

Program Description I

Program Title Sink the Yamamoto!
Submarine Attack Game
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Program Description, Equations, Variables After a successful patrol, with only one torpedo left, you, the commander of the USS Jellyfish, are heading up the Bungo-Bungo Straights at 6 knots (Jellyfish class will do 12 kn. max.) heading due North (0°). The Yamamoto appears dead ahead at your radar's limit of 20,000 yards. You don't know his heading, but his speed is a constant 18 knots. You dive and begin a radar approach receiving the following three displays every minute (this is one minute of game time, for your calculations, but takes only about 18 sec. real time) — 1) range/bearing (displayed for 5 sec.); range to the Yamamoto in yards, and bearing in degrees ($0-360^\circ$) relative to your bow. — 2) speed/heading (5 sec. also); your speed in knots and your compass heading in degrees. — 3) '0.000' displayed for 1 sec. This is your "window" for making course/speed changes, or for firing your torpedo. (See User Instructions). Use R/S for more time. Your torpedo may be fired at any angle from your bow and runs at 15 kn. After firing, the display will show 'range to target' at 5 sec. (game time) intervals. If you miss, range will start increasing — if you hit, you will know it! By the way, the Yamamoto makes random course changes, but only about 3 an hour. (game time) The archaic units are those used by WWII accounts and novels. Happy Hunting!

Operating Limits and Warnings The initial problem is always the same. To change it — 1) load the program. 2) Press [A]; 3) Press [R/S] — Read the minutes from your watch, and enter; 4) Enter [STO] [X] [3]; 5) [A] then starts the game. When you get him half the time, you're in the big league. He is not always "gettable". He may start at a wide angle and not tack, or make an odd sequence of tacks taking him out of range. Author not responsible for addiction, lost time, withdrawal symptoms, or divorce.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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Program Description II

Sketch(es)

Sample Problem(s) Steps 1-12 of the user instructions represent a realistic sample problem. Steps 13+14 are given only to show the mechanics of firing a torpedo. Let the program run from Step 12 on. When learning, stop the program (R/S) occasionally and draw a diagram.

When his bearing angle, relative to your bow (Step 4 User Instructions) remains constant, you are on an intercept course. However, when you get very close (< 2500 yds.), you must let him creep across your bow to account for your faster running torpedo.

Try to maneuver within 1000 yds. before you fire, but if you fire from less than 100 yds. (you can't miss!), assume that it was a 'suicide attack'.

Solution(s) As with game programs, there is no solution!

The initial example, outlined above and in User Instructions, will get you after him, but look out! - he tacks late in the game.

If you keep getting 'impossible' problems (Step 7 always 19389.001), an erroneous input has zeroed the random number register (3). Reload the program and use 'Operating Limits and Warnings' from pg. 1.

Reference(s)



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Initialize by OFF/ON or CL PRGM		☐ ☐	0.00
2	Load both sides of the program card		☐ ☐	0.000
3	Press A to start the problem		A ☐	
4	Range and bearing to target (displayed for 5 sec.) 20,000 yards at bearing 360° - same as 0°, or dead ahead		☐ ☐	20000.360
5	Your speed and heading - 6 knots at 0° (due North) for 5 sec.		☐ ☐	6.000
6	Zero displayed for 1 sec. (PAUSE) This is your 'window' for speed/course change or torpedo firing. To change speed/course, see Step 10. To fire your torpedo, see Step 13		☐ ☐	0.000
7	If you did nothing at Step 6, this is the range and bearing one minute (game time) after step 4. Range has closed to 19,316 yards and he is 1° on your starboard bow. (right, land lubber!)		☐ ☐	19316.001
8	Same as Step 5. You didn't change course.		☐ ☐	6.000
9	Stop during the 'window' for a course change		R/S ☐	0.000
10	Make a course/speed change to try to intercept him. This is 12 knots at heading 040°. (Angles must be 3 digits)		1 2 0 0 4 0 R/S ☐	12.040
11	Range 18,532 yards, relative bearing 321°. Notice he is now 39° off your port bow. This is because you turned 40° to starboard.		☐ ☐	18532.321
12	Indicates your new speed/course.		☐ ☐	12.040
13	Stop during the 'window' to fire a torpedo.		R/S ☐	
14	Minus one is the firing indicator. The fractional part is the torpedo angle from your bow. -1. fires straight ahead. The entry shown fires 3° to port.		1 . 3 5 7 CHS R/S ☐	18532.
	Steps 13 & 14 are for example only as it is preferable to maneuver to within 2000 yards as the angles are very uncertain at long range. Also torpedo run times (at 5 sec. game time intervals) will be excessive.		☐ ☐	

