

## Submarine Battle 2020 Introduction

The object of this game is for you as Submarine Commander to direct 10 to 15 submarines against a Convoy Commander's ships. The game is structured so that you can set up the Convoys with higher "Degree of Difficulty" Options which the Submarine Commander must overcome in order to win this War.

### 1. Convoy Details

The Convoys are composed of Transports, Tankers, and Troop Ships. For Convoy protection, there are Destroyers, Escort Carriers, Aircraft and Blimps which can sink the Submarines.

In the initial set-up for the Convoys, you select the total number of Transports, Tankers, and Troop Ships that will be in the Convoys. Each of these ships (known as "Targets" to Submariners) is worth one point in the scoring.

Each of the initial 10 submarines are worth a proportional value based on the # of initial targets. Thus for 80 total targets, each sub is then worth 8 points. During each hour of the Battle, the program calculates the Score which would be Number of targets minus (# Subs) X 8.

During the Initial Convoy Set-up (Option "A"), a random Number of Convoys from 6 to 12 will be made in which the Transports, Tankers, and Troop ships will also be assigned randomly. These Convoys have initial speed of 15 knots and start at X=800 and Y random from 0 to 1200. For the initial destinations of these Convoys, each one is randomly assigned to either Oil, Steel, or Troop Island.

After the initial Island destination assignment, the program then assigns destinations based on type of ships in the Convoy, in the order Oil, Steel, and Troop Islands. Thus if a convoy has Tankers and Troop ships (and no Transports), it will first go to Oil Island and then Troop Island and then to one of the 3 home bases. Similarly, a Convoy with only Tankers will go to Oil Island and then to one of the 3 home bases.

Note that whenever a Convoy # 1-12 and # 15 reach one of the 6 Islands (including the 3 home bases) a Message comes up stating "Convoy # is at (Reached) Island". **This is the Submarine Commanders chance to make note of the day and hour (in Convoy "Routing (Day-Hours) part of the battle form) and figure out what to do about finding it and attacking it.**

For example stationing a sub near the Oil, Steel, and Troop Islands will "Detect" the Convoys location, course, and # and types of ships in the Convoy. (It'll appear by using Option "C" and appear on the screen-Worksheet 1). Then the Submarine Commander can direct his subs to intercept and begin attacking this convoy.

Also note that the "Detection" only lasts on the sea leg between islands. For example, if you detect a convoy between Steel and Troop Island, the detection and screen values for that convoy will disappear when the Convoy reaches Troop Island. Another Submarine must detect the Convoy as it heads from Troop Island to one of the 3 home bases.

If all the Initial targets are assigned say to Convoys 1-7 and the random number of Convoys is 10, then Convoys # 8-10 will have one Destroyer traveling at 30 Knots assigned to it. These Destroyer-only Convoys travel between Oil, Steel, and Troop Islands in a random pattern. These Destroyer-only convoys will automatically return to one of the 3 Home Bases when they get down to no Depth Charges remaining. Also this returning Destroyer-only convoy will disable its Detection after expending its last Depth Charge. After reaching a home base, the destroyers will re-load a full load of depth charges and then head back to the three Islands (Oil, Steel, or Troop).

Other higher degree of difficulty Convoy protection is to say "yes" to having **Convoy 13**. It is a real Hunter-Killer Task Force composed of 5 Destroyers and one Escort Carrier which has 5 Aircraft with one Bomb each and traveling at 20 knots. The Carrier aircraft patrol within 75 miles

radius of the Convoy 13's position and all 5 aircraft will converge on any and all Submarines on the Surface within 75 miles of the Convoy 13.

A surfaced submarine has either one shot ( Regular Sub , Sonar Sub or Supply Sub ) or 2 shots ( Anti-aircraft sub) against the A/C which could be at 3 different altitudes during its attack. After the attack either the sub shoots down the aircraft and then automatically dives to get away from further A/C attacks, or it is sunk.

The program allows two or more surfaced subs within 5 miles of each other to add their AA fire to protect the first sub. However, if the first sub successfully shoots down the aircraft before the second sub gets to fire , it dives and then the second sub is under attack by the remaining A/C..

If the aircraft is shot down by using fire from the second sub, then both subs dive to get away from further attacks.

Once Convoy 13 gets down to only one aircraft remaining , it automatically changes course to one of the 3 Home bases .

Unlike the Convoys 1-12 and 15, Convoy 13 starts at X=800 ( Y= random from 700-1100) heading to one of its 4 turn points located at sea near Oil, Steel , Troop island and the Sub Base. After reaching each turn point ( with no message telling you where its at) , it randomly heads to one of the other 3 turn points .

An even higher degree of difficulty Convoy protection is to say" yes" to having **Convoy 15**. It is a Task Force composed of 20 Transports , 5 Destroyers and one Escort Carrier which has 5 Aircraft with one Bomb each and traveling at 20 knots. The Carrier aircraft patrol within 75 miles radius of the Convoy 15's position and all 5 aircraft will converge on any and all Submarines on the Surface within 75 miles of Convoy 15.

