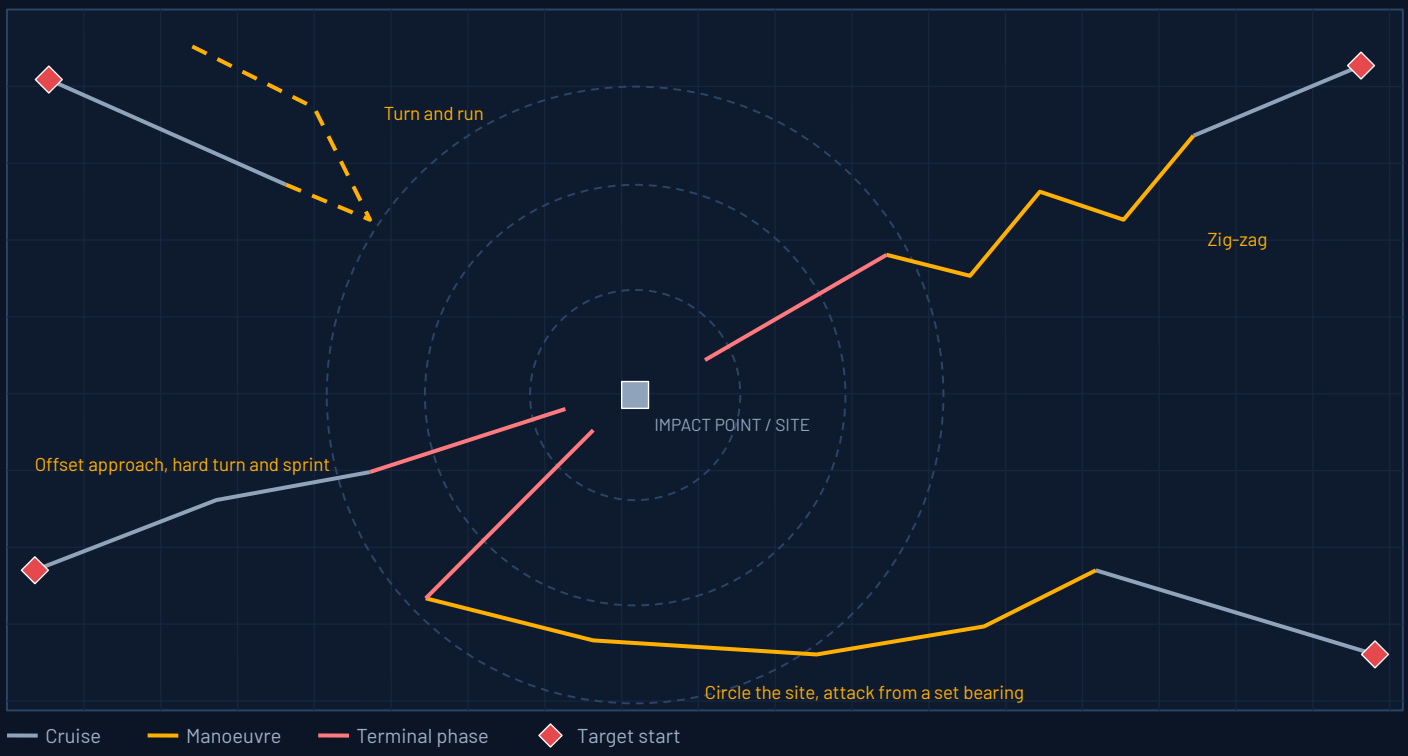
AutarchTrackSim

Scenario-driven target simulator

> Realistic, repeatable threats on demand: script manoeuvring targets and feed them to the chain exactly as real sensors would.



AutarchTrackSim generates simulated air targets and emits them as simulated sensor reports: long- and medium-range radar, a networked short-range radar and electro-optical / infrared confirmation, so AutarchFusion and AutarchC2 see them as they would see real sensors. Each target has a start point, cruise behaviour, a sequence of manoeuvres and an optional terminal dive. Scenarios are saved as files and replayed exactly, for integration testing, regression testing and operator training.

STATUS
A simulation tool, used to validate the Autarch chain end to end. It generates simulated targets only and never controls real equipment.

Six manoeuvre types
From zig-zag to offset approach with hard turn and sprint.

Terminal dive
Configurable start range, speed and dive angle.

Scenario files
Save, load, autostart, loop.

Closed loop
Simulated kills remove the target from the picture.