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Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	31 25 11	START/RESTART		*LBLB	31 25 12	Start of repetitive
	F?1	35 71 01	First pass?		PSS	31 42	tracking loop
	GSBb	32 22 12	No		RCL6	34 06	
	SF1	35 51 01		080	RCL4	34 04	
	π	35 73	First rand.# seed		PSS	31 42	
	STØ3	33 03	seed loc.		R→P	32 72	
	*LBLb	32 25 12	Restart entry		RCL9	34 09	
	PSS	31 42			X	71	
	CLX	44	Initialize Ex & Ey		INT	31 83	This area sets up the
010	STØ6	33 06	registers		Xy	35 52	range and relative
	6	06			X>0	31 81	bearing of the
	4	04			GTØ1	22 01	Yamamoto.
	5	05			RCL2	34 02	
	STØ4	33 04		070	+	61	
	PSS	31 42			*LBL1	31 25 01	
	2	02			RCL8	34 08	
	EEX	43	Initialize yds/knot		FRAC	32 83	
	4	04	/min.		RCL1	34 01	
	Xy	35 52			X	71	
020	÷	81			-	51	
	STØ9	33 09			X>0	31 81	
	CLX	44			GTØ2	22 02	
	STØ7	33 07	Initialize Jellyfish		RCL2	34 02	
	6	06	speed & heading	080	+	61	
	STØ8	33 08			*LBL02	31 25 02	
	STØ6	33 06			RCL1	34 01	
	3	03			÷	81	
	6	06	Initialize program		+	61	Yamamoto bearing/spd.
	0	0	constants		-X-	31 84	Display
030	STØ2	33 02			RCL8	34 08	J/F course/spd
	1	01			-X-	31 84	Flash it!
	EEX	43			0	00	Window for firing
	3	03			PAUS	35 72	or course change
	STØ1	33 01		090	F?3	35 71 03	Entry?
	DSP3	23 03	Initialize operating		GSBw	32 22 11	Yes
	CF3	35 61 03	mode		GSB7	31 22 07	No, check for tack
	CF0	35 61 00			RCL5	34 05	Navigation
	GSB3	31 22 03	Get random no.		RCL4	34 04	equations
	.	83			Σ+	21	
040	5	05			RCL7	34 07	
	-	51			RCL6	34 06	
	X>0	31 81	Determine direction		Σ-	35 21	
	SF0	35 51 00	of next tack		GTØB	22 12	To start of loop
	8	08		100	*LBLa	32 25 11	Entry routine
	0	00	Initialize Yamamoto		X<0	31 71	Torpedo launched?
	X	71	to 18 knots, between		GTØ4	22 04	Yes
	1	01	140° & 240° heading		FRAC	32 83	No, make course/spd.
	8	08			STØ8	33 08	change
	0	00			LSTX	35 82	
050	-	51			INT	31 83	Make sure spd. is
	1	01			1	01	within limits.
	8	08			2	02	
	P→R	31 72	Convert to rectangular		X>y	32 81	
	STØ4	33 04	and store	110	R↓	35 53	
	Xy	35 52			STØ+8	33 61 08	
	STØ5	33 05	End of initialization		RCL8	34 08	

