AutarchC2

Counter-UAS command and control

> See every track, apply your own Rules of Engagement, plan a safe intercept and supervise the engagement, from one operator screen.

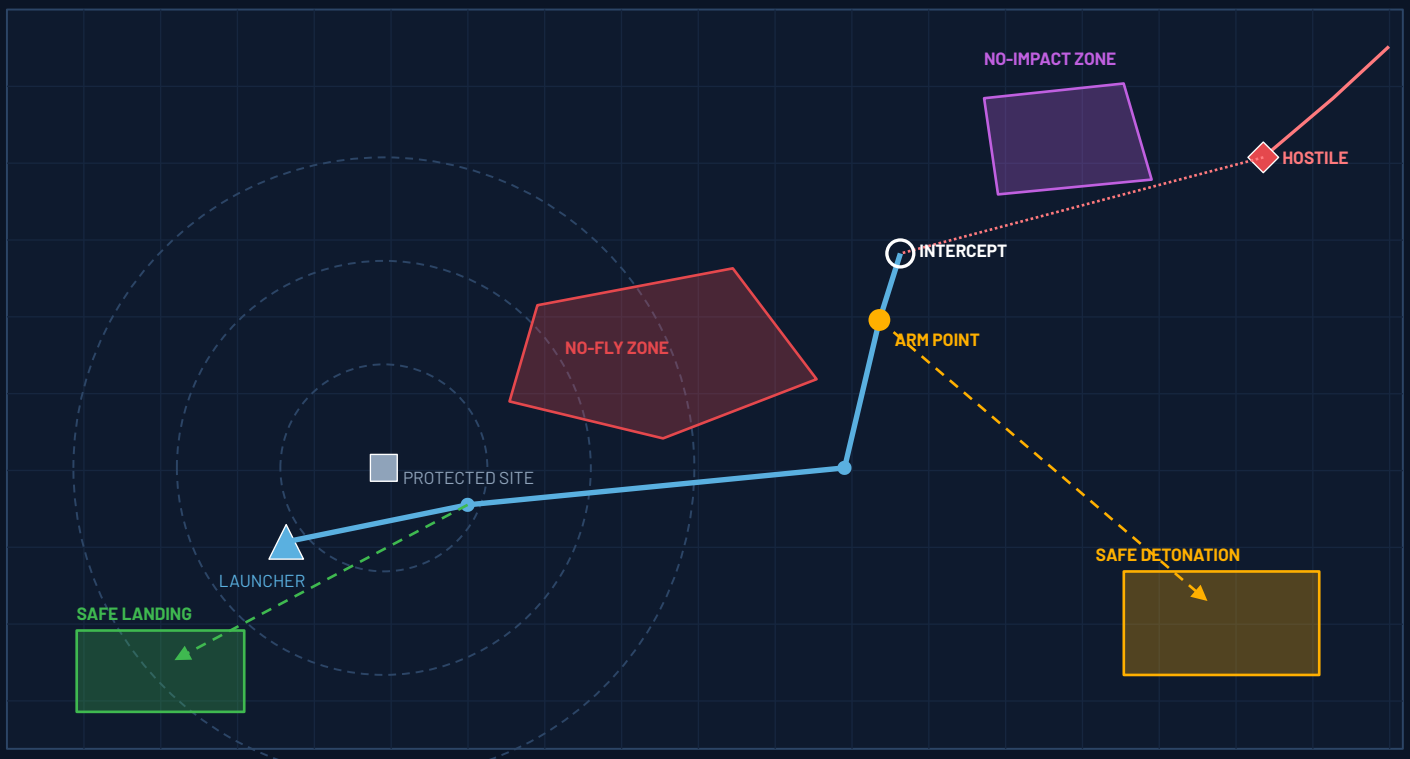


Illustration of the operator picture: a hostile track, the planned interceptor route around a no-fly zone, the arm point, the intercept point and both abort options.