Convoy 15 initial start is just east of one of the 3 home bases and traveling directly to Steel Island since it only has Transports . So it will arrive at Steel Island in 65-70 hours after the game starts ( Day 2 , hours 17 to 22). If it gets back to one of the home bases with 5 or more transports, it can build a Second Escort Carrier , more Tankers ,etc and really complicate the Sub Commanders problems.

Another higher degree of Convoy protection is to answer "**yes**" to " Do you want a random Escort Carrier?". In this case, an Escort Carrier with its 5 Aircraft will be randomly assigned to one of the original convoys (# 1- " X" ) , where X can be 6-12. This makes it hard because the sub Commander doesn't know which convoy has the Escort carrier and must remained submerged within 75 miles of each convoy until he knows which Convoy has the Carrier.

## **2. Return to Home Base/ Build new Ships Option**

Remember, this is a long term game. If many Tankers get back to Home Bases , Convoys will start going faster than 15 knots reducing the number of Submarine Attacks and complicating the Sub Commanders job. Conversely, if few tankers get back to Home Bases , the Convoys will be slower , thus making the Sub Commanders job easier.

**The Equation for New Speed for the 2<sup>nd</sup> and subsequent Trips is**  
**Speed= Integer (( 90 + 2\* ( Number of tankers delivered)/ Day )**

Each transport returning brings back 6,000 tons of finished Steel. The tonnages needed for new ships is

Transports	6,000
Tankers	6,000
Troop Ships	6,000
Destroyers	3,000
Carriers	30,000

Thus, **one goal of the Submarine Commander is to not let 5 or more transports** in any one Convoy return to home Base as the Convoy Commander will build a Carrier to protect the Convoy.

Incidentally , although you are the Submarine Commander, you are also the Convoy Admiral. So you should “turn your hat around” and assume the Duties of an Aggressive Convoy Commander whenever you have the chance , such as during aircraft attack, blimp attack, Depth Charging, and building new ships .

This way , you will really get the feel of the long term Submarine-Convoy Battles of WW II as in the “Battle of the Atlantic” and “ US Submarines in the Pacific War “.

The program has a built in routine which ties the number of returning Troop Ships with the probability of submarines sinking the Destroyers protecting the other ships. During the first **10** days, destroyers are protected. After **10** days, which is when the last Convoys would have returned the first time to the Home Bases , the program then will make it more likely that destroyers will be sunk during submarine attacks if few Troop Ships are returning.

The equation for Calculating the number of destroyers sunk is

$$DDS ( final ) = Integer ( ( 5 * Day * DDS(initial) / ( 50 + 5 * (N6) ) )$$

Where

DDS (initial ) is the # of hits on the Destroyers in a Sub Attack ( 1-6 ) . Note that hits are first absorbed by the Tankers, Troop Ships, Transports, and Carriers , so that DDS(initial ) is usually a low value.

N6= Total # of Troop Ships delivered during the game.

### 3. Blimp Details

During the initial Convoy set-up, Option “A” you are asked to put in the Blimp Activation score. This is the score in which the Submarines are “winning”. Thus when you put in 20 , whenever the subs are leading by 20 points, then the blimps are activated. Also note that even if the score goes the other way in favor of the Convoys, the Blimps are still there flying. When the blimps are activated, you will receive a message telling you that they are activated. Nine Blimps start flying at 30 knots from the 6 Islands ( One each from the Home Islands and 2 each from Oil, Steel , and Troop Islands. The blimps have a 30 mile radius ability to spot surfaced submarines.

A surfaced submarine has either one shot ( Regular Sub , Sonar Sub or Supply Sub ) or 2 shots ( Anti-aircraft sub) against the Blimp which could be at 3 different altitudes during its attack. After the attack either the sub shoots down the Blimp ( The sub remains on the surface) , or it is sunk.

The program allows two surfaced subs detected by the Blimp to add their AA fire to protect the first sub. If the Blimp is shot down by using fire from the second sub, then both subs remain on the surface.

If the Blimp is not shot down by the second sub , then the first sub is sunk.

**Then it would be a good idea to go to Option “D” and change the second subs status to “Dive” to forestall another Blimp attack.**

Just like Convoy 13 , there are no messages telling you where the Blimps are located. The Blimps have 7 turn points : the 3 home bases ( North , Center, and South ), the 3 islands ( Oil, Steel, and Troop ) and also X, Y=1700,110 right next to the Sub Base. Upon reaching a turn point , a random assignment to one of the other 6 turn points is made for the Blimp.

