

Test 17: Missile, Radar Sensor, Distance Fuze

1.

This test will verify that a missile can be fired from a ship towards an aircraft and guide itself using a radar sensor and a distance fuze to detonate after the missile has covered a certain distance.

2.

A ship MY_SHIP1 starts off at a stationary location facing east, with no speed. MY_SHIP1 is equipped with a missile that has a radar sensor and a distance fuze. An aircraft MY_AIRPLANE1 starts off with a speed of 0 with a longitude of 5 minutes away from MY_SHIP1 facing north.

3.

```
delete window wTop
create window wTop top view with 350 (0*0'0# 0*15'0# 0*1'0.0#)
(0*5'0# 0*15'0# 0*1'0.0#)

define sensor radar SENSOR_RADAR1 with field of view 30 power 50
sensitivity 10
define sensor distance FUZE_DISTANCE1 with trigger distance 5.0

define munition missile MUNITION_MISSILE1 with sensor
SENSOR_RADAR1 fuze FUZE_DISTANCE1 arming distance 1

define ship ACTOR_SHIP1 with munition (MUNITION_MISSILE1)

define airplane ACTOR_AIRPLANE1 with munition (MUNITION_MISSILE1)

create actor MY_SHIP1 from ACTOR_SHIP1 at 0*0'0.0#/0*10'0.0#/0
with course 90 speed 0

create actor MY_AIRPLANE1 from ACTOR_AIRPLANE1 at
0*0'0.0#/0*5'0.0#/0 with course 0 speed 0

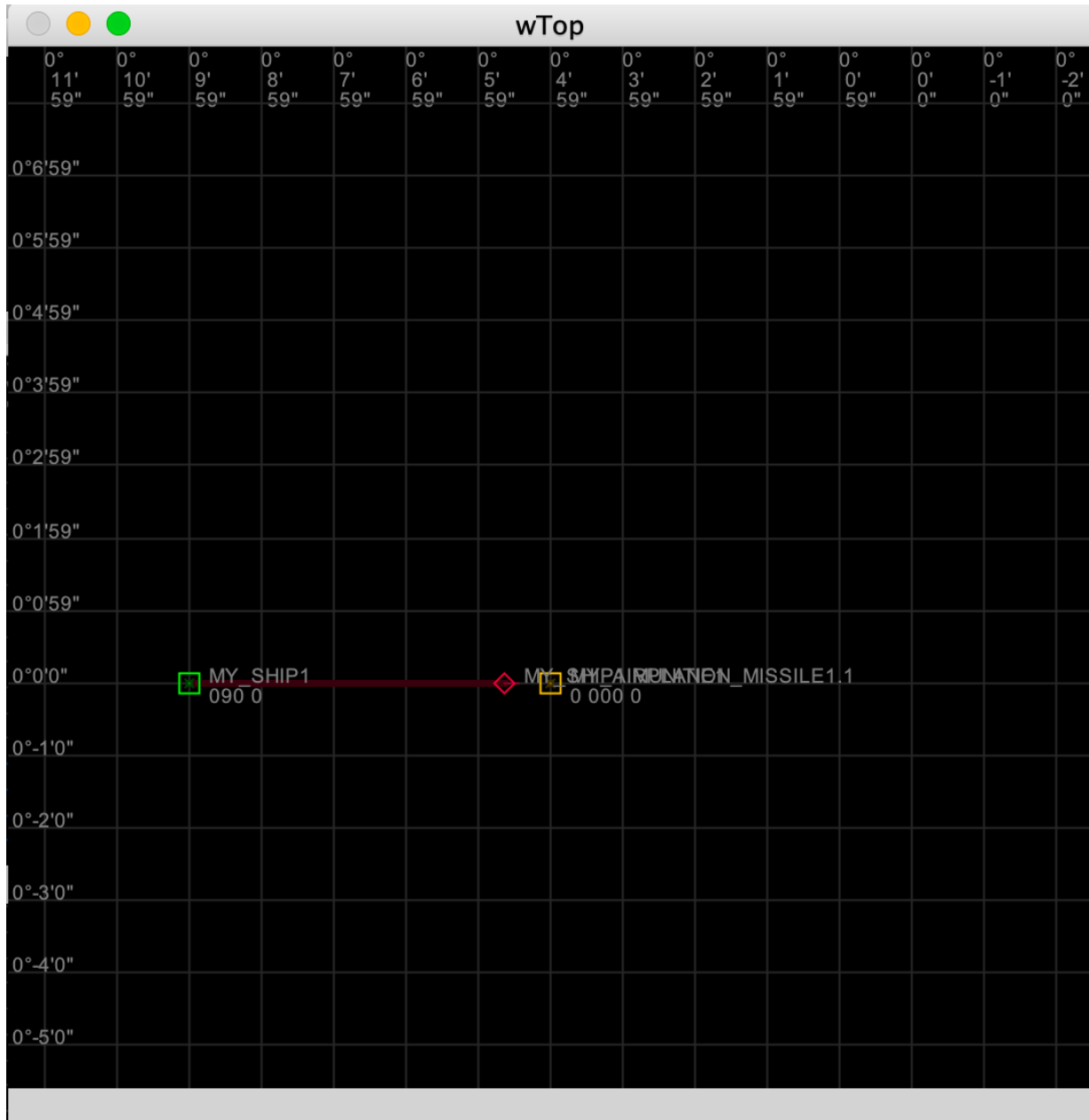
set MY_SHIP1 load munition MUNITION_MISSILE1

@wait 10

set MY_SHIP1 deploy munition MY_SHIP1.MUNITION_MISSILE1.1
```

