Integrating a Simulated UAV in a Live Exercise

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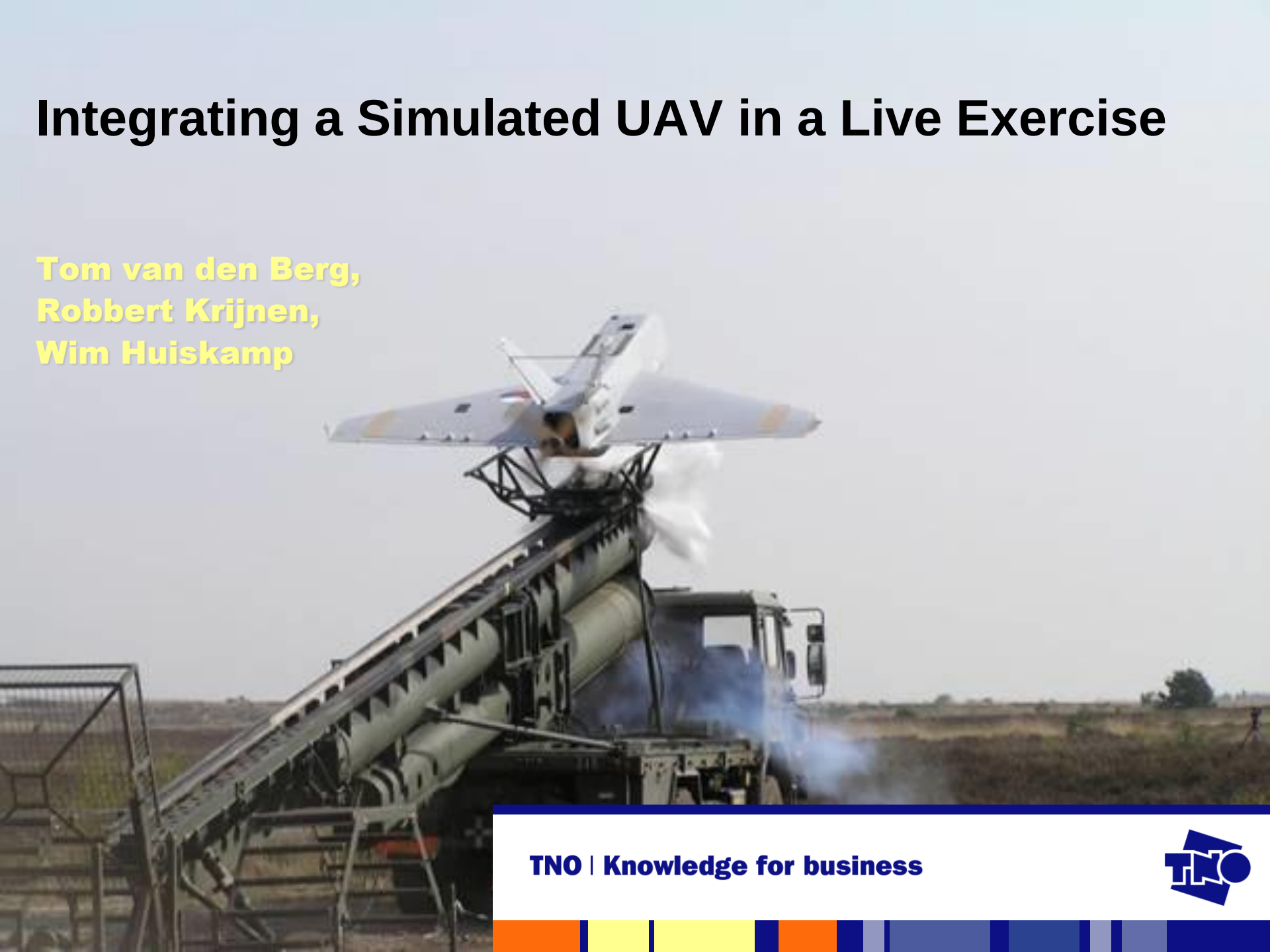