### 4. Game Options (A, C, D, G, T, X)

To Start , or Restart the Game :

1. Click on the “Submarine Battle 2020 ” Excel File.
2. Click on “ Developer “ on the upper tab line ( at top )
2. Click on “Visual Basic Editor” ( at top left )
3. On the VBA Project on the left,  
Scroll to “Gamestart (Sheet1) ‘ and click.
4. The sub routines will now appear ( It shows “Declarations”)  
Scroll down to the sub routine “Submarine\_Battle” and click.
5. Either click on “Run” , then “Run sub/user Form F5” on the upper tab line
6. Microsoft Excel “ to return to the Menu “ will now appear. Click “ OK “
7. Microsoft Excel ( with 5 Options A,C,D,G,T , X ) appears, click “ OK”
8. Select “ G “ ( All options are capital letters).
9. Select Either “ Restart=1 , Save =2 , or New Game =3 “.

When the screen shows the Options , do the following:

**A. Select Option “C” :**

Option “ C” shows the current status of the submarines , detected convoys , and what blimps are flying . It also shows which subs are in the process of attacking a convoy by showing Sub “X” and Convoy “ Y “ to the right of the Convoy Status. Also shown for Sub “ X “ is either a snorkel sub ( speed =15 knots submerged ) or an Anti-Aircraft ( AA) sub by using a “1” if so, or “0” if not. “

Both bits of information on Sub “X” is useful whenever Carrier Aircraft in the Convoy or Blimps are flying between the Islands.

**B. Select Option “ G”**

For a brand new game, input a 3 ( Do this twice to clear the last game completely.) This will make all data equal to zero.

If you are restarting a game previously started, input a 1.

Note that whenever you decide to stop a game in progress , input a 2 to save all the data. Also , every time you use Option “D” to change a sub ‘s direction , destination, or to intercept a convoy, the program also saves all the games data automatically. Thus if the program bombs out for any reason, you can re-start using Option “G , press 1 “ to go back to the last sub change .

**C. Select Option “A”, and Initialize the Convoys ( # 1-12 )** by inputting the # of Transports , Tankers, and Troop Ships. Destroyers are assigned depending on how many other ships are randomly put in the convoys.

You will be asked “How many ships/destroyer” and “ # of Depth Charges per Destroyer”. A good beginner’s level answers is 5 ships/DD and 3 DC/DD because an Average Convoy with 6-9 ships will have 2 Destroyers with 6 DC’S. It takes 5 DC’S to definitely sink a sub. During 2 Depth Charge Attacks, this sample Convoy could drop 3 DC’s on each attack and have a 60 % chance of sinking 2 subs. Even if a sub is not sunk after enduring a 3 DC attack, it will be damaged and lose 6 Torpedoes and 1.5 days fuel. Also , the sub course is changed 90 degrees from the Convoys and it doesn’t detect the convoys ship’s make-up and other details. Also, after a Depth Charge attack, the Sub’s Sub Attack set-up is disabled. It will be necessary to manually re-set a new sub Attack.

The # of convoys is randomly assigned from 6 to 12. Convoys with ships travel at 15 knots and Convoys with only Destroyers travel at 30 knots.

These convoys start at X=800 miles, Y random and head for the 3 Islands. Note that for the Initial destinations ( Convoy trip # 1) that the Convoys are randomly assigned one of the 3 Islands regardless of their Ship types. For example, a Convoy with only tankers may be assigned to go to Troop island.

The normal Convoy circuit is 1<sup>st</sup> to Oil Island ( if it has tankers) , 2<sup>nd</sup> to Steel island ( if it has Transports) , and 3<sup>rd</sup> to Troop Island ( if it has Troop Ships.)

After completing their Required circuit, they head back to one of the 3 home base ( North , Center , or South Islands) to deliver their Oil, Transports, and Troops. Then you can build new ships if transports return.

**Convoy # 13** is one carrier with 5 bombs ( aircraft ) which have a 75 mile range and 5 destroyers. This convoy randomly goes between 4 turn points ( near Oil, Steel , Troop and the Sub Base). No messages announce its location or next destination.

**Convoy # 15** is one carrier ( 5 Bombs), 5 Destroyers , and 20 Transports which start at one of the 3 home bases and head directly to Steel Island at 20 Knots. Adding Convoys 13 and/or 15 add to the Sub Commanders degree of difficulty.

Another higher degree of Convoy protection is to answer “**yes**” to “ Do you want a random Escort Carrier?”. In this case, an Escort Carrier with its 5 Aircraft will be randomly assigned to one of the original convoys (# 1- “ X” ) , where X can be 6-12. This makes it hard because the sub Commander doesn't know which convoy has the Escort carrier and must remain submerged within 75 miles of each convoy until he knows which Convoy has the Carrier

Also by selecting a low score ( Subs have sunk more targets ) for **Blimp activation**, the degree of difficulty gets even harder as 9 blimps traveling at 30 knots with a detection range of 30 miles search for surfaced subs.

#### **D. Select Option” D” and set up each of Subs # 1-10.**

Select Yes for initial setting.

