

Professional Development Short Course On:

Submarines and Their Combat Systems

Instructor:

Captain Ray Wellborn

ATI Course Schedule:

<http://www.ATCourses.com/schedule.htm>

ATI's Submarines and Their Combat Systems:

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Submarines and Their Combat Systems

Summary

To heighten this Introduction to Submarines, and to enhance its comprehensiveness, this course underwent major revision and update in 2004. It is now an animated, full-color PowerPoint presentation.

This course presents the fundamental philosophy of submarine design, construction, and stability as well as the utilization of submarines as cost-effective warships at sea. A thumbnail history of waging war by coming up from below the surface of the sea relates prior gains—and, prior set-backs. Today's submarine tasking is discussed in consonance with the strategy and policy of the US, and the goals, objectives, mission, functions, tasks, responsibilities, and roles of the US Navy. The foreboding efficacy of submarine warfare is analyzed referencing some enthralling calculations for its Benefits-to-Cost, in that Submarines Sink Ships!

The standard submarine organization, daily routine, and battle station assignments are presented. The selection process for the "who" that volunteers for submarine duty is advanced. Moreover, the "why" they volunteer is examined to expound on their willingness, as well as their abilities, to undergo a demanding extensive qualification program, which essentially tests their mettle to measure up to the legend of Steel Boats, and Iron Men!

In that submarines operate in the ocean-depths, submariners have to sense threats in the denser medium in which their [Undersea] Boat operates. Thus, they rely on acoustic reception for Sound in the Sea whose principles are defined as a basis for a rudimentary primer on the "Calculus of Acoustics." The components and nomenclature for a modernized Combat System Suite are presented, inclusive of the Command-Control-Communication Computerized Information sub-systems that outfit the Common Submarine Radio Room.

A synoptic review of submarine forces existing around the world is presented as a Submarine Order of Battle for each country "boasting" them. Anti-Submarine Warfare, ASW, is discussed from the perspective of both the Hunter and the Hunted. The effectiveness of Air and Surface Force units is elaborated to emphasize that when coupled with Submarine Force units their Combined-Arms ability decisively can engage The Enemy Below.

The submarine threat for the 21st century is discussed, posing such questions as: "Will diesel-electric submarines, as a cost-effective weapon for the Third World, be a significant threat to the national economies of other nations? Is shallow-water ASW in the littoral approaches to a coastline of a country embroiled in a Low-Intensity-Conflict a Mission-Essential-Need— for the US too? Will it still be best to sink a submarine while it is in port? So, where do We, the People... go from here?"

Herein the submarine is presented as a system in its self, thus an aim of the instructor is to clarify the essences of sub-system interfaces for engineers and scientists involved in testing or R&D for submarine systems. Attendees who in the past have worked with specific submarine sub-systems can consider this course as Continuing Education. Also, because of its introductory nature, this course will be enlightening to those just entering the field. A copy of the presentation is provided to all attendees, including some relevant white papers.

What You Will Learn

- Engineers & scientists in R&D or testing of submarine systems.
- Newcomers to the field.
- Those who specialize in just one subsystem & want an overview.

February 4-6, 2009

Laurel, Maryland

\$1490 (8:00am - 5:00pm)

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Course Outline

1. Thumbnail History of Warfare from Beneath the Sea: From a glass-barrel in circa 300 BC, to SSN 774 in 2004.

2. The Efficacy of Submarine Warfare — WWI and WWII: A Benefit/Cost Analysis to depict just how well Submarines Sink Ships!

3. Submarine Organization — and, Submariners: What is the psyche and disposition of those Qualified in Submarines, as distinguished by a pair of Dolphins? And, will new submariners be able to measure up to the legend of Steel Boats, and Iron Men!

4. Submarine Design & Construction: Fundamentals of Form, Fit, & Function, plus an analysis of ship-stability.

5. Principles of Sound in the Sea: A basis for a rudimentary primer on the "Calculus of Acoustical Propagation."

6. Combat System Suite — Components & Nomenclature: In OHIO, LOS ANGELES, SEAWOLF, and VIRGINIA.

7. Submarines of the World — by Order of Battle: How Many, from Where. To do What, to Whom?

8. Antisubmarine Warfare — Our Number One Priority: For the USN, ASW is a combined-arms task for forces from above, on, and below the surface of the sea — inclusive of littoral waters — to engage The Enemy Below!

