportunities in the marine industry including those at marinas, maritime museums, boat restoration and re-engineering businesses, and custom and production boat building companies. The **nine-month Certificate and two-year Associate Degree programs developed in partnership with North Central Michigan College** will also emphasize the importance of teamwork, positive work ethics, project management skills and sound business practices.

The School will also serve the community with its weekend, after-school/youth and summer boat building workshops that teach, promote and preserve the art and tradition of wooden boat building.

The Programs:

Career Programs offered at TMS and NCMC will focus on the skills and business training that meet the needs of local, regional, national and international businesses involved in the building, refitting, restoration, service and maintenance of classic and contemporary boats. As new technologies evolve the boat building and service industries continue to seek employees who exhibit up to date training, education and leadership skills and THE MICHIGAN SCHOOL offers a career path program that meets those needs.

Boat Building Workshops and Youth Programs will be offered during the summer, after school and on weekends during the fall, winter and spring. In order to deliver high level learning opportunities to our students and the community The Michigan School will launch its programs in phases:

1.

- **Phase 1: September 2011-June 2012**
 - Contemporary Composite Boat Building/Introduction to Marine Systems
 - Evening and weekend public Wooden Boat Building Workshops
 - Youth Boat Building Programs
- **Phase 1A: July 2011 through August 2011**
 - Summer Workshops at Irish Boat Shop
- **Phase 3: September 2012-June 2013**
 - Contemporary Composite Boat Building
 - Marine Systems
 - Evening and weekend public Wooden Boat Building Workshops
 - Youth Boat Building Programs
- **Phase 3A: July 2013 through August 2013**
 - Summer Workshops
- **Phase 4: September 2013-June 2014**
 - Contemporary Composite Boat Building
 - Marine Systems
 - Wooden Boat Building, Joinery and Restoration
 - Evening and weekend public Wooden Boat Building Workshops
 - Youth Boat Building Programs



PHASE 1: CONTEMPORARY COMPOSITES

SEPTEMBER 2011

Teaching students the skills relevant to today's boat building and marine industries is a priority for the boat school. **Composite manufacturing technology is also used extensively in multiple industries such as aerospace, transportation and alternative energy so the skills learned at TMS will be transferable. Because of the employment opportunities for graduates the composite program will be the first course offered.** To meet those goals classes in the safe use of contemporary boat building materials and methods such as resin infusion, wet bagging, fiberglass and cold molding will be offered. The project boat(s) in this course will be practical composite construction 15-22 feet in length and will be built from start to launching. Decks, hatches and other components

will be constructed using composite methods and materials. Mechanical system installation will be part of the curriculum. The boat(s) will then be marketed and sold.

2.

- The focus of the Composites Program is to prepare students for careers in the custom and production boat building industries. Materials, resins systems, cores, adhesives and finishes will be taught with an emphasis on choosing the correct materials for a given application.
- The composites industry in the USA generates significant economic activity: US\$13.7 billion a year for composites manufacturers and \$45.3 billion a year for impacted suppliers and manufacturers, according to the [ACMA's 2009 Composites Industry Report](#). [Boeing's Current Market Outlook 2010-2029](#) predicts that air carriers in North America will take delivery of 7200 new aircraft, valued at \$700 billion, over the next 19 years. Airplane age will become an issue as fuel-thirsty, older aircraft increasingly impact profits. The need to replace older, less efficient airplanes will account for 44% of the projected market for new airplanes worldwide. The greatest demand for new aircraft by market value will come from the US, followed by China, says Boeing. In automotive applications, significant opportunities exist for composites in the North American automotive market, reports [Lucintel](#), predicting the market will reach \$1581.1 million in 2014. Declines in vehicle production from 2003 to 2008 were offset by greater demand for composites due to the necessity of improving fuel efficiency and vehicle durability while reducing maintenance costs, says Lucintel in its research report, *Opportunities for Composites in the North American Automotive Market 2009-2014: Trends, Forecast and Opportunity Analysis* (May 2009).
- This growth in the composite industry will require a skilled workforce that has the knowledge and skill to build capacity and increase efficiency in applying the material in a variety of settings. North Central's proposal to teach boat building and marine technology as an application of composite materials will yield graduates who can respond to this need.
- Students will be instructed in how to create composite fabrication using open molding, wet bagging, resin infusion and pre-pregs manufacturing methods. The design and construction of composite tooling will also be taught with a focus on the various materials and methods used in industry to construct one-off or production tools.
- Emphasis will be placed on teaching "real-world" project management, communication, and leadership skills. The course is taught through a series of lectures, bench demonstrations, and the fabrication of a composite boat. Guest lectures and field trips to regional boat builders will augment the course. The proposed course outline is as follows:

Topic

Shop Safety

Rules

Accident response

Understanding a Material Safety Data Sheet (MSDS)

Proper use and care of Personal Protection Equipment (PPE)

Pneumatic and power tool safety

Chemical spills and hazardous waste

Math Review

Working with ratios

Calculating fiber volumes

Glass to resin ratios
% by weight versus % by volume
Concept of specific gravity/ Units of measurement

3.