AutarchC2 is the command-and-control application of the Autarch counter-UAS suite. It presents the fused air picture, classifies every track by its behaviour against Rules of Engagement that are loaded from each customer's own configuration, plans a flyable interceptor route around no-fly and other zones, computes a kinematic future-point intercept, decides when the interceptor arms and where it goes if it aborts, and supervises several interceptors against several targets at once. Every decision is shown with its reasons and recorded for review.

STATUS

Validated in a full simulation environment with simulated targets, sensors, launcher and interceptors. No live launch, real hardware integration, fielded or engagement use is claimed.

Your Rules of Engagement

Loaded from configuration, never hard-coded; behaviour drives the classification.

Safe route planning

Around no-fly zones, with arm point and abort options in every plan.

Future-point intercept

Aims where the target will be, using the interceptor's own flight model.

Supervised engagement

Multi-target, salvo, divert and abort, all recorded.

OPERATOR PICTURE

One screen for the whole engagement

The operator works from a single map-centred screen. Everything AutarchC2 knows is drawn on it: tracks with their classification colour and trail, launchers and their sectors of responsibility, the zones the planner must respect, range rings, every interceptor in flight with a live call-out, and the plan for each hostile track. Side panels explain the numbers behind each decision.

Map and call-outs
Tracks, launchers, interceptors, zones and range rings on one tactical view. Each interceptor carries a call-out with its phase, safety state, altitude, speed, remaining endurance and distance to target.

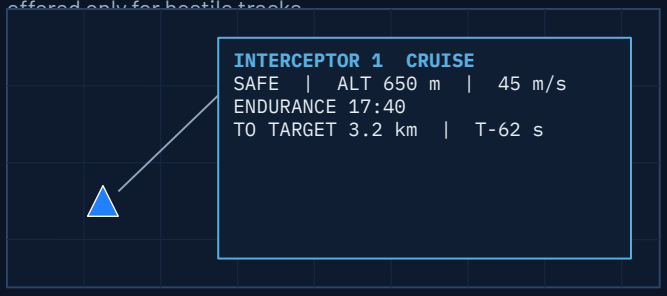
Track list and info panel
Select a track to see range and bearing from the site, altitude, speed, time to reach the site, trend graphs and the full engagement plan, or the reason why no plan is possible.

Rules of Engagement window
Every track ranked by how many hostile rules hold, with each rule shown as met or not met. The engage control lives here and is offered only for hostile tracks.

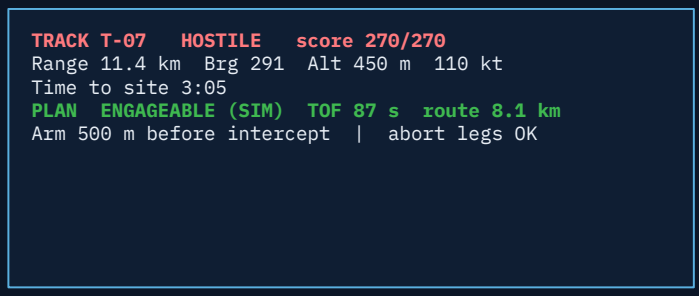
Zones the planner respects
No-fly zones, no-impact zones, safe landing zones, safe detonation zones and geofences, each with an altitude band and a criticality, drawn on the map or loaded with the scenario.

Launcher and interceptor status
Launcher health, tube readiness and each interceptor's phase and outcome, reported back from the launcher side. The launcher's operating mode is shown as reported, never assumed.

Recorder and audit trail
A continuous, tamper-evident session recording and an audit trail of every rule change, operator action and engagement step, with export for after-action review.



Interceptor call-out (illustrative values)



Info panel for a selected hostile track (illustrative values)

Operator workflow

1 Observe
Fused tracks appear with trails and colours.

2 Classify
Rules of Engagement evaluate every update.

3 Plan
C2 keeps a live plan for each hostile.

4 Engage
Operator engages from the rules window.

5 Supervise
Re-task, arm, salvo, divert or abort.

6 Review
Recording, audit trail and exports.

What the operator gets

Decisions with reasons
Each plan reads ENGAGEABLE or SAFETY HOLD, and says why: time of flight, route length, arm point, abort options and the checks that passed or failed.