Select either **Sonar sub** ( 12 Torpedoes max, with 25 mile submerged convoy detection range. (Note all subs have 25 mile surface detection range and convoys have 15 mile surface detection range and 5 miles sonar detection range. Regular ,Anti-aircraft and Supply subs have 15 mile submerged detection range.)

Or select an **Anti-aircraft sub** ( 18 max torpedoes)

Or select a **Regular sub** ( 24 max torpedoes.)

Or select a **Supply Sub** ( 24 Torpedoes , 20 days fuel)

Note that Supply subs start with 24 torpedoes which can be transferred to other submarines. A rendezvous is usually set up by stationing the supply sub at a location near the Battle s. After other subs expend some of their torpedoes and fuel, send them to the supply sub's location.

Once the sub reaches the Supply sub, a message will tell you that you can either transfer torpedoes, or skip transferring torpedoes. Then a message tells you that you can transfer fuel ( 0.1 day's Minimum). After the transfer is complete, go to Option “D” and move the recently supplied sub away from the Supply Sub or you'll get the message that the sub is at the Supply Sub again. ( It'll be necessary to transfer at least 0.1 day's fuel to continue the program.) After the Supply sub transfers all its torpedoes and fuel to other subs, then send it back to the Sub Base to take on a new load of torpedoes and fuel or change it to another configuration ( regular, Sonar or Anti-Aircraft sub).

During a Carrier or Blimp attack on a surfaced sub, Regular subs , Sonar subs and Supply Subs get one shot at the aircraft or Blimp and it has 3 altitude choices . An AA Sub gets 2 shots. You can have 2 subs together within 5 miles ( Carrier Attack ) or 30 miles (Blimp Attack) and add their shots to protect each other.

Note each sub starts with 10 days fuel ( Based on 10 knot speed ) . Surfaced subs can go 25 knots max and submerged subs can do 10 knots max. For every torpedo left off at initial setting, the sub gets another days fuel.

### **Snorkle Option:**

Just as Germany introduced the use of the Snorkle ( first developed by the Dutch) late in WWII, this option allows you to have snorkel submarines. The advantage is that you can stay submerged and run at speeds up to 15 knots. If you are attacking a Convoy with a carrier, sometimes 15 knots submerged is still faster than the Convoy, thus you can manually make an End Around this Convoy for a 2<sup>nd</sup> attack and subsequent attacks..

However, by converting to a snorkel sub, it is necessary to **remove 4 torpedoes**.

First set-up the sub as you want it ( ie, Sonar, Anti-aircraft, regular or Supply ) with the # of torpedoes and fuel as you want it. Then by answering "yes" to a snorkel, 4 torpedoes will be removed.

Normally, start the subs at the sub base ( X=1700,Y=100 ).

There are 3 options for setting the subs direction : **Course** , 0 is to the right(east) , 180 is to the left ( west); **Intercept** ; or **Destination** (X,Y).

**Intercept** can only be used if a convoy has been Detected. Found convoys are shown on option " C" and remain found until they enter an island.

When a sub reaches its **Destination**, it automatically dives and the speed is set to zero.

If you ask for a sub to **Intercept** a found convoy, the program will calculate the X,Y co-ordinates based upon the intercept speed you put in. It will then tell you the X,Y Destination and number of hours before the sub engages the Convoy. If the hours answer is 100, you will need more speed to get a better intercept position and time. After getting the desired Attack solution, use Option D , answer " NO" to "Is this the Initial Data" ,and input the X,Y Intercept co-ordinates in the Destination Option ( don't need the Intercept Option at this time.)

Also, once you know the Intercept destination, you can send the other subs in the Wolf Pack to the same destination.

**E.** After setting up the subs and convoys, use **option "T" , The Time Advance Option**. This time routine advances each convoy, sub ,and blimp one hours travel. It also checks to see if a sub finds a convoy ( or vice-versa if the convoy is close to the sub ( less than 5 miles submerged, or less than 15 on surface).

Then it automatically goes into the "Depth Charge " mode . If the sub survives the DC, it then goes into the Sub Attack Mode , but is disabled from doing an automatic attack due to the Depth Charging. Also, other subs in the Wolf Pack also lose their automatic Sub Attack set-ups. It also checks to see if any Blimps are within 30 miles of a surfaced sub. If so, it goes into the Blimp Attack Mode.

It also checks to see if any surfaced subs are within 75 miles of an Aircraft Carrier with remaining aircraft. If so, it automatically goes into the Aircraft Attack mode.

**Note: Each of the ( 6 ) 50 by 50 mile Islands are protected by Aircraft. If a sub is inside the boundaries of a Convoy Island, the Island 's aircraft will sink the sub. So, the Submarine Commander needs to be vigilant whenever the subs are close to the Islands.**

After each hour is up, the Sub Commander has the ability to go back to the main menu . Usually you will use Option "D" and change some of the subs directions, speed , etc.