Materials Overview (review at start of year and reinforce throughout)

Glass, carbon and aramid fibers
Fabric types- woven, knits, veils, twills, and unidirectional
Cores- Balsa and Foam
Styrenated resin systems
Initiators a.k.a catalyst
Promoted versus non-promoted resin systems
Epoxy resin systems
Gel coats
Fillers, putties and fairing compounds/Types of adhesives
Interpreting Technical Data Sheets (TDS)
Lab: Testing/measuring peak exotherm, viscosity
Lab: Exotherm profiles of resin based on catalyst and ratio
Lab: Weight estimate of composite parts
Lab: Estimation of resin absorption base on material weight

Tooling Design and Construction

Review of drawing standards/Basic lofting
Draft, die-locks and other design considerations
Temporary or "one-off" molds
Stick-built plugs/masters
Creating a tool from a master
CNC machining of plugs and molds
Tooling pastes
Tooling boards
Mold release systems
Electrical grounding of tools
Lab: Build simple plug and mold

Open Molding Process

Mold preparation and coatings
Tools used
Resin application methods
Material wet-out methods
Consolidation of fibers
Bedding of core
Lab: Build part with tooling

Wet-Bagging Process

Materials unique to the process
Consumables
Equipment required
Wetting-out of material
Consumables
Understanding vacuum
Lab: Build part with tooling

Resin Infusion Process

Materials unique to the process
Consumables
Equipment required

Darcey's Law
Understanding vacuum
Considerations in placing vacuum and resin feed

4.

Pre-impregnated Materials

Materials unique to the process
Consumables
Equipment required
Resin systems used in pre-pregs
Loading and de-bulking materials
Application of vacuum
Post curing
Lab: Construct flat panels

Finishes- Types and Application Methods

In mold coatings- gel coat
Post mold coatings- urethanes
Equipment
Preparation
Repair/safety
Lab: Post-finish part made earlier in the year

Properties of composite laminate

Applicable ASTM Tests
Strength versus Stiffness
Modulus
Thermal properties
Lab: Perform ASTM testing on flat panels and compare results

Wood Composite

Vacuum bagging wood veneers
Strip-planking with glass overlay
Lab: Component for Center Console

Processing of Cured Parts

De-molding
Cut and grind tools
Machining

Bonding in Structures

Primary versus secondary bonding
Surface preparations
Bonding in with tabbing
Bonding in with adhesives
Lab: Test effectiveness of different surface preparation methods

Composite Large Boat: Strip Plank Foam with E-glass and Epoxy Overlay

Set-up strong-back and molds
Strip plank and laminate hull
Infuse cockpit sole
Temporary tooling for small and medium parts
Wet-bag stringers
Pre-preg bulkheads
Fairing and finish work

Composite Small Craft: canoe or drift boat

Build Plug
Laminate mold
Infuse part

Interior/exterior trim
Exterior fairing and finish work
Field trips and guest lecturers

5.



PHASE 2: MARINE SYSTEMS

SEPTEMBER 2012

Using boat mock-ups and an existing vessel as their “classroom” students will learn to troubleshoot, repair and/or install the various systems that are common in today’s boats at marinas and boatyards across the country. Course work will be divided into classroom, work bench, lectures and “on the vessel” segments. Experts from the industry will also be invited to present lectures on the topics covered in the curriculum. As a way to build awareness of, and interest in, the TMS program, this ongoing lecture series will be open to the public.

The courses will also emphasize “real-world” project management, communication, and leadership skills.

The focus of the Marine Systems Program is to expose students to the systems commonly found in custom and production sailboat and powerboats. Students will be trained in the proper installation, routine maintenance and repair of marine system. The course will be taught with a focus on The American Boat and Yacht Council’s *Standards and Technical Reports for Small Craft* by experienced industry professionals certified in ABYC standards. Students will also be exposed to United States Coast Guard (USCG) standards and the Code of Federal Regulations (CFR).