Less workload under pressure
The rules run on every update and the planner keeps every hostile plan fresh in the background, so the operator decides rather than calculates.

Role-based control
Changes to rules, whitelist and launchers need a super-user login; sessions log out automatically after inactivity.

One picture, many sources
The fused picture from AutarchFusion can be shown together with a direct radar track feed, each under its own identity.

Hostile · Suspect · Confirmed drone · Unknown / tracked · Friend / own · Neutral · Whitelisted

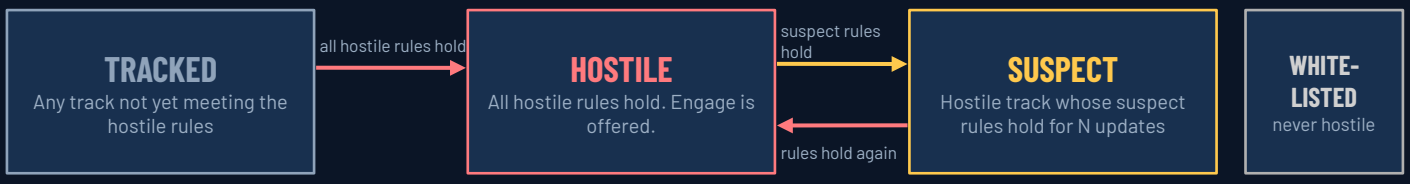
Track colours and symbols follow the classification and can be adjusted by the customer.

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

RULES OF ENGAGEMENT

Your rules, loaded from configuration, applied to behaviour

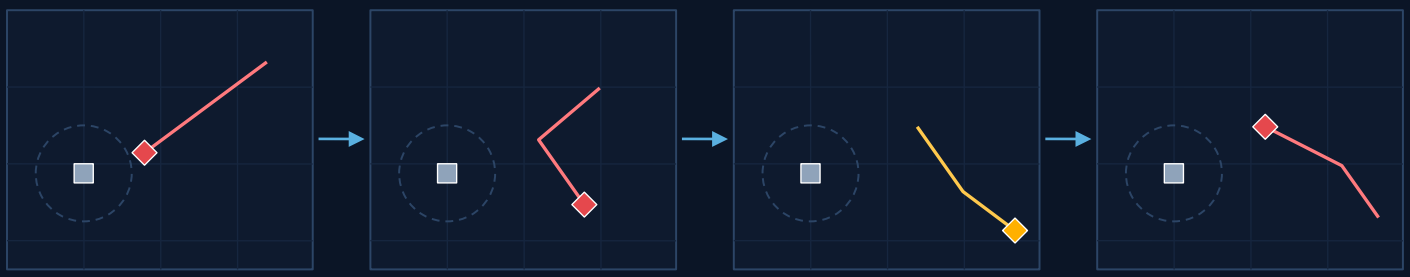
AutarchC2 classifies every track against a Rules of Engagement rule set. The rules are not hard-coded: the conditions, thresholds and the importance weight of each rule are defined in a loadable configuration tailored to each customer's doctrine, and a super user can reload it while the system runs. The classification follows what each track actually does, update by update.



An example rule set

Transition	Condition (all must hold)	Weight
Track becomes HOSTILE	Not on the whitelist	100
	Visually confirmed by an electro-optical / infrared sensor	90
	Within a set range of the protected site (here 15 km)	80
HOSTILE becomes SUSPECT (for 2 consecutive updates)	Turned away from the site (at least 90 degrees off the inbound axis)	60
	Outside the set range of the site	50
SUSPECT returns to HOSTILE	All hostile rules hold again	

Classification follows behaviour



1 HOSTILE
Inbound, inside the set range and visually confirmed: all hostile rules hold, engage offered.

2 STILL HOSTILE
Turning away, but still inside the set range: not every suspect rule holds yet.

3 SUSPECT
Turned away and outside the range for two updates: engage withdrawn.

4 HOSTILE AGAIN
Back inbound and confirmed: all hostile rules hold again, engage offered.

Configurable condition types
Not whitelisted, visually confirmed, range to site below or above, heading towards or away from the site, closing speed, speed above, altitude below or above, classification is, inside a geofence or zone.