Another choice is to use option C to observe where the Subs and Convoys are located and revise your plans accordingly.

Just as the Convoys have the ability to make new ships , the Submarine Commander has an efficient Ship Yard back at the Sub Base. Unfortunately, he only has enough steel to produce 5 more submarines , one every 5 days. So, a message comes up every 5 days ( Sub 11 built at the Sub Base ) . Go to option D, set up Sub 11 and send it into battle.

To speed up the passage of time, you can click between the 2 Screens : ( **OK and YES**)

A. Score Screen.. shows day, hour, number of subs, ships, and the score and whose "Winning" Convoys or Subs **Click OK**

B. Advance Time Screen.. Continue = **Yes** ( advance another hour in time ) or **No** (return to the main menu)

Note: An even faster way to speed up the passage of time is to simply press the Enter key twice for each hour of game time. Don't get carried away with rapidly pressing the Enter key because you'll need to read and possibly act on information from the Messages at the end of each hour.

**Messages** appearing after one hour advancement which probably will cause you to say "NO" in B: Advance Time? include

Location Messages ( Examples: " Convoy # 5 is at Troop Island" ; " Sub 11 Built at the Sub Base" : " Sub 2 at the Sub Base" .)

All other Messages take you to specific actionable Program routines:

1. Depth Charge Attack
2. Sub Attack
3. Carrier Aircraft Attack
4. Blimp Attack
5. Build New Ships Option

F. Detailed instructions for Pausing the Game ( Option "X")

### **Game Pause details:**

1<sup>st</sup>, Save the Game , Option G, Input a 2.

In the menu, press a capital "X".

The USS Sea Poacher SS 406 Patch will come up.

Click on the Patch upper right "X" .

Double click on the upper right "X" .

Click on "Yes" on the question " Do you want to save the changes you made to Submarine Battle Game.xls.?"

Click " Continue " on the Microsoft excel Compatibility Checker Page

When re-starting the game, use Option G , input a 1.

## **5. Sub Attack Details**

After a Sub contacts a Convoy, the "Sub Attack " message is displayed.

You then get a choice to go to the **sub attack** or to **abort the attack**.

Usually you will abort an attack if you all ready have detected the convoy, have established its position ( Option "C" ) , and it is moving away from the sub ( but still within the sub's Sonar or surface range).

If you select the Sub Attack ( yes) option, then a screen will appear telling you the Convoy #, Number of Targets, # of Destroyers, # of Depth Charges , and Closet Firing Ranges ( Surface and Submerged ) to the Convoy during the attack.

Note that during the attack, the convoy advances position 1 hour and the closest ranges are calculated assuming the sub travels at 15 knots on the surface or 10 knots submerged towards the Convoy during the same hour.

You will be asked for the **Firing Range** and whether it's a Surface ( S) or Submerged ( D) Attack.

**Be advised that although you can get closer during a surface attack, that you are 100% certain of a follow-up Depth Charge Attack.** ( You might still do a Surface Attack if the Convoy has only a few Depth Charges and you're willing to risk having your sub sunk. If so, fire your torpedoes at the closest range so as to get the maximum # of Hits.)

During a Submerged Attack, the following # of hits , # of torpedoes fired , and Probability of Depth Charge counter-attack will guide your choice of firing range:

Firing Range, Yards	# of Hits ( Fire 6 Torp.)	# of Hits ( Fire 4 Torp.)	Prob. Of DC
< 2,000	6	4	100 %
< 3,000	5	3	69 %
< 4,000	4	2	34
< 5,000	3	1	13
< 6,000	2	None	0 %
< 7,000	1	None	0 %
> 7,000	None	None	0 %

A reasonable firing range of 3,990 yards gives the sub skipper a 66 % success rate when firing 6 torpedoes and 50% when firing 4 torpedoes, while having only a 34 % probability of being Depth Charged right after the Attack.

After determining the # of Hits, the program sinks 1<sup>st</sup> the Transports, Tankers, Troop ships and has "Hits" on the Carrier. These hits are based upon the relative # of any particular type of ship. In other words, if a convoy has 5 Transports and 1 Troop Ship, and has 3 hits, then most likely 3 Transports will be sunk leaving the Convoy with 2 Transports and 1 Troop Ship. On the next Sub Attack with 2 hits, a Troop Ship and a Transport will be sunk.

The Carriers can absorb 5 hits before being sunk. But each Hit on a Carrier causes that Convoy to slow down 2 knots and for the Carrier to lose one bomb ( aircraft). After the 4<sup>th</sup> hit for example, Convoy 13 or 15 will be down to 12 knots from its initial 20 knot speed. The 5<sup>th</sup> Carrier hit will sink the Carrier, but not cause the Convoy to lose any more speed. Remember that Convoy 13 automatically returns to one of the 3 home bases whenever it is down to 1 bomb left.

