8305 Catamaran Circle
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Use Case Scripting (UCSN2502)

Evasion Maneuvers

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Contents

Introduction

Overview

This use case scripting document shows how to use the MACE Script Editor create buttonized scripts that can be used as evasion maneuvers either independently or used by the MACE Reaction Postures.

Each of the scripts is a buttonized script which are saved in the C:\Users\Public\Documents\MACE\xml\Scripts\Buttonize file structure – so they can be used by MACE platforms as reaction posture (Figure 1).

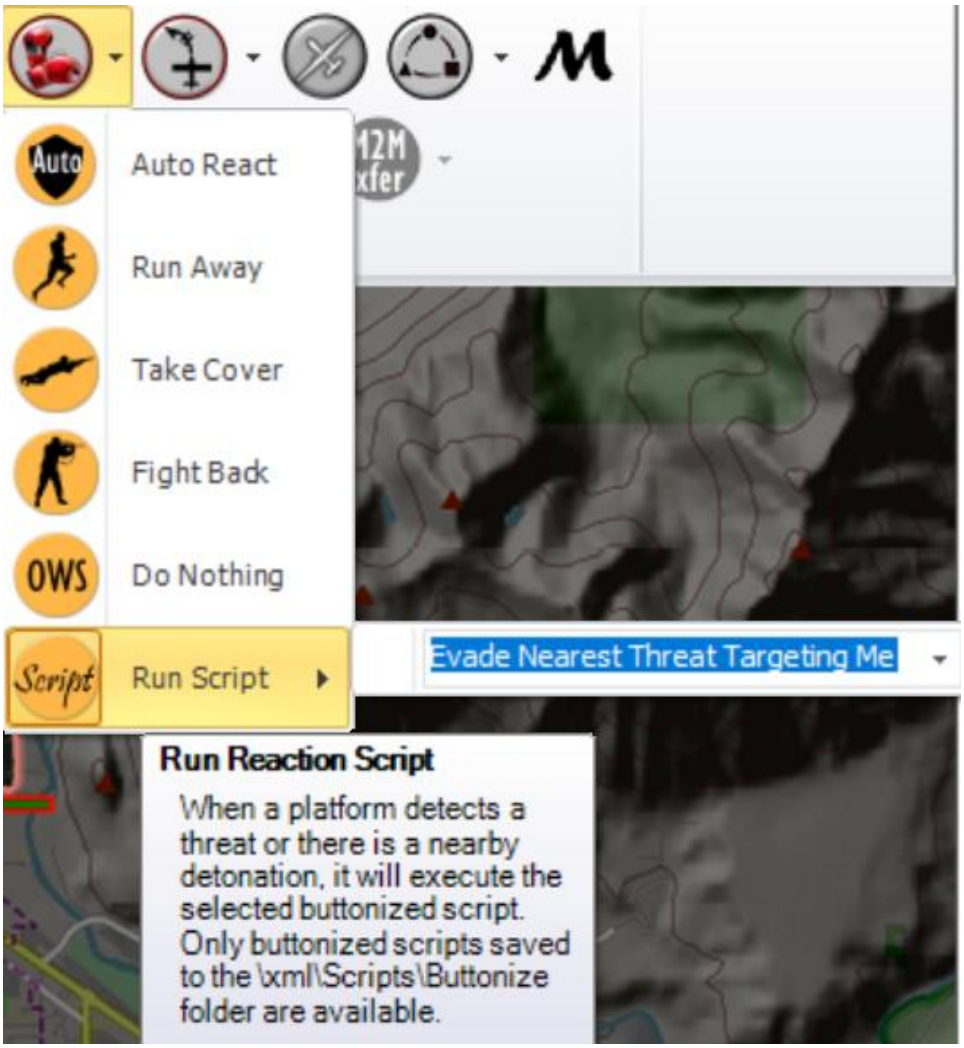

Figure 1: Buttonized script defined as a reaction posture

Scripting Items Covered

TRIGGERS	ACTIONS	OTHER
	Shoot Weapon	Set Script Number Variable
	Turn To (relative)	While
	Delay	Increment Script Number Variable
	Proceed To Waypoint	Execute Code Script
	Speed To	
	Tactic – Land	
	Maneuver Aggressiveness	

Script String Variables Used

- <Scripted Platform>
- <Scripted Platform's Highest RADAR Threat>
- <Script String Variable – This Script>