4. After 10 seconds, MY_SHIP1 will fire MY_SHIP1.MUNITION_MISSILE1.1 and will travel directly east towards the direction of MY_AIRPLANE1. Once the missile has covered 5 nautical miles, the missile will detonate.

5.



6.

event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_elapsed	time_elapse	target_beari
1	218	7.63	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						
2	218	7.63	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0	0						
3	218	7.63	missile	MY_SHIP1.MUNITION_MISSILE1.1	0	0.166666667	0	90	0	0	0	FALSE	FALSE					
4	218	7.63	distance	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_DISTANCE1.2	0	0.166666667	0	90	0	0	0							
5	218	7.63	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0	0.166666667	0	90	0	0	0			0		0		
6	219	7.665	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0							

MY_SHIP1.MUNITION_MISSILE1.1 starts of at longitude 0.166667 in event 3

event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_elapsed	time_elapse	target_
3611	940	32.9	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						
3612	940	32.9	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0	0						
3613	940	32.9	missile	MY_SHIP1.MUNITION_MISSILE1.1	0	0.094166667	0	90	4	0	TRUE	TRUE						
3614	940	32.9	distance	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_DISTANCE1.2	0	0.094166667	0	90	4	0								
3615	940	32.9	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0	0.094166667	0	90	4	0			MY_AIRPLANE1	50	60.15986481	5.005893		
3616	941	32.935	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						
3617	941	32.935	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0	0						
3618	941	32.935	missile	MY_SHIP1.MUNITION_MISSILE1.1	0	0.094	0	90	4	0	TRUE	TRUE						
3619	942	32.97	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						
3620	942	32.97	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0	0						
3621	943	33.005	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						
3622	943	33.005	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0	0						
3623	944	33.04	airplane	MY_AIRPLANE1	0	0.083333333	0	0	0	0	0	0						

MY_SHIP.MUNITION_MISSILE1.1 detonates at a longitude of 0.094 in event 3618

It can be observed that the missile did travel east as expected and then detonated after it covered about 0.072667 (0.166667-0.94) in longitude.

7. The actual results are inconsistent with the expected results, MY_SHIP.MUNITION_MISSILE1 detonated after about 4.36 nautical miles, the expected distance was 5 nautical. However, MY_SHIP.MUNITION_MISSILE1 did travel about 5.02 regular miles.

8. Altitude should vary between 2 different actors during a test.

Test 20: Missile, Radar Sensor, Time Fuze

1.

This test will verify that a missile can be fired from a ship towards an aircraft and guide itself using a radar sensor and a time fuze to detonate after the missile has been deployed for a certain amount of time.

2.

A ship MY_SHIP1 starts off at a stationary location facing east, with no speed. MY_SHIP1 is equipped with a missile that has a radar sensor and a distance fuze. An aircraft MY_AIRPLANE1 starts off with a speed of 0 with a longitude of 5 minutes away from MY_SHIP1 facing north.