Score and ranking
Each track's score is the sum of the weights of the hostile rules that hold, so the most threatening tracks rise to the top of the rules window.

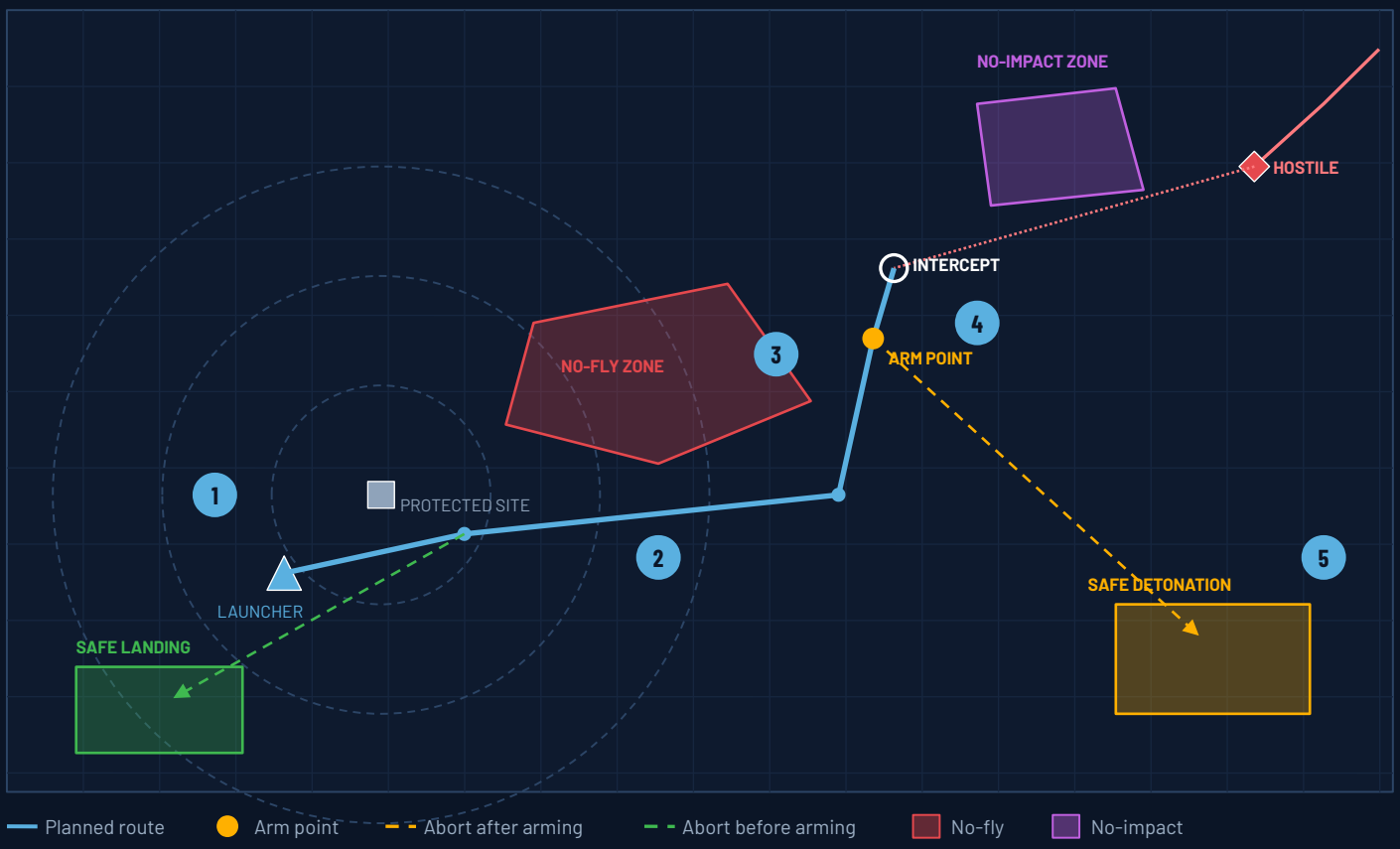
Controlled changes
Loading or reloading rules needs a super-user login; the whitelist (callsigns, transponder addresses, track identities) is applied within seconds of saving.

