Yes... on the sub I was on we did do some of the stuff we did, and we didn't do some of the other stuff we did, because if we did do it, it was secret... so we didn't really do it. Even though we really did. But not really.

Those medals me and my shipmates got that we didn't get for doing what we didn't do that we did... I really got those. Except not. But, yeah.

That's because we never went where we were, so we weren't there where we were.

And even though we weren't where we were, we did do the stuff we didn't do while we weren't there, not doing it.

As far as what boat we were on when we didn't go there on it, and didn't do the stuff we did while not doing that either, I'm not supposed to refer to that either.

So the bottom line is that while we weren't on the boat I won't mention, not doing what we were doing where we weren't... we didn't do that either.

I hope this clarifies things. I really was a submariner.
OUT FOR A DRIVE.
USS BOSTON (SSN 703)
1986
Fools and crazy men

A brief history of submarine warfare

(Bill Riffer)
“Only a fool would waste his time trying to build a submarine and even if he succeeded, only a crazy man would go down in it.”

Anonymous
What we’re going to do

- Early development (1600 – 1900)
- WWI (Germany vs. Britain)
- WWII (Germany vs. Britain/US)
- WWII (US vs. Japan)
- Cold War (NATO vs. Soviet Union)
- Current status and future
Opening thoughts

- Strategy and Doctrine
- Questions (real time)
- Classified stuff
- Fact vs. opinion (mine)
- No mines or midgets
Opening Thoughts (2)

- My apologies to the British, Russians, Japanese, Dutch, Romanians, Chinese, Albanians, and the 50 or so others that have used submarines in warfare.

- Submarine warfare is brutal, uncivilized, and inhuman. Hiding behind the statistics are real people.
"It is possible to make a Ship or Boate that may goe under the water unto the bottome, and so to come up again at your pleasure. [If] Any magnitude of body that is in the water . . . having alwaies but one weight, may be made bigger or lesser, then it Shall swimme when you would, and sinke when you list . . . ."
Early Developments

- 130 proposed designs before $\approx 1870$
- Essentially all warships
- Semi-submersibles
- Human powered
CSS HUNLEY
CSS Hunley

(Feb. 17, 1864)

Inside the Hunley

1. Rear Ballast Tank
2. -3. 1st Officer’s Positions (Crank, Ballast Tank)
4. -9. Crew Positions (Crankshaft)
10. Bellows Equipment
11. Captain’s Position (Helm, Ballast Tank)
12. Forward Ballast Tank
What’s Needed?

- To create a successful submersible you need:
  - Surface propulsion
  - Submerged propulsion
  - Trimming and ballasting
  - Stand-off weapon
Whitehead Torpedo - 1867
The Race is on

• Between 1870 and 1900
  – 20 submarines were actually built in 9 different countries

• None of these were really successful

• Leading the charge were two Americans:
  – Simon Lake and John Holland
USS HOLLAND (SS-1) $150,000
First crew of USS Holland (SS-1)
Submarine forces

• Hollands become ubiquitous
  – Buying new ones
  – Licensing arrangements
• TR takes an interest
• Submarine school
By 1914

- 16 countries had about 400 total subs
  - England: 74
  - Russia: 48
  - Germany: 28
  - Japan: 13
  - France: 72
  - US: 30
  - Italy: 21
  - Austria: 6

- 28 submarines had been lost in accidents generally with all hands

- And, there was no doctrine, strategy or tactics.
German WWI Campaign

“Our submarine fleet was as good as any in the world....and it wasn’t very good.”

A German U-Boat officer
The British View

“The Submarine is underhanded, unfair, and damned un-English. The Government should treat all submarines as pirates and hang all crews.”

Adm. A.K. Wilson
The War at Sea Begins (1914)

- British Blockade
- U-Boats begin “coastal defense”
- On Sept 22, the Submarine comes of age
  - U-9 and Aboukir, Cressy, & Hogue
THE TORPEDOING AND SINKING OF H.M.S. ABOUKIR, HOEUE AND CRESSY, SEP. 22ND, 1914, BY A GERMAN SUBMARINE. COPYRIGHT COZENS, PORTSMOUTH.
First Blows

• British make three decisions:
  – End the near blockade
  – Escort all capital warships
  – Run for port when threatened

• Germans start true submarine patrols
  – Prize rules in full effect
Prize Rules

- Issue warning
- Inspect cargo and papers
- Insure crew safety
- Disposition
  1. Prize crew
  2. Tow to neutral port
  3. Destroy

- February 1915 – Declared War Zone
The “War Zone”

- No prize rules but
- Gun sinkings
- #'s start climbing
U-20

KptLt. Schwieger
How to Deal with U-Boats?

- Seagulls (?)
- Rowboats (?)
- Dazzle Paint (?)

- Ramming & Guns (39)
- Depth Charges (30)
- Mines (58)
- Aircraft (none but...)
- British subs (20)
- Other (29)
Dazzle-Paint

Merchant vessel dazzle-painted as seen through a submarine periscope.

The same vessel on identical course painted grey.
Q-Ships
U-Boat Kills (1)

War Zone declared

Sinkings per quarter 1914 - 1916
Jutland

“The prisoner has assaulted his jailer but remains a prisoner nonetheless.”

US Newspaper Report

(So now it was submarines or nothing.)
Germany’s final plan

- Move >1M troops from the Russian front
- Total Unrestricted Submarine warfare (Feb 1917)
  - England out of the war in 6 months
- Accept that the US will declare war (April 1917)
- Beat the French army before the US can have an impact (1919?)
U-Boat Kills (2)

Unrestricted Submarine Warfare

Sinkings per quarter 1914 - 1916
1916 - 1917
U-Boat Kills (3)

Why didn’t it work???