Accompanying Tutorial Video

A narrated YouTube video is available: https://youtu.be/_DoBM58P1Po

Video Key Scenes

1. (00:20) Mission Setup
2. (04:35) MACE Auto reaction posture actions
3. (06:58) 180 Turn Chaff & Weave Script build
4. (13:17) 180 Turn Chaff & Weave Script build playthrough
5. (14:05) 180 Turn Chaff & Weave Script 2 - with While Loop build
6. (18:51) 180 Turn Chaff & Weave Script 2- with While Loop playthrough
7. (20:41) 180 Turn Chaff & Weave Script 2 - correction for symmetrical turns in while loop
8. (21:22) Beam highest radar threat and land build
9. (26:16) Beam highest radar threat and land playthrough
10. (26:53) Evade Nearest Threat Targeting Me (Codescript) build
11. (32:59) Evade Nearest Threat Targeting Me (Codescript) playthrough

Script Description 1 – 180 Turn Chaff & Weave

A script that turns through 180 degrees, chaffs and weaves.

Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> left 180 degrees. (Wait for action to finish.)
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> right 30 degrees. (Wait for action to finish.)
Delay: 0 hours 0 minutes 1 seconds (Wait for action to finish.)
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> left 60 degrees. (Wait for action to finish.)
Delay: 0 hours 0 minutes 1 seconds (Wait for action to finish.)
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> right 30 degrees. (Wait for action to finish.)

Triggers

No Triggers – Script is triggered by MACE Reaction Posture process

Actions

Action 1 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Note: 'Shoot Regardless if equipped' is often a good choice for a buttonized script as it can be applied to any platform that might not have a specific weapons load specified in the shoot weapon field.

Action 2 [Navigation 1] – Turn Left/Right

- Degrees: "-180" – left turn because '-' is used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Action 3 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"

- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 4 [Navigation 1] – Turn Left/Right

- Degrees: "30" – right turn because no sign used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Action 5 [Scripting 1] – Delay

- Delay Script: "1" Seconds

Action 6 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 7 [Navigation 1] – Turn Left/Right

- Degrees: "-60" – left turn because '-' is used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Actions 8 & 9 - Repeat Action 5 and Action 6

Action 10 [Navigation 1] – Turn Left/Right

- Degrees: "30" – right turn because no sign used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Script Description 2 – 180 Turn Chaff & Weave 2

A script similar to **Script Description 1 – 180 Turn Chaff & Weave,** except a 'While' loop is used with a script number variable to repeat weave and chaff actions.

Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> left 180 degrees. (Wait for action to finish.)
Set number variable of this script to 0.
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> right 30 degrees. (Wait for action to finish.)
Delay: 0 hours 0 minutes 1 seconds (Wait for action to finish.)
While Is Number Variable of this script less than 4
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Turn <Script Platform> left 60 degrees. (Wait for action to finish.)
Delay: 0 hours 0 minutes 1 seconds (Wait for action to finish.)
Turn <Script Platform> right 60 degrees. (Wait for action to finish.)
Increment number variable of this script by 1
End While
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Delay: 0 hours 0 minutes 3 seconds (Wait for action to finish.)
Proceed <Script Platform> to nearest waypoint not reached, Adjust intent, Adjust spee...

Triggers

No Triggers – Script is triggered by MACE Reaction Posture process

Actions

Action 1 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Note: 'Shoot Regardless if equipped' is often a good choice for a buttonized script as it can be applied to any platform that might not have a specific weapons load specified in the shoot weapon field.

Action 2 [Navigation 1] – Turn Left/Right

- Degrees: "-180" – left turn because '-' is used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Action 3 [Scripting 1] – Set Script Number Var

- Script index number: "0"
    - 0 is always 'this' script
- To Specific Value: "0"
    - So that it can be incremented up in the 'While Loop' later

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed.

Setting the script number variable to 0 before the while loops ensures it is 'reset' if the script is ever run more than once.

Action 4 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 5 [Navigation 1] – Turn Left/Right

- Degrees: "30" – right turn because no sign used before value
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Note: this right turn is the first part of the weave, it means that we can create symmetrical turns within the while loop that follows so that the entity oscillates its turns equally about a center line away from the threat.

