SWARMER™

MESAS 2026

Where Simulation Meets Contested Reality

What 100,000 combat missions reveal about models of autonomy

Alex Fink
President and US CEO, Swarmer

Prague, October 2026

Operational experience as a reality check

100,000+

combat missions supported by Swarmer's autonomy software since April 2024

Operational evidence tests the assumptions built into autonomy models

Operational evidence shows where models need more work.

The simulation-reality gap

COMMON MODEL ASSUMPTIONS

- Reliable communications
- Stable navigation
- Predictable agent behaviour
- Limited attrition
- Consistent human interaction

CONTESTED OPERATING CONDITIONS

- Electronic warfare and GNSS denial
- Intermittent communications
- Hardware variation and platform loss
- Weather
- Active adversary adaptation

A model can work in simulation and behave differently in the field.

Autonomy operates as a spectrum

Direct control

1

Human maintains continuous control

Supervised autonomy

2

System handles transit
Human focuses on engagement

Distributed autonomy

3

Human sets objectives
System assigns tasks and coordinates execution

Different mission phases can allocate responsibility differently between humans and machines.

Drone count alone does not define a swarm

OUR RESEARCH DEFINITION

Group action that is **autonomous, distributed, and coordinated** without real-time external instructions.

OFTEN MISTAKEN FOR SWARMING

- Formation flight
- Leader-follower patterns
- Centrally controlled multi-drone operations
- Pre-programmed choreography

Research basis: Drone Swarm Operations in Modern Conflict, co-authored with UNSW Canberra researchers

Human authority by function

HUMANS DEFINE AND AUTHORISE

- Mission objectives
- Target approval and authorised sets
- Geographic constraints
- Rules of engagement
- Fallback and abort criteria

AUTONOMOUS SYSTEMS EXECUTE

- Navigation
- Timing
- Coordination
- Task allocation
- Selection of the suitable asset

More autonomy makes each human decision more important.

Validation beyond successful demonstrations

01

Mission effect

Did the system achieve the intended operational effect?

02

Cycle time

How quickly did sensing become action?

03

Survivability

How did actual losses compare with the model?

04

Operator span

How many platforms could 1 operator supervise effectively?

Validation should measure outcomes and show what happens when systems fail.

The simulation-deployment evidence loop



Implications for NATO

01 **Common terminology**

Use precise definitions for autonomy and swarming.

02 **Representative scenarios**

Model contested and denied environments as standard conditions.

03 **Structured operational data**

Collect evidence that can improve models across iterations.

04 **Outcome-based metrics**

Evaluate mission effect, cycle time, survivability and operator span.

05 **Continuous V&V**

Connect simulation, testing and deployment throughout the lifecycle.

06 **Testable responsibility**

Treat explainability and rules of engagement as technical requirements.

Otherwise, NATO risks validating the model rather than the system.

CLOSING MESSAGE

Operational evidence makes simulation more realistic

Simulation prepares systems for deployment.

Deployment exposes assumptions, limits and failure modes.

Evidence improves the next model and the next capability.

If we do not test our assumptions ourselves, the battlefield will test them for us.