3.

```
delete window wTop
create window wTop top view with 350 (0*0'0# 0*15'0# 0*1'0.0#)
(0*5'0# 0*15'0# 0*1'0.0#)

define sensor radar SENSOR_RADAR1 with field of view 30 power 50
sensitivity 10
define sensor time FUZE_TIME1 with trigger time 10.0

define munition missile MUNITION_MISSILE1 with sensor
SENSOR_RADAR1 fuze FUZE_TIME1 arming distance 1

define ship ACTOR_SHIP1 with munition (MUNITION_MISSILE1)

define airplane ACTOR_AIRPLANE1 with munition (MUNITION_MISSILE1)

create actor MY_SHIP1 from ACTOR_SHIP1 at 0*0'0.0#/0*10'0.0#/0
with course 90 speed 0

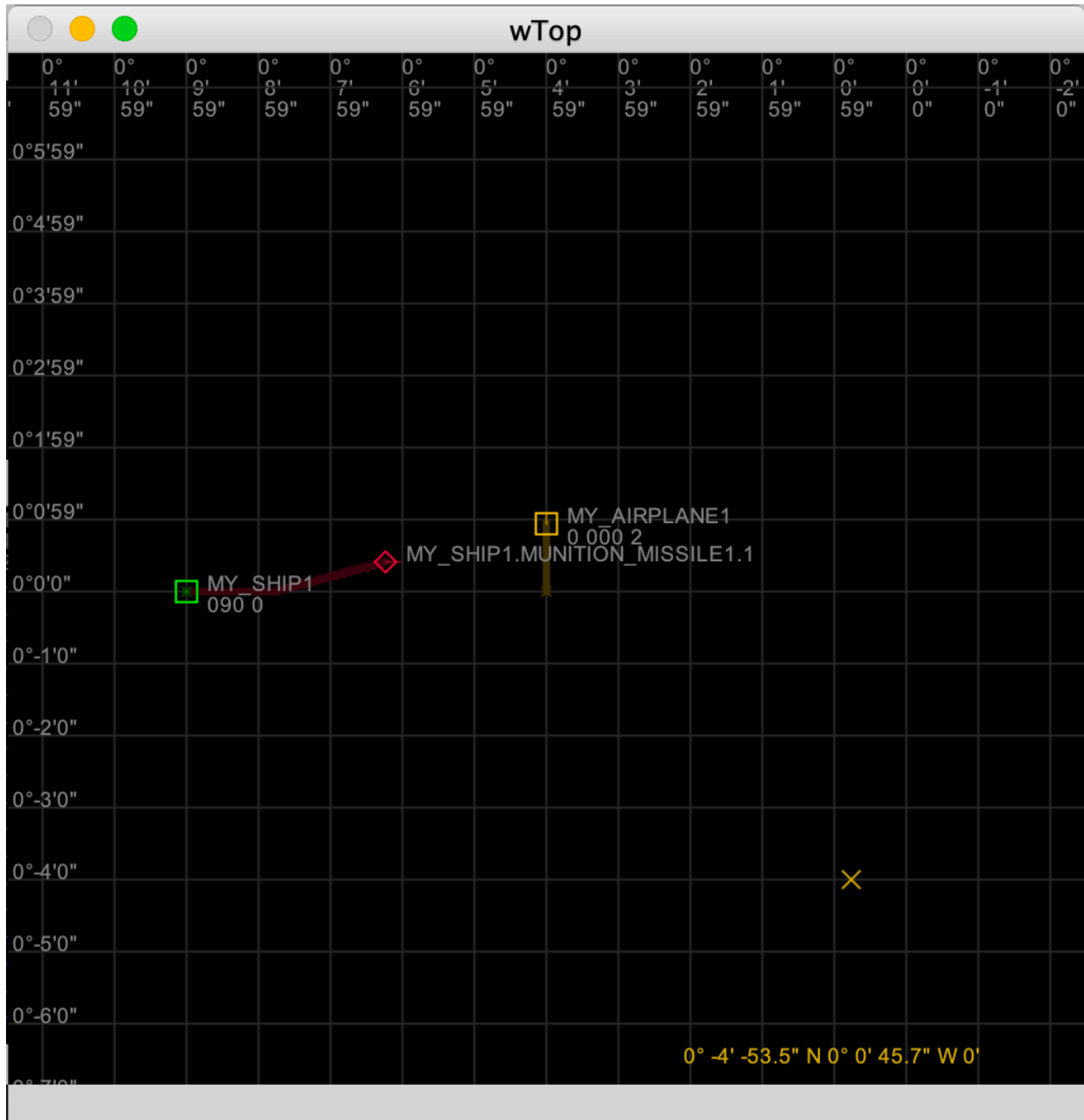
create actor MY_AIRPLANE1 from ACTOR_AIRPLANE1 at
0*0'0.0#/0*5'0.0#/0 with course 0 speed 2

set MY_SHIP1 load munition MUNITION_MISSILE1

@wait 10
set MY_SHIP1 deploy munition MY_SHIP1.MUNITION_MISSILE1.1
```

4. After 10 seconds, MY_SHIP1 will fire MY_SHIP1.MUNITION_MISSILE1.1 and will travel towards the direction of MY_AIRPLANE1. Once the missile has been deployed for 10 seconds it will detonate.