Students will have the necessary experience to take the ABYC certification exam at the culmination of the program. The course outline is as follows:

Topic

Shop Safety

Rules

Accident response

Understanding a MSDS *Material Safety Data Sheet*

Proper use and care of PPE *Personal Protection Equipment*

Machine and power tool safety

Dealing with chemical spills and hazardous waste

Basic understanding of Fiber Reinforced Plastics (FRP) and Composites

Resin and fabric choices
Surface preparation for secondary bonding

6.

Working with cored structures

Cosmetic repairs

Structural Repairs

Marine AC and DC systems (ABYC E-2, E-10, E-11)

Basic Principles- Ohm's Law

Use of multi-meters

Circuit design

Standards

Trouble shooting

Installations

Galvanic Corrosion

Grounding

Isolators

Batteries

Lab: Wire a breaker panel

Potable Water Systems (ABYC H-23)

Standards

Tanks/installation/venting

Plumbing

Fittings

Winterizing/Commissioning

Lab: Install system in mock-up

Gray Water Systems

Standards

Tanks/installation/venting

Plumbing

Fittings

Cockpit drainage requirements

Winterizing/Commissioning

Lab: Install system in mock-up

Waste Systems (33 CFR Part 159)

Standards

Tanks/installation/venting

Plumbing

Fittings

Winterizing

Commissioning

Marine Sanitation Device (MSD)

Lab: Install system in mock-up

Fuel Systems (ABYC H-24 and H-33)

Standards

Tanks- material

Hoses and hose clamps

Grounding

Venting of tank

Filters

Lab: Install system in mock-up

Engine compartment standards and design (ABYC H-2, H-22, H-27, H-32)

Ventilation- passive and forced
Bilge pumps and limber holes
Lighting

7.

Fire protection
Equipment placement
Access

LPG Systems (ABYC A-1)

Standards
Storage design
Plumbing
Stoves and heaters

Steering Systems (ABYC P-17, P-18, P-21, P-27)

Standards
Hydraulic
Cable
Push-pull
Installation
Maintenance

Lab: Install system in mock-up

Refrigeration and Air Conditioning Systems (ABYC A-6)

Types of systems
Sizing a system for particular application
System requirements
Trouble shooting/Recharging/Leak detection

General IB Propulsion (ABYC P-1, P-4, P-6, P-14)

Propeller theory and types
Shafts
Sound abatement
Engine mounts/vibration isolation
Engine alignment
Struts and bearings
Exhaust Systems

Diesel Engine Theory and Installation

Principles of operations
Mechanical versus electrical fuel injection
Supporting Fuel and lubrication systems
Cooling
Troubleshooting
Maintenance
Winterizing
Commissioning

Gas Engine Theory and Installation

Principles of operations
Carbureted versus fuel injected
Cooling systems
Troubleshooting
Maintenance
Winterizing
Commissioning

Inboard/Outboard

Principles of operation

Installation
Troubleshooting
Maintenance

8.

Winterizing
Commissioning

Finishes- Types and Application Methods

Types of cosmetic finishes
Equipment required
Surface preparation
Safety

Lab: Work on donor boat

Install systems on Composite Program Boat

Refitting of Donor Boat

Field Trips and Lectures



SMALL BOAT CONSTRUCTION AND CLASSIC RESTORATION

SEPTEMBER 2013

Note: This curriculum will initially be introduced as part of the summer, weekend and evening courses currently being developed.

Students will learn the skills necessary to pursue careers in boatyards, maritime museums, classic restoration shops and marinas that offer these types of traditional boat construction and historically significant restoration services. Woodworking, joinery and small boat construction will be parts of this program so that students have a solid understanding of tool use, boat nomenclature and construction methods. Restoration project boats will either be ones donated to the boat school or restored on a commission basis. Boats donated to the boat school will be marketed and sold after completion.