Every change explained
Each classification change is logged with the time and the rules that caused it, and shown in the rules event view.

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

PATH PLANNING

A flyable route around everything that must be avoided



1 Leave the launcher safely
The route starts with the interceptor's launch delay, vertical boost to a safe height and climb-out. A zone that contains the launcher itself is exempted so the drone can leave the pad.

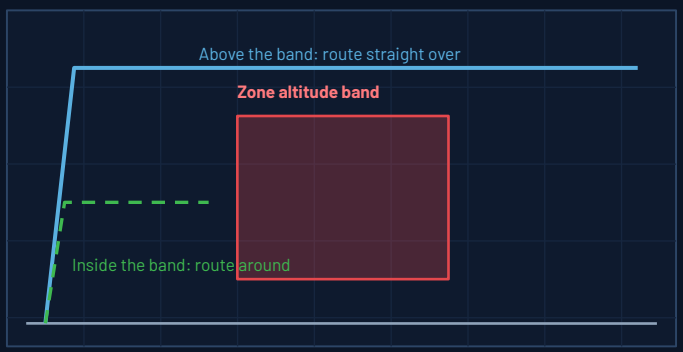
2 Shortest safe route
AutarchC2 searches for the shortest route that keeps clear of every no-fly zone, each enlarged by a safety buffer plus the interceptor's turn radius. Zones are avoided only when the flight altitude falls inside their altitude band.

3 Arm point
A set distance before the intercept along the route, the plan places the arm point. Arming is later commanded on live geometry, not on the plan alone.

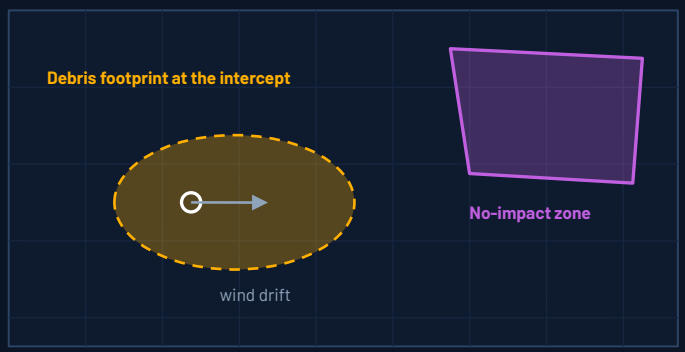
4 Intercept point clear of no-impact zones
At the intercept the predicted debris footprint, which grows with height, stretches with target speed and drifts downwind, must stay clear of every no-impact zone; otherwise a later intercept is searched.

5 Abort options in every plan
Before arming, an abort leg leads to the nearest safe landing zone; after arming, to the nearest safe detonation zone. Both legs are checked against endurance.

6 No feasible plan, no launch
If no launcher can achieve a safe, timely intercept within its sector, range and endurance, the plan reads SAFETY HOLD and nothing can be launched.