Action 6 [Scripting 1] – Delay

- Delay Script: "1" Seconds

Action 7 [Scripting 2] – While

Trigger [Scripting] – Script Number Variable

- Script Index Number: "0"
    - 0 is always 'this' script
- Value is: "Less Than" "4"
    - Its currently 0 (See Action 3 [Scripting 1] – Set Script Number Var) and will be incremented by 1 in each loop

Action 8 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 9 [Navigation 1] – Turn Left/Right

- Degrees: "-60" – Left turn
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Note: this turn will need to be 'balanced' with a turn of the same amount in the other direction within the while loop or else the platform will not progress down a single direction away from the threat.

Action 10 [Scripting 1] – Delay

- Delay Script: "1" Seconds

Action 11 [Navigation 1] – Turn Left/Right

- Degrees: "60" – Right turn
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Note: this turn 'balances' out the initial left 60 degree turn.

Action 12 [Scripting 1] – Increment Script Var

- Script Index Number: "0"
    - 0 is always 'this' script
- Increment: "1"

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed. So after the first iteration of the while loop the number variable is 1, after the second 2 and so on. After the 3rd iteration the trigger check (**Action 7 [Scripting 2] – While**) is performed and returns FALSE permitting exit from the while loop.

Action 13 [Scripting 2] – End While

Defines the end of the while loop – all actions after this are performed when the while loop trigger condition (**Action 7 [Scripting 2] – While**) returns FALSE.

Action 14 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 15 [Scripting 1] – Delay

- Delay Script: "3" Seconds

Action 16 [Navigation 1] – Proceed to Waypoint

- Waypoint: "Nearest Waypoint Not Reached"
    - Puts aircraft back on the route at the nearest waypoint that it hasn't visited
- Enter intent: ☑
    - Aircraft will now follow waypoints
- Speed To: ☑ "100" knots
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

- Means the 'reaction' of the reaction posture is not finished until this action is completed, will stop further reactions

Script Description 3 – Beam Break Lock

This buttonized script uses a 'While Loop' initially to put out 2 chaff at 0.2ms spacing then turns the platform 90 degrees relative to the 'Highest Radar Threat'; at the same time the platform slows to 40kts and when it reaches that speed it lands.

```
Set number variable of this script to 0.
While Is Number Variable of this script less than 2
   Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
   Delay: 0 hours 0 minutes 0.2 seconds (Wait for action to finish.)
   Increment number variable of this script by 1
End While
Turn <Script Platform> 90 degrees relative to: <Script Platform's Highest RADAR Threa...
Speed <Script Platform> to 40 Knots.
Set landing zone of <Script Platform> to nothing and clear parking location.
Assign tactic land to <Script Platform>. (Wait for action to finish.)
```

Action 1 [Scripting 1] – Set Script Number Var

- Script index number: "0"
  - 0 is always 'this' script
- To Specific Value: "0"
  - So that it can be incremented up in the 'While Loop' later

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed.

Setting the script number variable to 0 before the while loops ensures it is 'reset' if the script is ever run more than once.

Action 2 [Scripting 2] – While

Trigger [Scripting] – Script Number Variable

- Script Index Number: "0"
  - 0 is always 'this' script
- Value is: "Less Than" "2"
  - Its currently 0 (See Action 1 [Scripting 1] – Set Script Number Var) and will be incremented by 1 in each loop

Action 3 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 4 [Scripting 1] – Delay

- Delay Script: "0.2" Seconds

Action 5 [Scripting 1] – Increment Script Var

- Script Index Number: "0"
  - 0 is always 'this' script
- Increment: "1"

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed.

Action 6 [Scripting 2] – End While

Defines the end of the while loop – all actions after this are performed when the while loop trigger condition (**Action 2 [Scripting 2] – While**) returns FALSE.

Action 7 [Navigation 1] – Turn Left/Right

- Degrees: "90"
  - Right turn, but as shortest direction of turn is ticked this is irrelevant
- Relative To: ☑ "<Scripted Platform's Highest RADAR Threat>"
  - Relative to means the turn will place the platform 90 degrees relative to threat
- Shortest Direction of Turn: ☑
  - Will turn to 90 degrees to the threat the shortest way
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑
- Force action if not finished in : "20" seconds

- The subsequent speed drop will happen after 20s

Action 8 – [Navigation 1] – Speed to

- Speed To: "40" "Knots"
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☐
  - The speed will change but the landing will be initiated before it reaches 40kts

Action 9 [Navigation] – Tactic – Land

- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑
  - Only when the aircraft is on the ground is this action complete, the script complete, and the entire reaction posture maneuver complete

Script Description 4 – Evade Nearest Threat Targeting Me

This buttonized script uses the same initial while loop technique as **Script Description 3 – Beam Break Lock** but adds a Flare release at the same time as the Chaff. Then the script uses one of the MACE included 'code scripts' to return to the script string variable the callsign of the closest entity that is targeting the script platform. The script changes the maneuver performance of the script platform then turns relative to the script string variable (ie the nearest threat targeting it), speeds up, and then after 20s returns to the nearest waypoint on its route.