A special case for Convoys with 2 or more Carriers is that the Convoys minimum speed will be 2 knots if all the Carriers are sunk.



Note that if the Attack Screen said that the closest range to fire is 4,500 yards submerged , then the program will keep looping and ask : “Firing range” until you input a firing range greater than 4,500 yards.

The Submarines are configured with 6 torpedo tubes forward for the Regular and Anti-Aircraft Subs. The Sonar Subs only have 4 Forward tubes in order to make room for the extra Sonar Equipment and only have room for 4 Torpedoes in the Forward Room.

The Anti-Aircraft Subs have only room for 10 Torpedoes in the Forward Torpedo Room in order to make room for the extra anti-aircraft guns and ammunition.

The Supply Subs only have the 4 After tubes and can only fire a maximum of 4 torpedoes per attack even though they can carry 24 torpedoes.

All four types of subs have 4 After tubes ( Stern Tubes) .

The Firing order for the 4 types of subs is as follows:

	Regular Sub ( 24 Torp. Max)	AA Sub ( 18 Max)	Sonar ( 12)	Supply (24)
Salvo #				
1. Fire 6 Max from the Forward tubes	-----	-----	-----	-----
2. Fire 6 Max from the Forward tubes	Same	-----	-----	-----
3. Fire 4 Max from the Forward tubes	Same	Same	-----	-----
4. Fire 4 Max from the Stern tubes	Same	Same	-----	-----
5. Fire 4 Max from the Stern tubes	Same	Same	Same	Same

The subs have Fuel Capacity to run at 10 knots continually for 10 days ( 2400 gallons). During the Initial sub set-up, Option D, you can reduce the maximum torpedo load and get another 240 gallons of fuel for each torpedo you leave at the Sub Base. Note that you can still have all the Salvos of 6 or 4 torpedoes ( # 1-4) except that the last salvo # 5 will be reduced by one Torpedo.

**Remember that whenever a sub runs out of fuel, then it loses all remaining torpedoes. Then it needs to return to the Sub Base to re-load torpedoes and re-fuel and maybe change its configuration or go to the Supply sub to take on torpedoes and fuel but still have its original configuration.**

**After the Sub returns to the Sub Base, you may re-configure it into either a Sonar, Anti-Aircraft, Regular Sub or Supply Sub.**

### End-Around Details

Right after a successful Sub Attack , the program will automatically steer the attacking sub on an “end- around” second attack. Note on Sheet 1 ( Option C ) that right after the attack that both the sub and convoy are at the same general position ( the sub will be at the Firing Range point.)

On the screen you will see an “11” in column 11. This indicates that Sub attack # 1 just occurred. Also column 12 will show the Convoy # that the sub just attacked. Column 13 shows the total # of Ships sunk by the Sub.

The program then allows the convoy to proceed on course. Meanwhile, the sub will first travel 10 miles submerged on a course 90 Degrees from the Attacked Convoy’s course, then surface and proceed at 25 knots.

The sub first jogs away from the Convoy in order to stay 17 miles away from the Convoy ( so that its not spotted by the Convoys Destroyers.)

Then it will parallel the Convoy on the same course as the Convoy. Since the sub is traveling at 25 knots on the Surface, it will eventually get ahead of the convoy and then turn to place itself within range of the Convoy for a second attack. Note that sheet 1 , option C, will show the count down to the next attack . ( The sub turns on “3” in column 11 and waits submerged at zero speed for the convoy).

Note that it will automatically repeated the same process for a 3<sup>rd</sup> and subsequent attacks.

Note that you might want to “Break Off” the automatic attack for these reasons:

1. The sub ( always to the right of the Convoy and 17 miles from it) might follow the Convoy into one of the 6 Islands and automatically get sunk by the Island’s Aircraft.
2. The Sub will surface within 2 hours of the Attack to begin its end around. If Blimps or Carrier Aircraft are near, the sub might come under aerial attack.
3. The Sub is out of torpedoes and / or has only a few left so that only a few hits are possible.
4. Sub Commander wishes to shift the next attack to another Convoy.
5. Sub Commander has another purpose in mind for the sub.
6. The sub is low on remaining fuel and will be burning it at the maximum rate of 25 knots for 8 more hours.

To Break Off the Attack, go to Option D, answer “No” to “Is this the Initial setting.” You will get a warning that the Sub is doing an End Around”.

Answer “ Yes” to break off the End Around.

Then change the subs destination, intercept , or its course.

**Be careful to send the sub away from the Convoy you just Attacked, as the Convoy will now “spot” the sub if its within 15 miles surfaced or 5 miles submerged.**

### **Special Case: End Around after attacking a Convoy with a Carrier.**

The program automatically has the attacking sub(s) , do the end around, but if the Carrier has one or more Bombs ( aircraft) left, then the sub(s) **will not surface**. This protects the sub(s) from Carrier Aircraft attack.