Illustrative diagrams, not to scale. Validated in a full simulation environment.

TRACK EDITOR

Script each threat precisely

Each target is defined in a track editor: where it starts, how it cruises, what it does on the way in and how it ends. A live preview draws the path from above and the height profile over time, using the same kinematics as the running simulation, and shows the time to impact as values change.

Six manoeuvres, triggered by range to the impact point



Zig-zag
Lateral weave with set amplitude and period between two ranges



Up / down
Vertical weave in height with set amplitude and period



Turn and run
Turn away by a set angle, run for a set time and speed, then resume



Altitude change
Climb or descend to a new height at a set rate

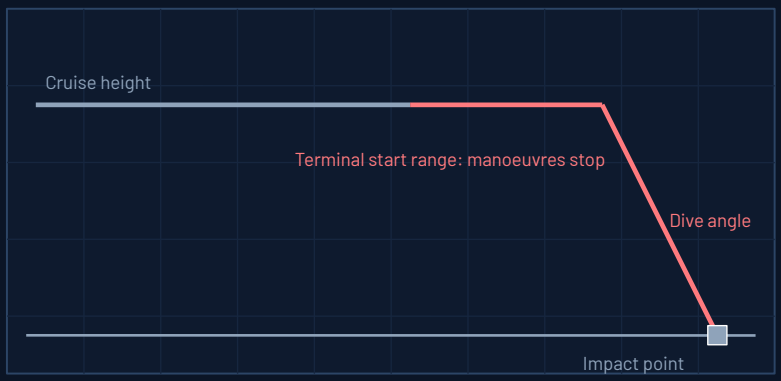


Circle the site
Orbit at a set radius, then attack from a chosen bearing



Offset approach
Fly offset to one side, turn in hard and sprint at the site

Terminal phase and dive (side view)



Start point and cruise
Bearing and distance from the site, start delay, cruise speed and height above ground, maximum turn rate, climb and descent rate, acceleration.

Terminal phase
From the terminal start range the target flies straight at the impact point at terminal speed, diving at the set angle; a helper fits the dive to the height.

Identity and signature
Callsign, object class, radar cross-section and classification confidence reported to the sensors.

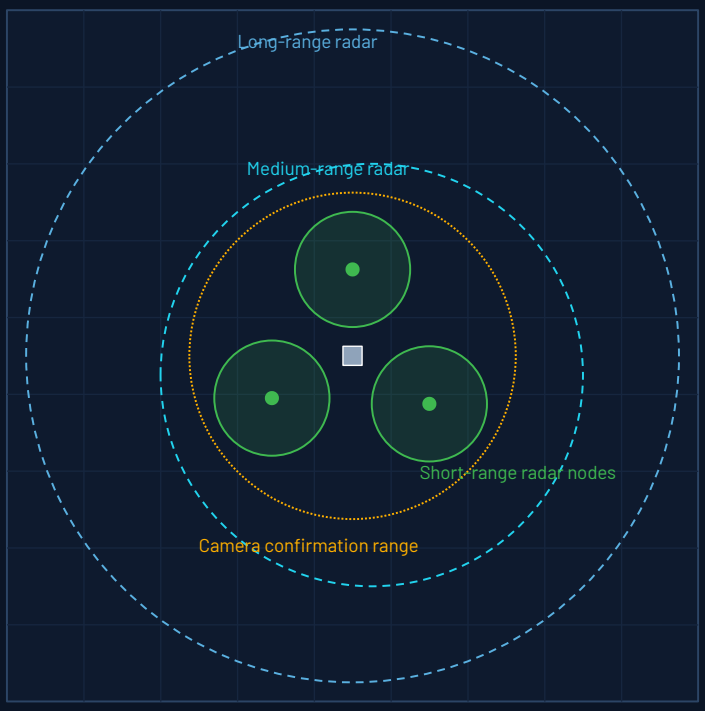
Manoeuvres run in sequence; each starts when the target's range to the impact point reaches its trigger. The preview colours the path: grey cruise, yellow manoeuvre, red terminal.