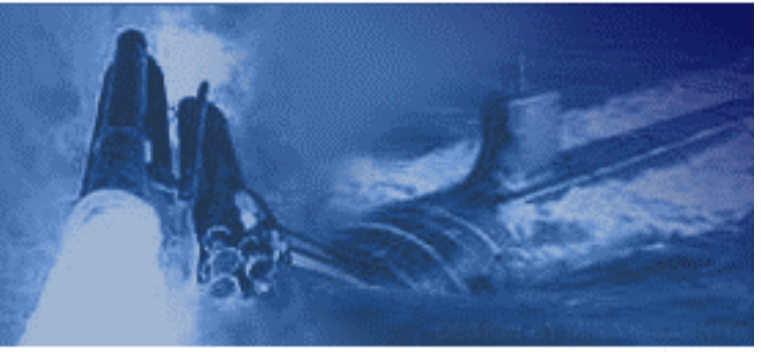
Instructor

Captain Ray Wellborn, USN (retired) served over 13 years of his 30-year Navy career in submarines. He has a BSEE degree from the US Naval Academy, and a MSEE degree from the Naval Postgraduate School. He also has an MA from the Naval War College. He had two major commands at sea and one ashore: USS MOUNT BAKER (AE 34), USS DETROIT (AOE 4), and the Naval Electronics Systems Engineering Center, Charleston. He was Program Manager for Tactical Towed Array Sonar Systems, and Program Director for Surface Ship and Helicopter ASW Systems for the Naval Sea Command in Washington, DC. After retirement in 1989, he was the Director of Programs, ARGOTEC, Inc.: and, oversaw the manufacture of advanced R&D models for large underwater acoustic projectors. From 1992 to 1996, he was a Senior Lecturer in the Marine Engineering Department of Texas A&M, Galveston. Since 1996, he has been an independent consultant for International Maritime Affairs.



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US NUCLEAR-POWERED SUBMARINES :

OPERATIONAL CAPABILITY.

- **Covert or Overt Operations.**
 - **Instill Fear/Uncertainty.**
 - **Example: *The Falklands*.**

- **Independent Sustain-ability.**
 - **Mobility in High-Risk Area.**
 - **Undetected—Hard to Target.**
 - **Assured Attack Capability.**

- **Precise Strike Ability.**
 - **Unexpected.**
 - **Reduced Risk.**

- **ASuW/ASW Skills Applied Directly.**
 - **In Execution of Intelligence.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

NUCLEAR STRIKE CAPABILITY.

- **US Ballistic Missile Submarines.**
 - **Survivable Strategic Deterrent.**
 - **Ominous Instrument of Choice.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

SURVEILLANCE & RECONNAISSANCE.

- **Complement to Space-Based Signal Intercepts.**
 - **Capture Line-of-Sight Transmissions.**
 - **Observe Elusive Over-Water Tests.**
 - **Sole Source “Tip-Off” to Other Assets.**

- **Provide Undersea Situational Awareness.**
 - **Onboard Sensors.**
 - **Unmanned Undersea Vehicles, UUVs.**
 - **Real Time Battlespace Info.**
 - **Contributor to Tactical/Planning Picture.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

INTELLIGENCE COLLECTION.

- **Submarine-Gathered Intelligence.**
 - **Covert or Overt.**
 - **Focuses Military Planning & Operations.**
 - **Minimizes Battle Casualties.**
 - **Helps Maintain the Peace.**

- **Can Respond on Short Notice.**
 - **Tasking from Military Leaders.**
 - **Tasking from Civilian Leaders.**
 - **Flexible to Changing Situations.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

LANDING SPECIAL OPERATIONS FORCES.

- **Excellent Platform.**
 - **Inherent Stealth & Endurance.**
 - **Can Operate Covertly in Denied Areas.**
 - **Sophisticated Communications & Sensors.**
 - **Secure, Precise & Reliable.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

SEA CONTROL.