Sinkings per quarter 1914 - 1916
1916-1917
1917-1918

No Convoys
Convoys
Why not Convoy?

- Less efficient
- Not enough escorts
- Too many “eggs in one basket”
Convoy Math

- $P_d = f(N \times FP/Area)$
  - The footprint (FP) for 100 ships is $\approx 14\%$ bigger. If the Area is very big (the ocean) and the number of detection opportunities (N) is very small, then
  - $P_d$ gets very small. $\approx 1.3\%$ vs $\approx 99\%$
Why Convoys Work
The Costs

- Germany lost 178 U-Boats & 5000 men
  - About 1/2 of their force
  - Ended the war with 171

- Allies lost 5000 ships and 15000 men
  - 11 Million tons (1/4 the worlds total)
  - Note: 3 men per ship
  - The effect of gun sinking (>90%) & prize rules
Between the Wars

- Versailles forbids German U-boats
- Sub improvements were evolutionary
- Washington Naval Conference of 1921-1922
  - The French “saved” the submarine
- The London Naval Treaty of 1930
- ASDIC (Sonar) makes its appearance
- British/German Naval Treaty of 1936
  - The “end of the submarine” (?)
The only picture of a submarine on patrol you’re ever going to see.
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(Bill Riffer)
German WWII Campaign

"The only thing that ever really scared me was the U-boat"

Winston Churchill
German WWII Campaign

- Strategic goal: 500000 tons / month
  - Both Germany & England agreed
  - This is about 50 – 60 ships per month
  - Estimated this would require about 300 U-Boats
German Advantages

• Good boats
  – (Type VII & IX)

• Admiral Karl Donitz
  – the man with the plan

• Very well-trained crews (especially CO’s)

• Good match between doctrine, strategy, & tactics
  (because Donitz controlled them all)
Type VII U-Boat
German Disadvantages (Solvable)

- Faulty Torpedoes
  - Running depth
  - Contact exploders
  - Influence exploders
    - *Fixed early and effectively*

- Communications Vulnerabilities
  - Communications & Ciphers
German Disadvantage (Unsolvable)

- Adolph Hitler
  - No clue about submarine or naval warfare
  - Hitler & Donitz had completely different view of a war with Britain
  - Construction quotas
  - Deployment decisions
    - Norway (3 times)
    - Dieppe
    - Torch
    - Malta
  - Escort missions
Net result

• Germany started the war with 57 U-Boats 26 of which were ocean going.
  – *(Imagine if he had had his 300!)*

• Hitler wanted to be England’s friend
  – Prize rules in force.

• Campaign got off to a slow start.
First Blood (Scapa Flow)

14 October 1939

HMS Royal Oak

Gunther Prien
U-47
Conduct of the Campaign (I)

- Sept 39 to Mar 40 – Getting started
  - Suspended prize rules in Nov 1939.
  - Did reasonably well (150 Ktons / month)

- Mar 40 to June 40 – The Norway Break
  - Hitler orders all U-Boats to Norway
Conduct of the Campaign (II)

- June 40 to Nov 40 - First “Glückliche Zeit”
  - French Ports (Brest, Lorient, St-Nazaire, La Rochelle, & Bordeaux
  - B-Deinst
  - Wolf packs introduced (Donitz’s plan)
  - Good Weather
  - 300 Ktons / month
  - England is the enemy

- Dec 40 to Mar 41 - Winter break
  - Wear & tear and winter limit operations
Conduct of the Campaign (III)

Mar 41 to Jan 42 – Slugging it out

- Both sides get better
- U-boat production starts to climb
- US begins to play an active role
- 183Ktons / month
- Enigma machine captured Mar 41
- British are into U-Boat avoidance
- The “Air Gap”
The Air Gap

Area 'A' had been the limit of the early patrols. These were extended to cover Area 'B' during 1942 and Area 'C' during 1943.

Distances shown are approximate.
Conduct of the Campaign (IV)

- Jan 42 to Aug 42 – 2d “Glückliche Zeit”
  - US enters the war
  - “Shark” introduced
  - Operation Drumroll
  - 500 Ktons / month (GOAL!!)
  - By Sept. driven back into the “Air Gap”
Enigma Machines

3 Rotor - Standard

4 Rotor - Shark
Conduct of the Campaign (V)

• Aug 42 to Apr 43 – Slugging it out some more
  ▪ Continue at 500 Ktons / month
  ▪ U-boat losses continue to be low (3 / month)
  ▪ Donitz gets more boats (200+)
  ▪ **Allies make defeating the U-Boat the primary war aim.** (Casablanca)
Conduct of the Campaign (VI)

- Late spring / early summer 1943
  - The battle ends in complete U-Boat defeat

- WHY???
Allied ships and U-Boat Losses

- Hull Losses
- Year

- Allied Ships (X10)
- U-Boats
U-Boat Performance - 1943

- Tons/U-boat days

1941
1942
The Answer is......

- Allied Technology
- Allied Tactics
- B-Deinst goes blind

- This time it is not directly strategic but it flows from the 1942 strategic decision:
  - Defeat of the U-Boats was given priority over all other aspects of the war.
Technology

- Cavity Magnetron
- Long Range Aircraft
- Torpex
- Hedgehogs
- Jeep Carriers
- HF/DF (Huff Duff)
- Leigh Light
- Fido
- Sonobouys
- Rockets
PBY4
Long-Range
ASW Aircraft

Cavity Magnetron

Hedgehogs

Huff Duff

Jeep Carriers
Tactics & Training

- Dedicated Escort Groups
- Hunter-Killer Groups
- ASW Schools
- Aircrew Training
- Experienced CO’s
- Use of Enigma to kill U-boats vice avoid them