5.



6.

command	event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_elapsed	time_elapsed
deploy MY_SHIP1.MUNITION_MISSILE1.1	1434	697	24.395	airplane	MY_AIRPLANE1	0.007972222	0.083333333	0	0	2	0	0						
	1435	697	24.395	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0						
	1436	697	24.395	missile	MY_SHIP1.MUNITION_MISSILE1.1	0	0.166666667	0	90	0	0	TRUE	FALSE					
	1437	697	24.395	time	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_TIME1.2	0	0.166666667	0	90	0	0	0						0
	1438	697	24.395	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0	0.166666667	0	90	0	0	0			0		0	
	1439	698	24.43	airplane	MY_AIRPLANE1	0.008	0.083333333	0	0	2	0	0						
	1440	698	24.43	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0						
	1441	698	24.43	missile	MY_SHIP1.MUNITION_MISSILE1.1	0	0.166611111	0	90	4	0	TRUE	FALSE					
	1442	698	24.43	time	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_TIME1.2	0	0.166611111	0	90	4	0	0						0.035
	1443	698	24.43	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0	0.166611111	0	90	4	0	0			49.77087709	7.754439463		

MY_SHIP1.MUNITION_MISSILE1.1 is deployed at time 24.395 at event number 1436

event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_elapsed	time_elapsed	target_bearing
2861	982	34.37	missile	MY_SHIP1.MUNITION_MISSILE1.1	0.00675	0.121086435	0	90	4	0	TRUE	TRUE						
2862	982	34.37	time	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_TIME1.2	0.00675	0.121086435	0	90	4	0	0							9.975
2863	982	34.37	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0.00675	0.121086435	0	90	4	0	0		MY_AIRPLANE1	48.59644552		16.30742251		
2864	983	34.405	airplane	MY_AIRPLANE1	0.015916667	0.083333333	0	0	2	0	0							
2865	983	34.405	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0							
2866	983	34.405	missile	MY_SHIP1.MUNITION_MISSILE1.1	0.00675	0.120919768	0	60	4	0	TRUE	TRUE						
2867	983	34.405	time	MY_SHIP1.MUNITION_MISSILE1.1.FUZE_TIME1.2	0.00675	0.120919768	0	60	4	0	0							10.01
2868	983	34.405	radar	MY_SHIP1.MUNITION_MISSILE1.1.SENSOR_RADAR1.1	0.00675	0.120919768	0	60	4	0	0		MY_AIRPLANE1	48.57624199		16.36611665		
2869	984	34.44	airplane	MY_AIRPLANE1	0.015944444	0.083333333	0	0	2	0	0							
2870	984	34.44	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0							
2871	984	34.44	missile	MY_SHIP1.MUNITION_MISSILE1.1	0.006833333	0.120775431	0	90	4	0	TRUE	TRUE						
2872	985	34.475	airplane	MY_AIRPLANE1	0.015972222	0.083333333	0	0	2	0	0							
2873	985	34.475	ship	MY_SHIP1	0	0.166666667	0	90	0	0	0							
2874	986	34.51	airplane	MY_AIRPLANE1	0.016	0.083333333	0	0	2	0	0							

MY_SHIP1.MUNITION_MISSILE1.1 detonates at time 34.44 at event number 2871 towards the direction of MY_AIRPLANE1.

7. The results are as expected, 10 seconds after the missile was deployed, it detonated.

8. Multiple missiles should be launched at different times with different fuze timers and verify that the desired time for each missile is consistent with the time it takes to detonate.

Test 21: Missile, Thermal Sensor, Radar Fuze

1.

This test verifies that a missile equipped with a thermal sensor and radar fuze can be fired from an airplane towards a ship.

2.

An airplane MY_AIRPLANE1 starts off at a stationary location facing east, with no speed. MY_AIRPLANE1 is equipped with a missile that has a thermal sensor and a radar fuze sensor. A ship MY_SHIP1 starts off with a speed of 1 with a longitude of 30 seconds away from MY_AIRPLANE1 facing north.