- **Preclude/Overcome Ocean Area Denial.**
 - **Preclude Coercion by Force.**
 - **Overcome/Disable Any Force.**
 - **Wrest Control from a Determined Enemy.**

- **Disrupt/Interdict/Cut Sea-Lanes.**
 - ***SINK SHIPS !***
 - **Open Ocean and Littorals.**
 - **Economic Strangulation.**
 - **Deny Military Transport/Re-Supply.**
 - **Preclude Power Projection.**

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US NUCLEAR-POWERED SUBMARINES : (continued.)

MINE WARFARE.

- **Covertly & Precisely Lay Mines.**
 - **Minimum Risk to US Forces.**

- **Covertly & Precisely Detect/Report Mines.**
 - **Prepare the Battlefield for Safe Entry.**

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US SUBMARINE VISION for FY 2000-2010:

- **Remain World's Preeminent Submarine Force.**
- **Incorporate New and Innovative Technologies.**
- **Maintain Dominance in the Maritime Battlespace.**
- **Promote Multi-Capable Submarines for the US.**
- **Develop Tactics to Support National Objectives.**
 - **Battle Space Prep**
 - **Sea Control**
 - **Land Battle Support**
 - **Strategic Deterrence**
- **Effect the Role of a Stealthy, Full Spectrum Expeditionary Platform for the CinCs.**

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US SUBMARINE OPERATIONS:

- **There Are Five Military Domains, and *Undersea* is the Most Stealthy of All.**
- **Inherent Protection from NBC Weapons, and Tracking/Targeting by Satellite Systems.**
- **Yield Greatest Impact for Risks Taken.**
- **Dissuades Others from Being a Maritime Threat.**
- **Actual Operations Are Highly Classified Therefore, Dissemination of Result is Restricted.**
 - **Little Understood.**
 - **Frequently Undervalued.**

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US SUBMARINE OPERATIONS IN DENIED AREAS:

- **Utilize Ability to Prepare & Control Battlespace.**

- **Ascendancy in Sea Control & Land Attack Roles.**
 - **In Littoral Regions, Non-Stealthy Platforms will be Ineffective due to Advanced Targeting.**

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US SUBMARINE FORCE STRUCTURE :

- **A Robust Submarine Force is Required for Peacetime Presence and Deterrence.**
- **Mission-Essential Need for at least 72 Submarines-- Fifty is Inadequate!**
- **A Significant Number of Submarines Will Require Replacement Early in the 21st Century.**
- **VIRGINIA Class Construction Must Ramp Up At Least To Two per Year.**

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US SUBMARINE INNOVATION:

- **Maintain an Aggressive Technological Development & Insertion Program.**
 - **Reverse Payload Limitations.**
 - **Increase Capabilities.**

- **US Navy/DARPA Committed to Long-Term Progressive Technology in VIRGINIA Class.**

- **VIRGINIA Class Designed with Built-In Flexibility.**
 - **Modular Design Techniques.**
 - **Open Architecture.**

- **Active Studies for TRIDENT Submarine Modifications for More Versatility.**

US SUBMARINE COST-EFFECTIVENESS :

- **Nuclear-Powered Submarines Are One of the Most Cost-Effective Weapons in the US Arsenal.**
 - **Highly Capable/Multi-Mission Submarines.**
 - **We Can Not Afford to be Without Them.**

- **Acquisition “Investment” Pays “Dividends” in Low-Cost Submarine Operations.**
 - **Stealth, Survivability, and Lethality.**
 - **Tremendous “Return” on the Investment.**

- **There Are No Realistic Alternatives to VIRGINIA.**
 - **Requisite Quality at an Affordable Price.**
 - **Cost Close to a New SSN-688(I).**

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US SUBMARINE COST-EFFECTIVENESS : (continued.)

- **ARGUMENT**: Nuclear-Powered versus Diesel-Electric.
 - Forward Strategy/Global Responsibilities.
 - Operate Far from US for Extended Periods.
 - Mobility/Covertness & Firepower/Endurance.

- **ARGUMENT**: Retain/Build Older Classes versus New.
 - Limited Margin for Future Improvement.
 - New Modular Design for Technological Advances.
 - Older Does Not Mean Cheaper.
 - Retain Does Not Reduce Required Build-Rate.

- **ARGUMENT**: Build Only Experimental Systems.
 - Will Not Meet Current Military Requirements.
 - Does Not Meet Needed Force Levels.
 - Computer Analysis/Simulation More Practical.
 - Operational Tests/Evaluation Are Affordable.