Altitude-aware zones (side view)

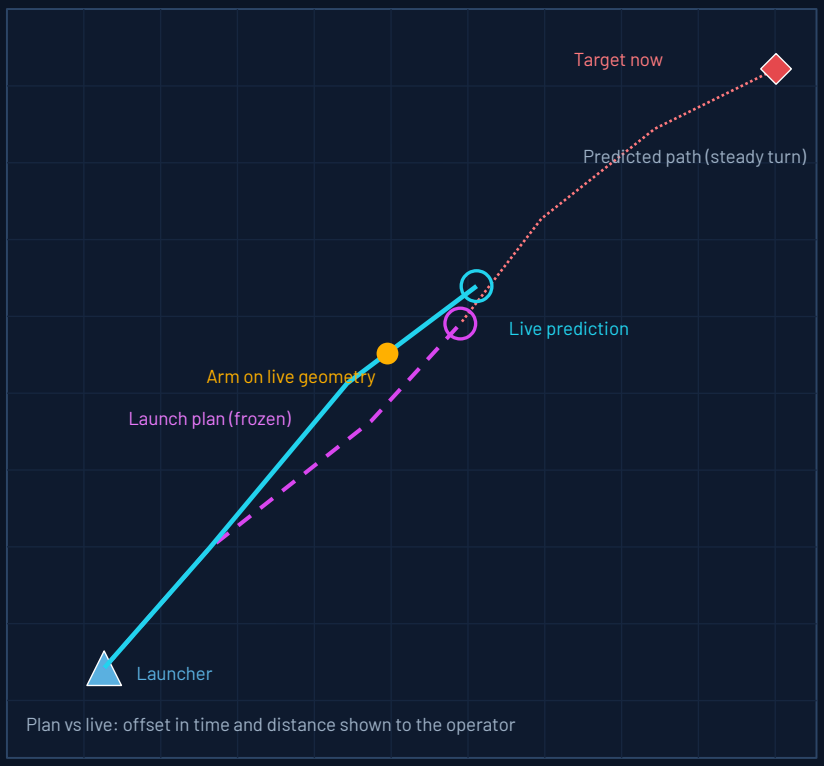


Debris footprint must stay clear of no-impact zones (top view)

KINEMATIC FUTURE-POINT INTERCEPT

Aim where the target will be, not where it is

AutarchC2 predicts the target's path from its live track, flying straight or in a steady turn and sampled every second, and finds the earliest moment at which the interceptor can be there first. The interceptor is modelled with its own flight characteristics: launch delay, boost to a safe height, climb with limited acceleration, turn rate, bank and climb angle, then cruise. The intercept must lie inside the launcher's sector and range, within endurance, clear of no-impact zones and a safety margin before the target reaches the site.



Plan vs live: offset in time and distance shown to the operator

Live versus plan
About once a second AutarchC2 re-predicts the intercept from the live track and the interceptor's reported state, and shows the difference from the frozen launch plan in seconds and metres.

Mid-course re-tasking
When the predicted intercept moves by more than a set distance, or the target changes course, speed or climb, the interceptor receives a new route and aim point, at most every few seconds and never once it is in its terminal phase.

Arming on live geometry
The warhead is armed by AutarchC2 when the live distance to the target falls inside the arm distance or the live time-to-go drops below a set lead time. The interceptor never arms itself.

Interceptor phases, as supervised by AutarchC2

LAUNCH DELAY	BOOST	CLIMB-ROUTE	CRUISE	ARMED	TERMINAL	OUTCOME
Tube to air	Vertical to safe height	Climb along the route	Fly the C2 route	Commanded by C2	Interceptor's own pursuit	Intercepted, missed, landed, detonated or aborted

Readouts that explain the intercept

Before launch
Time of flight, route length, arm point, both abort legs and the checks that passed, so the operator sees why a plan is ENGAGEABLE or on SAFETY HOLD.

During fly-out
Predicted intercept time and range from the site, offset from plan, remaining endurance and the interceptor's phase.

After the outcome
Actual intercept versus plan in time and distance, endurance used and miss distance, with the original plan kept on the map for comparison.