- Surveying/estimating
- Lofting/basic design
- Vessel history

- Woodworking
- Boat building

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- Hull and structural repair/backbone, decks, cabin, etc.
- Joinery
- Finishing
- Rigging or re-powering



WOODEN BOAT BUILDING WORKSHOPS

JULY & AUGUST 2011
SEPTEMBER 2011

We have a passion for boats! While providing a unique career education program for the marine trades is a priority for The School we are also committed to hosting public programs that benefit the community by teaching and preserving the history and craft of wooden boat building. THE MICHIGAN SCHOOL will offer workshops and seminars during the September to June school year as well as over the summer. These programs will include:

- After-school boat building workshops for "at risk" young people will be developed with existing alternative education organizations and the Institute of Business and Industry Training at North Central Michigan College
- Summer and Winter Workshops
 - Build and take home your own kayak or rowing boat
 - Group boat building and restoration projects
 - Short workshops in lofting, navigation, asset maintenance, surveying, and other topics of interest in the community

School Management

Founder **David Lesh** spent over four years as the executive director of the Great Lakes Boat Building School where he quickly helped build the school into a nationally recognized and respected program. His responsibilities at THE MICHIGAN SCHOOL

include overseeing fundraising, strategic planning, grant research and development, marketing, branding, student recruitment, public relations, operations, and other duties. Dave was a partner in a strategic communication company in Indianapolis and has worked as a nationally known freelance illustrator and designer for over 25 years. Dave

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has also served on several non-profit boards including The Illustrators Partnership of America, Burt Lake Preservation Association, Great Lakes Boat Building School and the Cheboygan County Planning Commission in northern Michigan. And he loves boats.

Technical Advisor

Ken Workinger has generously provided his professional services to the development of the school's marine and boat building programs. A 1992 graduate of The Landing School Ken brings 18 years of experience to the TMS as a design engineer and manager of the Advanced Composite Group at Tiara Yachts. Ken taught lofting and boat building classes at the Michigan Maritime Museum and, as the owner of Jolly Dog Boat Design, he's designed a number of boats currently in use on the Great Lakes including the CM20 sailboat for the Challenge Mountain adaptive sailing program in Boyne City.

Faculty

A search for qualified instructors and staff members will take place via classified ads in local, regional and national trade publications, newspapers and websites. The ideal instructors should have experience in the marine industry as boat builders, restorers, woodworkers and/or technicians as well as teaching experience. The candidates should be accredited through one or more professional organizations such as ABYC.

Founding Board of Directors

The School is extremely fortunate to have a talented and dedicated board of directors comprised of industry and community leaders.

Alan Gurski	President/Gougeon Brothers
Marty Letts	Hinckley Yachts/Harbor Springs
Tom Orlow	Little Traverse Sailors
Dick Babcock	Irish Boat Shop
Fred Ford	Yacht Designer/Harbor Springs
Bob Marsh	Associate Dean/North Central Michigan College
John Russell	Harbormaster/Bay Harbor
Ken Workinger	Tiara Yachts/Energetx/Composite Engineer
Greg Krueger	President/Jefferson Beach Yachts
Ed Mahoney	Michigan State University and MBIA

Board of Advisors

A critical part of the planning and development of the school and its programming is the active participation of THE MICHIGAN SCHOOL Advisory Board members. Valuable input and professional guidance continues to be generously provided by:

John Ropp	Michigan Boating Industry Association
Lyn Jenks	Business consultant

Michael Esposito	Irish Boat Shop/President
Brian Granger	Walstrom Marine
Mike Dow	Former marina owner and wooden boat builder
Martin Sutter	Advocate for the restoration of classic motor yachts
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Tom Erhart	Northern Lakes Economic Alliance
Bill Prince	Naval architect/Classic Yacht Magazine publisher
Steve Van Dam	Van Dam Custom Boats/Owner
Michel Berryer	Van Dam Custom Boats/Designer
Chris Hammond	North Central Michigan College
Patrick O'Brien	Little Traverse Yacht Club
Charles Macinnis	North Central Michigan College/marketing
Cameron Brunet-Koch	North Central Michigan College/President
Jim Clapperton	Michigan Works/No Worker Left Behind
David Nichols	Author/Educator/Boat builder
Josh Swan	Boat builder/restorer/owner J.W. Swan Boatworks
Karen Wales	Associate Editor/WoodenBoat magazine
Sean Pollion	NCMC Foundation/Director
Steve Schnell	County Community Development Director
Jennifer Booher	Professional fundraiser and grant writer
Linda Orlow	Little Traverse Sailors
Carter Williams	Managing Director/OI Ventures
Gary Sturm	Manager/Cable Marine/Ft. Lauderdale
Meade Gougeon	Gougeon Brothers
Jeff Wright	Gougeon Brothers
Joe Parker	PRO SET Gougeon Brothers