3.

```
define sensor radar FUZE_RADAR1 with field of view 30 power 50
sensitivity 10
```

```
define sensor thermal FUZE_THERMAL1 with field of view 45
sensitivity 0.1
```

```
define munition missile MUNITION_MISSILE1 with sensor FUZE_RADAR1
fuze FUZE_THERMAL1 arming distance 1.0
```

```
define airplane ACTOR_AIRPLANE1 with munition (MUNITION_MISSILE1)
```

```
define ship ACTOR_SHIP1 with munition (MUNITION_MISSILE1)
```

```
create actor MY_AIRPLANE1 from ACTOR_AIRPLANE1 at
49*39'37.9#/117*26'19.0#/0 with course 90 speed 0
```

```
create actor MY_SHIP1 from ACTOR_SHIP1 at
49*39'37.9#/117*25'30.0#/0 with course 0 speed 1
```

```
set MY_AIRPLANE1 load munition MUNITION_MISSILE1
```

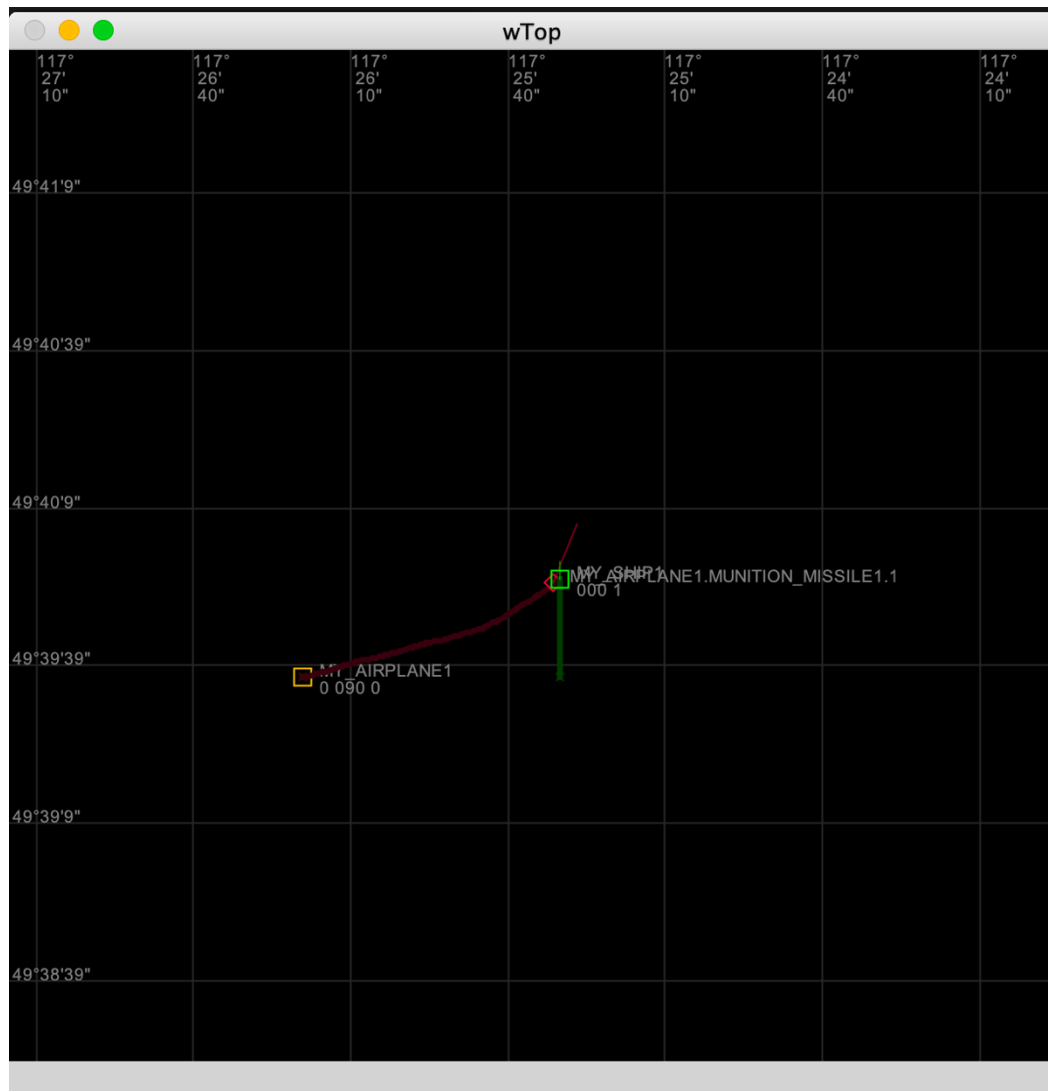
```
@wait 10
```

```
set MY_AIRPLANE1 deploy munition MY_AIRPLANE1.MUNITION_MISSILE1.1
```

4. After 10 seconds, MY_AIRPLANE1 will launch missile
MY_AIRPLANE1.MUNITION_MISSILE1.1

The missile should chase after MY_SHIP1 and eventually strike MY_SHIP1.