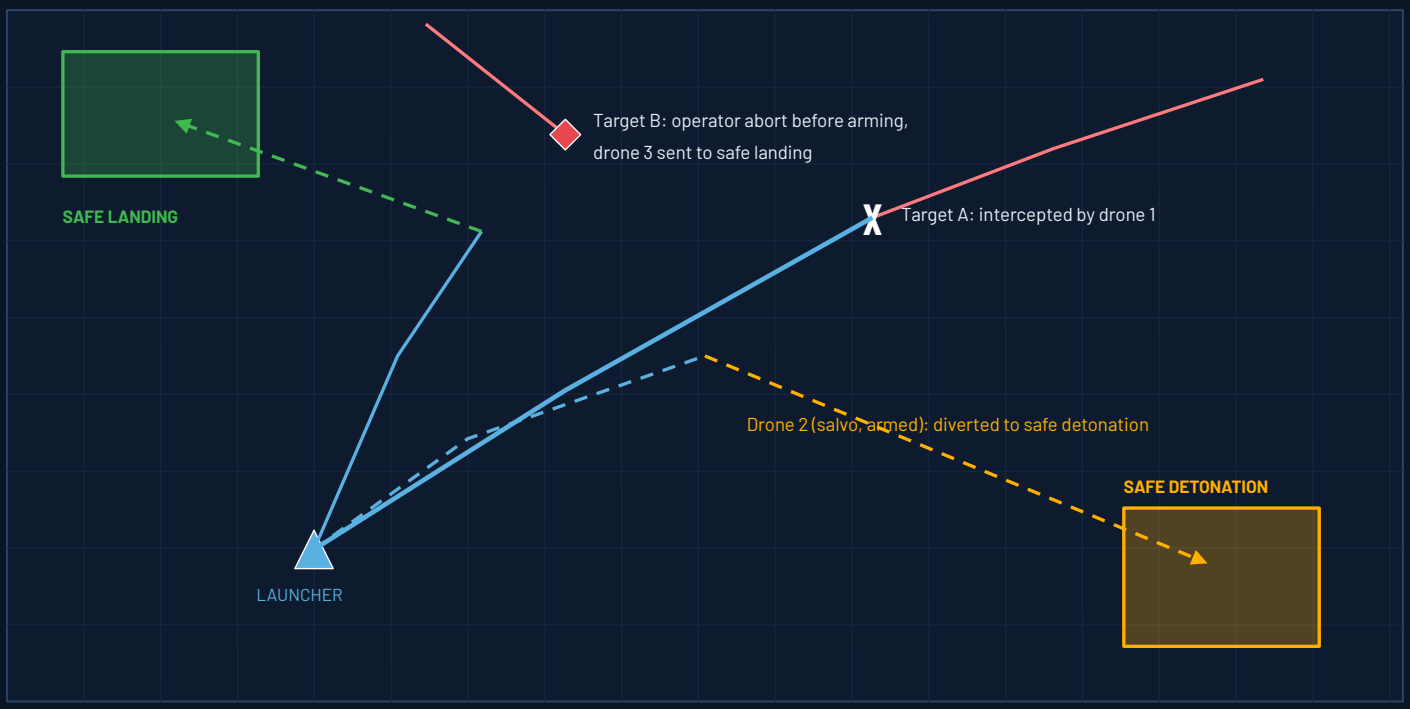
Shared flight model
The planner uses the same interceptor flight model as the simulated interceptor, so plan and outcome can be compared like for like.

Arm distance, arming lead time, terminal hand-over and re-task thresholds are customer settings, not fixed in the software.

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

ENGAGEMENT SUPERVISION

Several hostiles, several interceptors, one operator



Per-target engagements
Each hostile is engaged from the rules window with its own plan, launcher, tube and interceptor type. Pressing engage there is the operator's decision and launches at once; engaging from the map asks for confirmation first.

Salvo with safe divert
A further interceptor can be sent at the same target. If the target is destroyed first, AutarchC2 diverts every remaining interceptor of the salvo at once: armed ones to a safe detonation zone, safe ones to a safe landing zone.