But, typically the Carrier Convoy will out run the Sub(s) as the sub(s) are only doing 10 knots submerged. If you have enough Anti-aircraft protection with your sub(s), you can go to option “D” and surface your subs and manually do the end-around. But your subs will be attacked by the Carrier aircraft.

### **Wolf Pack Details**

You may group 2 or more subs at the same location and send them to the same destinations or intercepting a convoy together. This method is known as “Wolf Packs “ to submariners.

Wolf Packs are advantageous for several obvious reasons:

- A. You get 2 or more times the fire power. During sub attacks, each sub **can** shoot its salvo of torpedoes. Then the Wolf pack will automatically do the “End Around “ together to do the second attack and subsequent attacks.

Note that if the Convoy does a Depth Charge attack on any of the Wolf pack subs, then not only can it sink or damage the sub being Depth Charged, but then all of the remaining Wolf Pack subs are prohibited from doing their Sub Attacks.

After the Depth Charge Attack, it will be necessary to manually re-establish the second sub attack as follows:

1. Set the sub course at the Convoy's course minus 90 degrees and set the sub speed to 25 knots( Surfaced)..
2. Let the sub(s) go one hour at 25 knots, Sub course=Convoy course-90
3. Re-set the sub(s) course to the Convoys course and speed =25 knots Surfaced.
4. Check option C after 5-7 hours. Whenever the subs are ahead of the Convoys, then go to Option D and find out the Intercept X,Y Position.
5. Re-set the Sub(s) to the Intercept X,Y Position.

B. On the surface, you get to add the Anti-aircraft shots of all the Wolf pack subs. So , a Regular (or Sonar) Sub and an AA Sub would have 3 shots , enough to shot down a Blimp.

Remember , during aircraft attack that the combined shots might save the 1<sup>st</sup> sub ( if it shoots down the 1st aircraft and it then dives), but that the second sub is then still on the surface and without the 1<sup>st</sup> subs shots to help it with the remaining aircraft. Also note that the program gives the lowest number sub the 1<sup>st</sup> shot. Thus when grouping Wolf pack subs, try to pair a lower number Regular or Sonar sub with a higher numbered AA Sub. That way, the AA sub will at least have 2 shots to protect itself.

### **Intercept Option Details**

Intercept can only be used if a convoy has been Detected. Found convoys are shown on option " C" and remain found until they enter an island.

You can have the Sub Data Option D calculate the X,Y Position which leads the Convoy by 22 miles.( After the Convoy moves one more time, the sub is in a perfect position to make either a surface or submerged attack with the Closest Ranges = 0 yards.)

The program does this calculation by using the desired sub speed and it loops to return the Intercept X,Y position and hours before the attack.

Hint: Check to see where the Intercept X,Y is located. You might want to try Option D again if the intercept point is in a busy intersection of Blimps, Convoy 13 , etc. Simply try a faster or slower intercept speed to vary the intercept point.

Also, sending the sub **towards** a Convoy is the preferred intercept .

**Be wary of intercepts from behind a convoy as the sub will overtake the convoy, but might get within 15 miles and be spotted by the Convoy and Depth Charged.**

After setting Option D for the sub, you can see on Option C, Sheet 1 , that column 10 shows the Convoy # which the sub is intercepting.

### **Depth Charge Details**

When a sub has been spotted by a convoy , the sub also detects the Convoy. The priority is to first do the Depth Charge attack and see whether the sub is sunk or damaged.

The Depth Charge routine assigns the sub randomly to one of 5 depths ( 100, 200, 300, 400, or 500 feet).

Then the Message is shown that **Convoy “X” has found Sub “Y”**. Sometimes several Depth Charge Attacks are taking place , so that the Program asks “ **Which Sub to Depth Charge?”**.

After answering the Sub number to be DC, the program **shows how many DC’s** that the Convoy has. Then it asks “**How many DC’S to drop?”**

Remember that dropping 5 DC’s assures sinking the Sub. But each DC dropped has a 20% chance of sinking the sub.

If the sub is sunk, it is sent to X=1400, Y=0 and then will disappear on Screen 1, Option C. Also, the Time Routine will then award the Convoy whatever points a sub is worth.

Similarly, Convoys are sent to X, Y = -100, -100 whenever they are completely sunk ( usually the last Destroyer).

Then if the sub survives the DC , it can attack the same convoy. The sub loses 2 torpedoes and 0.5 Days Fuel for each DC dropped on it if it survives the Depth Charging.

Also its course is re-set 90 degrees from the Convoys course. It will be necessary to set up a Sub Attack by the 5 steps outlined under “Wolf Pack “ details.

### **Combined Depth Charge Attacks:**

**Note that sometimes a Sub is spotted by 2 Convoys. In this case, you can combine Depth Charges from both Convoys during the DC Attack.**

Note that if a convoy spots a Sub and the Convoy has zero Depth Charges, then the Depth Charge Attack is by-passed by the Program.