5.



6.

event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_ela	time_elapse	target_beari
1428	360	12.6	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.66052778	117.438611	0	90	0	0	FALSE	FALSE						
1429	360	12.6	thermal	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_THERMAL1.2	49.66052778	117.438611	0	90	0	0			MY_SHIP1	0.15	0.137932628			
1430	360	12.6	radar	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_RADAR1.1	49.66052778	117.438611	0	90	0	0			MY_SHIP1	48.01095919	44.14851858			
1431	361	12.635	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								90
1432	361	12.635	ship	MY_SHIP1	49.6645	117.425	0	0	1	0								
1433	361	12.635	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.66052778	117.438611	0	90	0	0	TRUE	FALSE						
1434	361	12.635	thermal	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_THERMAL1.2	49.66052778	117.438611	0	90	0	0			MY_SHIP1	0.15	0.137894888			
1435	361	12.635	radar	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_RADAR1.1	49.66052778	117.438611	0	90	0	0			MY_SHIP1	47.99780523	44.12433042			
1436	362	12.67	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								89.9415349
1437	362	12.67	ship	MY_SHIP1	49.66451389	117.425	0	0	1	0								
1438	362	12.67	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.66052778	117.438444	0	90	4	0	TRUE	FALSE						
1439	362	12.67	thermal	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_THERMAL1.2	49.66052778	117.438444	0	90	4	0			MY_SHIP1	0.15	0.139428606			
1440	362	12.67	radar	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_RADAR1.1	49.66052778	117.438444	0	90	4	0			MY_SHIP1	47.93740693	44.55897218			
1441	363	12.705	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								89.88307

event_num	event_group	time	agent_type	agent_id	latitude	longitude	altitude	course	speed_horizontal	speed_vertical	deployed	armed	target_id	power_raw	power_attenuated	distance_ela	time_elapse	target_beari
1863	447	15.645	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.66524271	117.425588	0	53.33922593	4	0	TRUE	FALSE						
1864	447	15.645	thermal	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_THERMAL1.2	49.66524271	117.425588	0	53.33922593	4	0			MY_SHIP1	0.15	2.636136596			
1865	447	15.645	radar	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_RADAR1.1	49.66524271	117.425588	0	53.33922593	4	0			MY_SHIP1	39.6562492	696.9285986			
1866	448	15.68	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								90
1867	448	15.68	ship	MY_SHIP1	49.66570833	117.425	0	0	1	0								
1868	448	15.68	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.66534422	117.425456	0	52.47851267	4	0	TRUE	FALSE						
1869	448	15.68	thermal	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_THERMAL1.2	49.66534422	117.425456	0	52.47851267	4	0			MY_SHIP1	0.15	3.350311291			
1870	448	15.68	radar	MY_AIRPLANE1.MUNITION_MISSILE1.1.FUZE_RADAR1.1	49.66534422	117.425456	0	52.47851267	4	0			MY_SHIP1	39.07436192	872.7418395			
1871	449	15.715	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								89.9415349
1872	449	15.715	ship	MY_SHIP1	49.66572222	117.425	0	0	1	0								
1873	449	15.715	missile	MY_AIRPLANE1.MUNITION_MISSILE1.1	49.660549828	117.425392	0	22.47851267	4	0	TRUE	TRUE						
1874	450	15.75	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								
1875	450	15.75	ship	MY_SHIP1	49.66573611	117.425	0	0	1	0								
1876	451	15.785	airplane	MY_AIRPLANE1	49.66052778	117.438611	0	90	0	0								
1877	451	15.785	ship	MY_SHIP1	49.66575	117.425	0	0	1	0								89.88307

Log entry 1433 shows that MY_AIRPLANE1.MUNITION_MISSILE1.1 has been deployed after 10 seconds towards MY_SHIP1. Entry 1873 shows MY_AIRPLANE1.MUNITION_MISSILE1.1 striking MY_SHIP1.

7.

The actual results are constituent with the expected results.

8.

A different ship should target MY_SHIP1 instead of an aircraft, this would verify that a missile can be deployed from different types of actors.