Abort at any time
The abort control sends the interceptor to the point AutarchC2 chooses from its zones and the interceptor's current position: a safe landing zone before arming, a safe detonation zone after.

Interceptor recommendation
For each hostile the planner proposes a ready interceptor from the launcher inventory, ordering hostiles by how soon they reach the site and keeping faster interceptors for the targets that need them. The operator decides.

Outcomes reported back
Each flight ends as intercepted, missed, landed, detonated or aborted, with time, miss distance and re-task count, shown on the map and in the info panel.

Loss of contact handled
If interceptor reports stop, AutarchC2 flags it clearly and resynchronises when contact returns; abort decisions stay with AutarchC2.

Every flight ends with a reported outcome

Outcome	Meaning
INTERCEPTED	Target destroyed within the kill radius (simulated). The track is marked killed and remaining salvo interceptors are diverted.
MISSED	Closest approach outside the kill radius, or inside it while the warhead was still safe.
LANDED / DETONATED	The interceptor completed an abort to a safe landing zone or a safe detonation zone.
ABORTED	The flight was ended by an abort before reaching its abort point.

Status. Salvo, divert and abort behaviour has been exercised end to end in multi-target simulation runs, with simulated kills. No live launch is claimed.

SUMMARY

Key benefits, audience and roadmap

Rules you own
Rules of Engagement are configuration, not code: adapt classification to your doctrine without a software release.

Safety built into every plan
Routes respect no-fly zones, intercept points respect no-impact zones, every plan carries abort options, and infeasible plans are held, not flown.

Explainable decisions
Each plan and classification shows its reasons and is recorded in a tamper-evident session log for after-action review.

Launcher-independent
Launch, arm, abort and re-task go through AutarchPad and the launcher manufacturer's plug-in, so AutarchC2 does not depend on one vendor.

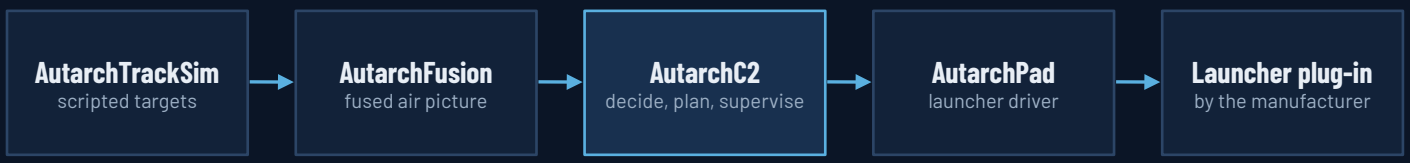
Simulation-proven chain
Validated end to end with AutarchTrackSim targets, AutarchFusion and AutarchPad, in single- and multi-target scenarios.

Who it is for

- Counter-UAS system integrators protecting a site
- Critical-infrastructure and industrial site operators
- Launcher and interceptor-drone manufacturers wanting a C2 front end
- Defence and security agencies evaluating C2 concepts in simulation
- Training organisations needing realistic operator scenarios

Where it fits

AutarchFusion feeds the fused air picture in; AutarchPad carries commands out to the launcher; AutarchTrackSim provides scripted targets for testing and training. AutarchC2 is the operator's single point of decision.



ROADMAP | NEXT STEP TO FULL AUTONOMY

Roadmap, the next step to full autonomy: Threat Evaluation and Weapon Assignment (TEWA) algorithms are not yet implemented and are required for fully autonomous operation of AutarchC2. When implemented, like the Rules of Engagement, they will not be hard-coded: TEWA logic and parameters will be defined in a loadable configuration, tailored to each customer's doctrine and requirements.

Status. All functions described here are implemented in AutarchC2 and validated in a full simulation environment with simulated targets, sensors, launcher and interceptors. Kills shown are simulated. The hardware side of any launcher is implemented by its manufacturer in the launcher plug-in. No live launch, real hardware integration, fielded or engagement use is claimed.