### **Switching between the Program and the Battle Map / Worksheet 1 /or Worksheet 3**

The Sub Battle Game is a Visual Basic for Application ( VBA) Program which is a sub-set of the Excel 2002 System , now up-dated to 2020.

To switch between the Battle Map ( 2 ) , or WorkSheet 1 or Worksheet 3 you must use Option “X “

So either at the end of the Game ( after saving all the data by using Option G 2 ) or when first restarting the Game ( option G 1 ) , input “X “ and then you can switch between the 3 sheets.

### **Worksheet Details**

1. Worksheet labeled “2” is the **Submarine Battle Map**.

It shows all six Islands, the Sub Base , and the Convoy Routes ( in black ). Also, Convoy 13’s possible routes ( in yellow).

Remember that Blimps not only travel along the Convoy Routes ( in black) but also between the six Islands and near the Sub Base ( green ).

The Submarine Battle map shows the locations of the Submarines ( round Markers) and the Submarine # ( in red) just to the right of the Sub Marker.

The Submarine Battle Map also shows the locations of **detected** Convoys ( Square Marker) and the Convoy # ( in red ) just to the right of the Convoy marker.

Blimps are not shown.

2. Worksheet 1 is the Option C Spreadsheet.

It shows all the Sub and **Detected** Convoy Data. It also shows the status of the 9 Blimps once they are activated ( 0 indicates the Blimp is shot down.)

3. Worksheet 3 is the location of all the Game Data.

After every Hour ( Option T) , it is up-dated . Also the program retrieves data from Worksheet 3 during new calculations.

**Note that the Submarine Commander should not look at Worksheet 3 while playing the Game , as this sheet displays all the information ( Convoy and Blimp locations, courses, destinations, etc )!!**

### Battle Map Construction Details

A very useful aide is to make your own Submarine Battle Map using white poster board. That way , you can see at a glance the positions of all your subs and the (detected) convoys. I used a 28 “ X 21 “ poster board mounted on a cork board so that I can use different colored push pins to represent the subs and convoys .

The scale of 1 and 3/16 inches representing 100 miles allows for the battle map to take up a 23” ( X=1800 miles) x 14.5 “( Y= 1200 miles) area. Then you can show enlargements of the Oil , Steel , and Troop Islands ( scale 1 “ =20 miles) regions below the main Battle map. These come in handy as your subs are close to the Islands. Remember, if the sub is inside the Islands during a Time routine, that they get sunk by Island Aircraft.

Draw the Islands X, Y CORNERS as follows:

Island	SW Corner	NW corner	NE Corner	SE Corner	Turnpoint
Sub Base	1700 , 0	1700 , 100	1800 , 100	1800 , 0	
North Base	0 , 925	0 , 975	50 , 975	50 , 925	25 , 950
Center Base	0 , 575	0 , 625	50 , 625	50 , 575	25 , 600
South Base	0 , 225	0 , 275	50 , 625	50 , 225	25 , 250
Oil Island	1100 , 1150	1100 , 1200	1150 , 1200	1150 , 1150	1125 , 1175
Steel Island	1400 , 800	1400 , 850	1450 , 850	1450 , 800	1425 , 825
Troop Island	1750 , 1150	1750 , 1200	1800 , 1200	1800 , 1150	1800 , 1200

Use the turnpoints to draw the routes between the islands for the Convoys and Blimps in black.

In addition, use the turnpoint 1700 , 1100 for 6 additional Blimp routes ( in green ) . Also , there are 2 additional blimp routes between the 3 convoy home bases ( North Base to Center Base and Center Base to South Base).

The 4 turnpoints for Convoy 13 actually have a 10 mile radius around the turnpoints:

1. Near Sub Base 1700, 150
2. Near Oil Island 1140, 1140
3. Near Steel Island 1460 , 900
4. Near Troop Island 1680 , 1110

Draw Convoy 13's routes in yellow.

I also show the Convoy initial start line at X=800 miles.

Show Convoy 13's initial start line at X=800 miles , Y= 700 to 1100.

There are several other useful lines:

1. Show a black line from X=800, Y=700 to X= 1700, Y=150. From X=800 , scale off the (possible) time positions of Convoy 13 every 10 hours ( 200 miles). That way, at the beginning of the game , you'll be able to see how close your subs could be to C13 if it's heading for that turnpoint next to the sub Base. ( Some of your subs may be headed the opposite way at 25 knots).
2. Show a black line from X=800 , Y=0 to Troop Island. Mark off every 150 miles .This line shows the (possible) time positions of one of the initial convoys ( # 1-12 ) if it is headed towards Troop Island on its initial run at 15 knots.
3. Starting at each of the home bases ( X=50 miles) , make 10 hour (possible) time marks ( 200 miles) for Convoy # 15 towards Steel Island. That way , if you have Convoy 15, you'll know the 3 possible locations of Convoy 15 on its initial run to Steel Island.

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