Set number variable of this script to 0.
While Is Number Variable of this script less than 2
Shoot weapon Flare (U.S.) from <Script Platform> regardless if loaded.
Shoot weapon Chaff (U.S.) from <Script Platform> regardless if loaded.
Delay: 0 hours 0 minutes 0.2 seconds (Wait for action to finish.)
Increment number variable of this script by 1
End While
Execute code script class: ClosestEnemyTargettingMe in ClosestEnemyTargettingMe.cs (W...
Set max performance (maintain alt) maneuver aggressiveness to <Script Platform>. Appl...
Turn <Script Platform> 180 degrees relative to: <Script String Variable - This Script...
Speed <Script Platform> to 120 Knots.
Delay: 0 hours 0 minutes 20 seconds (Wait for action to finish.)
Proceed <Script Platform> to nearest waypoint, Adjust intent, Adjust speed to 100 Knots.

Action 1 [Scripting 1] – Set Script Number Var

- Script index number: "0"
  - 0 is always 'this' script
- To Specific Value: "0"
  - So that it can be incremented up in the 'While Loop' later

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed.

Setting the script number variable to 0 before the while loops ensures it is 'reset' if the script is ever run more than once.

Action 2 [Scripting 2] – While

Trigger [Scripting] – Script Number Variable

- Script Index Number: "0"

- 0 is always 'this' script

- Value is: "Less Than" "2"
  - Its currently 0 and will be incremented by 1 in each loop

Action 3 [Equipment] – Shoot Weapon

- Weapon: "Chaff (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 4 [Equipment] – Shoot Weapon

- Weapon: "Flare (U.S.)"
- Shoot Regardless if equipped: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Action is instantaneous

Action 5 [Scripting 1] – Delay

- Delay Script: "0.2" Seconds

Action 6 [Scripting 1] – Increment Script Var

- Script Index Number: "0"
  - 0 is always 'this' script
- Increment: "1"

Note: The script number variable is the 'control' for the while loop; when it reaches a certain value the while loop ceases and the actions beyond it can be executed.

Action 7 [Scripting 2] – End While

Defines the end of the while loop – all actions after this are performed when the while loop trigger condition returns FALSE.

Action 8 [Scripting 2] – Execute Code Script

- Source File: "CodeScripts\Actions\ClosestEnemyTargettingMe.cs"

- Assigned To Platforms: Not required

Note: This results in the <Script String Variable> for this script being populated with the callsign of the nearest threat that is targeting the reacting platform.

Action 9 [Navigation 2] – Maneuver Aggressiveness

- Apply To: "Current State"
    - Which will be 'delta' but selecting this means it will work whatever
- Aggressiveness: "Max Performance Maintain Altitude"

Action 10 [Navigation 1] – Turn Left/Right

- Degrees: "180"
    - Right turn, but as shortest direction of turn is ticked this is irrelevant
- Relative To: ☑ "<Script String Variable>"
    - Relative to means the turn will place the platform 180 degrees relative to threat
    - The <Script String Variable> is now the callsign of the nearest threat targeting this platform (from **Action 8 [Scripting 2] – Execute Code Script**)
- Shortest Direction of Turn: ☑
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☑

Action 11 – [Navigation 1] – Speed to

- Speed To: "120" "Knots"
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☐

Action 12 [Scripting 1] – Delay

- Delay Script: "20" Seconds
    - To give time to run – could be a "Delay Until" proximity "Is outside of" some distance…

Action 13 [Navigation 1] – Proceed to Waypoint

- Waypoint: "Nearest Waypoint"
    - Puts aircraft back on the route at the nearest waypoint on the route regardless of it being visited or not
- Enter intent: ☑
    - Aircraft will now follow waypoints
- Speed To: ☑ "100" knots
- Assigned To Platforms: "<Scripted Platform>"
- Wait for action to finish before executing next: ☐
    - Means that if subsequently threatened while on the way to the waypoint it can react again as the script will have completed as will the reaction posture response.