REGISTERS

0	1	2	3	4	5	6	7	8	9
	1000.	360.	Rand.#	Target X knots	Target Y knots	Sub X knots	Sub Y knots	Sub speed / heading	3i2077 yds/kn./min.
S0	S1	S2	S3	S4 rel. pos. X knots	S5	S6 rel. pos. Y knots	S7	S8	S9
A	B	C	D	E	I				

Program Listing II

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	FRAC	32 83	Convert new course to delta values in rect. coord. + store		X>Y	32 81	Hit?
	RCL 1	34 01		170	GT0 6	22 06	Yay
	X	71			RCL 5	34 05	Nay
	X<Y	35 52			RCL 4	34 04	If you followed
	P→R	31 72			E+	21	this far, this code
	ST0 6	33 06			RCL 7	34 07	is obvious
	X<Y	35 52			RCL 6	34 06	
120	ST0 7	33 07			E-	35 21	
	RTN	35 22			GT0 5	22 05	Re-iterate
	*LBL 3	31 25 03			*LBL 6	31 25 06	You hit it!
	RCL 3	34 03	Pseudo random # generator		9	09	
	9	09	Stolen from HP	180	0	00	
	9	09			N!	35 81	Ring the bell!
	7	07			R/S	84	
	X	71			*LBL 7	31 25 07	Tack decision routine
	FRAC	32 83			GSB 3	31 22 03	Call RAND#
	ST0 3	33 03			.	83	
130	RTN	35 22			0	00	Tack one out of
	*LBL 4	31 25 04			5	05	twenty
	1	01			X<Y	32 71	Tack?
	+	61			RTN	35 22	No
	RCL 8	34 08		190	GSB 3	31 22 03	Yes, pick angle
	FRAC	32 83	Add firing angle		3	03	from 0-30 degrees
	+	61			0	00	Which direction
	RCL 1	34 01			X	71	left- decrease angle
	X	71			F?0	35 71 00	right-increase
	1	01			GT0 8	22 08	
140	.	83			SF0	35 51 00	
	2	02			GT0 9	22 09	
	5	05			*LBL 8	31 25 08	
	P→R	31 72			CHS	42	
	ST0 6	33 06		200	CF0	35 6 00	
	X<Y	35 52	Torpedo launch loop		*LBL 9	31 25 09	
	ST0 7	33 07			RCL 5	34 05	Get x-y coordinates
	RCL 5	34 05			RCL 4	34 04	of Yamamoto
	1	01			R→P	32 72	To polar
	2	02			R↓	35 53	Angle to x
150	.	81			+	61	Tack!
	ST0 5	33 05			R↑	35 54	
	RCL 4	34 04			P→R	31 72	Back to x-y + store
	1	01			ST0 4	33 04	
	2	02		210	R↓	35 53	
	+	81			ST0 5	33 05	
	ST0 4	33 04	It's on its way - sit back & watch!		RTN	35 22	
	*LBL 5	31 25 05	Same Nav. equations as the approach problem.		R/S	84	
	DSP0	23 00					
	P→S	31 42					
160	RCL 6	34 06					
	RCL 4	34 04					
	P→S	31 42					
	R→P	32 72					
	RCL 9	34 09		220			
	X	71					
	PAUS	35 72					
	EEX	43	Show range from target to torpedo				
	2	02					

LABELS					FLAGS	SET STATUS		
A START/RESTART	B	C	D	E	0 next tack flag	FLAGS		DISP
a used	b used	c	d	e	1 init. complete flag	ON OFF		
0	1 used	2 used	3 used	4 used	2	0 ☐ ☒	DEG ☒	FIX ☒
5 used	6 used	7 used	8 used	9 used	3 action entry flag	1 ☐ ☒	GRAD ☐	SCI ☐
						2 ☐ ☒	RAD ☐	ENG ☐
						3 ☐ ☒		n <u>3</u>