EUROPE / MEDITERRANEAN / CANADA [23 countries] = 133							
COUNTRY	SUB Class (OOB + Building)	Builder	CLASS OOB	SS OOB	Building	Mini-subs	hi-tech
Albania	SS Whiskey	RS		0		2 Reserve	
Algeria	SS Kilo 877E	RS	2	2			
Bulgaria	SS Romeo (Project633)	RS	1	1		restricted use	
Canada	SSK Victoria (876)	UK	2	2	2		#
Croatia	Una Mini-sub	YU			1?		1
Denmark	SSK Viking	SW		4	4		#
	SS S-207	GR	1			2 reserve	
	SSK Nacken (A-14)	SW	1				#
	SS S-205	GR	2				
Egypt	SS Romeo+Type 003	RS / CH	4	4			
Germany	SSK S-206A	GR	12	12			#
	SS S-205	GR				2 Research	
	SSK(FC) U-212	GR	0		4		#
Greece	SSK S-209	GR	8	8			#
	SSK S-214 AIP	GR			3		#
Israel	SSK Dolphin	GR	3	3			#
	SS S-206/500	UK				3 reserve	
Italy	SSK Sauro	IT	3	7			#
	SSK Pelosi	IT	2				#
	SS Toti	IT	2				
	SSK(FC) S-212A	GR			2		#
Libya	SS Foxtrot 641	RS	1	1		4 Reserve	
	Mala mini-sub	YU					6
Netherlands	SSK Walrus	DH	4	4			#
Norway	SSK Viking	SW		12	4 planned		#
	SSK S-210	GR	6				#
	SS S-207	GR	6				#
Poland	SS Kilo 877EK	RS	1	1			#
Portugal	SSK - Project	?		3	3		#
	SS Daphne	FR	3				
Romania	SS Kilo 877EK	RS	1	1		not operational	
Spain	S-80 (Scorpene?)	FR		8	4?		#
	SS Agosta	FR	4				#
	SS Daphne	FR	4				
Sweden	SSK Viking	SW		7	2 planned		#
	SSK Gotland A-19	SW	3				#
	SSK Vastergotland A-17	SW	4		going to 2		#
	SSK Naken A-14	SW				2 reserve	
Syria	SS Romeo	RS	3	3			
Turkey	SSK S-209 Improved	GR/TK		15	4		#
	SSK S-209/1400	GR	4		1		#
	SSK S-209/1200	GR	6				#
	SS Tang	US	2				
	SS Guppy	US	3				
Ukraine	SS Foxtrot 641	RU		1		1 not operational	
Yugoslavia	SS Savo	YU	1	1			
	Una Mini-sub	YU					3
				100	23		10
SOUTH AMERICA [8 countries] = 27							
COUNTRY	SUB Class (OOB+Building)	Builder	CLASS OOB	SS OOB	Building	Mini-subs	hi-tech
Argentina	SS TR-1700	GR	2	3			#
	SS S-209/1200	GR	1				#
Brazil	SSK S-209/1400	GR	4	5	1		#
	SSK Oberon	UK	1				#
Chile	SSK S-209/1300	GR	2	3			#