The Market

The traditional wood boat building program at the Great Lakes Boat Building School is 80 miles north in the eastern Upper Peninsula of Michigan. There are no contemporary boat building and marine industry programs currently offered in the Midwest. The GLBBS program offers traditional woodworking and boat building methods but does not offer an extensive systems or composite curriculum (its composite program is three months in length and is limited to the cold molding process). Since there are no similar programs in the Midwest TMS will have a competitive advantage for the recruitment of students and the garnering of industry support in the Great Lakes area of the country. There are a number of technical schools across the United States that focus on engine repair and maintenance. The Landing School in Maine offers several programs including Wood Boat Construction, Composites and Systems. Similar programs are now being offered at the International Yacht Restoration School in Rhode Island. These contemporary boat building and systems programs are relatively new with their development and implementation being undertaken to meet changing needs in the marine industry. There is no school offering these programs in the Great Lakes area.

Marketing/Branding

A thoughtful, well planned and professionally managed marketing and branding program is vital in today's marine education marketplace which offers options and choices for prospective students. We are fortunate to be working with Robert Falk of Falk/Harrison in the development and implementation of our branding and marketing. The TMS will focus on several audiences including:

- o Prospective student recruitment
 - o Boatyards, marinas, boat builders who represent potential employers
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- o Community leaders and organizations
- o Foundations
- o Supporters and sponsors
- o Boat buyers
- o Trade organizations

Marketing and branding of TMS will involve multiple venues such as:

- Trade publications/advertising and editorial content
 - o WoodenBoat magazine
 - o ProBoatbuilder
 - o Soundings magazine
 - o Classic Yacht Magazine
- THE MICHIGAN SCHOOL website
- **Social media such as Facebook, Twitter, and blogs**
- Regional newspapers and magazines
 - o Advertising
 - o Press releases
 - o Editorial content
- Trade organization memberships and participation
 - o ABYC (American Boat and Yacht Council)
 - o NMMA (National Marine Manufacturers Association)
 - o ABBRA (American Boat Builders and Repairers Association)
- School newsletters
- Presentations to community service and business groups
- Participation in festivals and shows
 - o Bay Harbor Vintage Boat Show
 - o Mystic Boat Show
 - o Detroit Boat Show
 - o Maine Boat builders Show
 - o Others
- Participation in local and state high school and college recruitment efforts
 - o Career and College nights
 - o Presentations to Career and Technical Education programs
 - o Presentations to high school vocational classes

Facility and Location

The Charlevoix/Petoskey/Harbor Springs corridor of northern Michigan provides an ideal location for THE MICHIGAN SCHOOL.

- Charlevoix, Petoskey and Harbor Springs are vibrant well-populated areas that will appeal to prospective students. The area is also the home for a number of marinas and boat related companies on the Great Lakes as well as inland lakes and rivers. A number of boat and marine related companies such as Gougeon Brothers, Quantum Sails, FourWinns, Van

Dam Custom Boats, Irish Boat Shop, Walstrom Marine, Grand Isle Marine, and Tiara Yachts are also located in the state.

- Affordable student housing is available in the area.
- THE MICHIGAN SCHOOL is growing its partnership with **North Central Michigan College** through a creative curriculum agreement that offers interested students the opportunity to pursue an Associate Degree or Certificate. Locating this marine program nearby will be a benefit to both NCMC and THE MICHIGAN SCHOOL and, most importantly, our students. Planning is ongoing and the goal is to work with NCMC in developing the premier marine skills training programs in the country.
- There is enthusiastic support by NCMC administrators, local marina management, the Michigan Boating Industry Association, ABYC, boat building businesses and individual community leaders as THE MICHIGAN SCHOOL develops its programs. With the support and guidance of our experienced board and local and regional advisors, this enthusiasm translates into sound business advice in the development of programs, physical facility, support and long term planning. **A professional consultant was hired to conduct an in-depth feasibility study and the results of that survey are now available.**
- A building of approximately 5000-7000 square feet is necessary so that several programs can eventually be operated at the same time. Space for a classroom, tool crib, and offices is also necessary. Plans are to increase workshop and classroom space as student enrollment increases and programs expand.
- From a community support standpoint it's important that the program is located between Charlevoix, Petoskey, and Harbor Springs.

Thank you for your interest in The Michigan School of Boat Building and Marine Technology and I'll continue to update you with news as the program moves forward. If you have any questions, suggestions or know of someone that would like to hear our story please don't hesitate to contact me.

Sincerely,

Dave Lesh/Director

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