What a scenario holds

Scenario level	Per target
Name, loop option, protected site and impact point (placeholders in shared examples)	Identity and callsign, class and signature, start point and delay, cruise behaviour, the manoeuvre sequence and the terminal phase

SIMULATED SENSORS AND CLOSED LOOP

Feeds the chain as real sensors would, and closes the loop



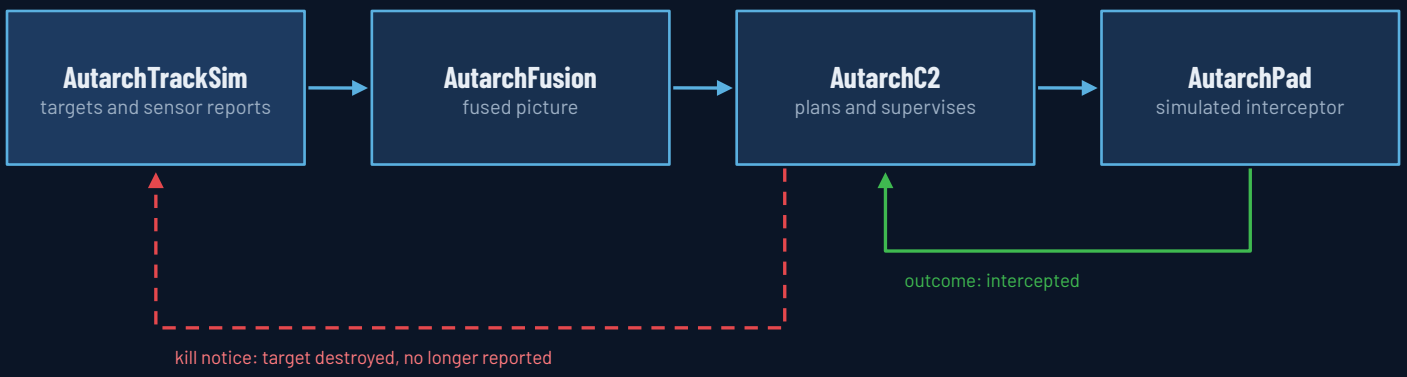
Simulated sensor coverage around the site (illustrative).

Sensor realism
Each simulated sensor has its own position, range limits, height limits, minimum detectable size, update rate, accuracy, detection probability and delay, with measurement noise that can be switched off for repeatable tests.

Standard radar formats
Long- and medium-range radar reports are produced in the same standard track format the real radars deliver, so the fusion inputs are exercised exactly as in service.

Rich data
The short-range radar network adds radar cross-section, Doppler and micro-Doppler images; camera confirmation is reported inside its set range.

Closed loop: a simulated kill removes the target



When AutarchC2 reports an intercept, it sends a kill notice naming the target and its position. AutarchTrackSim matches the notice by name, or to the nearest target if the name is unknown, marks the target killed and stops reporting it, so the outcome appears in every application just as it would in reality.

Per-track control
Add, edit, duplicate, delete, start, pause and stop single tracks or all tracks, also while the scenario runs; a live table shows range, bearing, speed, height above ground and phase.

Top view
A live top view shows every target with its flown path (solid) and planned path (dotted), so the trainer sees what the operator should be seeing.

Status. The closed loop has been exercised end to end in single- and multi-target simulation runs. All kills are simulated.

RUN, TEST, TRAIN

Repeatable scenarios for every stage of the programme

Integration and test

Validate sensors, fusion and C2 together with known ground truth; a truth log records every target position once a second for timing comparisons.

Regression testing

Replay the same scenario after a change to rules, planning or fusion settings and compare outcomes like for like.

Operator training

Build escalating threats, from a single slow target to several fast targets with manoeuvres, and loop them for continuous practice.

Scenario workflow

1 Build
Add targets in the track editor, preview each path.

→

2 Save
Store the scenario as a file and share it.

→

3 Run
Start all or single tracks; or start from the command line with autostart.

→

4 Loop
Repeat automatically with a pause between runs.

→

5 Review
Compare the truth log with what the chain reported.

Exactly repeatable
With a fixed random seed and noise settings, the same scenario produces the same reports, run after run.

Safe by design
Built-in self-tests use separate, non-live channels so they never disturb a running chain.

Same physics as the preview
What the editor previews is what the simulation flies.

Who it is for

- Integration and test teams validating sensors, fusion and C2
- Operator training with repeatable, escalating threats
- Developers regression-testing planning and rules changes
- Demonstrations of the Autarch chain

Status. AutarchTrackSim is a simulation tool (SIMULATION ONLY). It generates simulated targets and simulated sensor reports and accepts simulated kill notices; it does not connect to or control real sensors, launchers or interceptors.