ASIA / AFRICA [15 countries] = 269							
COUNTRY	SUB Class (OOB+Building)	Builder	CLASS OOB	SS OOB	Building	Mini-sub	hi-tech
Australia	SSK Collins	SW / AU	5	5	1		#
PRC	SSBN Xia	CH	1	68		(operational?)	#
	Type 94 SSBN	CH			1+3	(delayed)	
	Type 93 SSN	CH			1	(IOC >2005)	
	SSB Golf	RS	1			(testing)	
	SSN Han Type 091	CH	5				#
	SS Kilo 636	RU	2		1?		#
	SS Kilo 877EKM	RU	2				#
	SS Song Type 039	CH	2			3 (problems)	#
	SS Ming	CH	17			3 (AIP?)	
	SS Romeo	CH	38 ?				
India	SSN ATV	IN/RU			17	1	#
	SS Amur	RS				1	#
	SS Kilo 877EK + EKM	RU	10			upgrade	#
	SS S-209/1500	GR	4			2	#
	SS Foxtrot 641	RS	3				
Indonesia	SS S-209/1300	GR	2	2		2	#
Iran	SS Kilo 877EKM	RU	3	3			#
	MINI	NK				3	4
Japan	SSK Oyrushio	JP	3	16		3	#
	SSK Haruship	JP	6			1 training	#
	SSK Yuushio	JP	7			1 training	#
Malaysia	SS Zwaardvis	NT	2			Training	
North Korea	SS Romeo/Ming Type 033	NK / CH	22	48			
	SS Whiskey Project 613	RU	4				
	SSC Sang-O	NK	22				
	MINI	YU / NK					45
Pakistan	SSK Agosta 90B	FR	1	8		2 Exocet	#
	SS Agosta	FR	3				
	SS Daphne	FR	4				
	MG110	IT					2
Singapore	SS A-11 (from SWN OOB)	SW	2	2		2	#
South Africa	SS Daphne	FR	2	2		1 reserve	
	SS S-209	GR				3	#
South Korea	SSK S-214 AIP	GR		9		3	#
	SS S-209/1200	GR	9				#
	MINI SX-756W	IT					3
	MIMI Dolgorae	ROK					3
Taiwan	SSK Hai Lung	DH	2	2			#
	SS Guppy	US				2 training	
	Class TBD					8 planning	#
Thiland						2 GAL Class?	
Vietnam	SSC Sang-o	DPRK	2				
				182	30	57	
				304	56	69	

FIRST WORLD SUBMARINE POPULATION [4 countries]								
SSN & SSBN US, UK, FR, RUSSIA (USSR) = 182								
COUNTRY	SUB Class (OOB+Building)	Builder	CLASS OOB	SS OOB	Building	Mini-sub	hi-tech	
USA	SSBN 725 Ohio	US	18	71		4 to SSGN?	#	
	SSN 774 Virginia	US				4 30 planned	#	
	SSN 21 Seawolf	US	2				#	
	SSN 23 Jimmy Carter	US				1 SP OPS		
	SSN 751-773 (688I)	US	23				#	
	SSN 715-750	US	12					
	SSN 700-714	US	11					
	SSN 688-699	US	4				#	
	SSN 683	US	1				#	
	NR-1	US					1 Research	
AGSS 555	US					1 Research		
UK	SSBN Vanguard	UK	4	16			#	
	SSN Astute	UK				5	#	
	SSN Trafalgar	UK	7				#	
	SSN Swiftsure	UK	5				#	
France	SSBN Le Triomphant	FR	2	10	2		#	
	SSBN L'Inflexible	FR	2				#	
	SSN Barracuda	FR				6 planning	#	
Russia	SSN Amethyste	FR	6				#	
	SSBN Akula [Typhoon] 941	RS	2	61		2 Reserve	#	
	SSBN Borey 955					1	#	
	SSBN Delfin (Delta IV)667BDRM	RS	6				#	
	SSBN Kalmar (Delta III) 667BRD	RS	8				#	
	SSGN Antyey (Oscar I & II) 949A	RS	8	KURSKSUNK			2 reserve	#
	SSN/SSGN Yasen [Servodivinsk] 885	RU	0		1(3)		suspended	#
	SSN Bars [Akula I&II] 971/M Shchuka-B	RS	10				3 3 reserve	#
	SSN Barracuda (SI) 945	RS	1					#
	SSN Kondor (SII) 945A	RS	2					#
	SSN Schuka (Victor III) 671RTM	RS	8					#
	SSK Amur/Lada 1650	RU				2		#
	SSK Vashavyanka (Kilo 636/4B)	RS	3				3 reserve	#
	SSK Kilo 877	RS	12				? reserve	
	SSAN Yankee/Stretch 667M	RS	1				research	
	SSAN Platus 1851	RS					2 Research	
	SSAN Kashalot (Unifirm) 1910	RS					2 Research	
SSA Makrel (Beluga) 1710	RS					1 Research		
Note: 1st World decreasing rapidly	1st WORLD TOTAL			158	24			
Note: 3rd World increasing	3rd WORLD TOTAL			304	56	69		
11/14/2001 ref. M. Scherr 703-588-2362	TOTAL			462	80	69		
BASED ON 'various open sources'	GRAND TOTAL						611	
WORLD SUBMARINE POPULATION [50 countries] =					611			
ROW SUBMARINE POPULATION [46 countries]=				429				

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