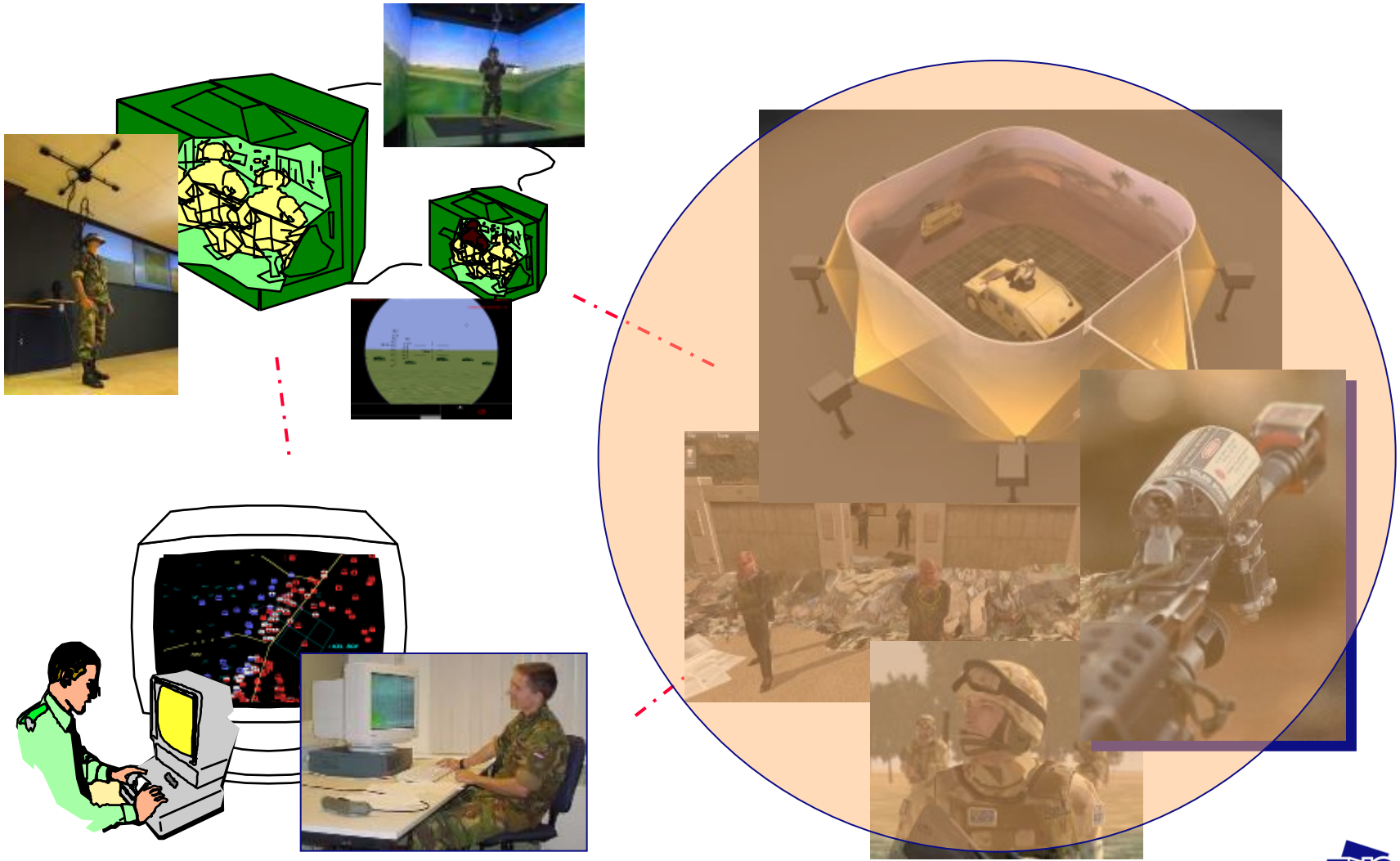
TNO | Knowledge for business

Gaps in Live training

- Training area limitations
- Lack of collective training opportunities (national, NATO)
- Realism, sparse environment
- Cost, risks, availability
- …

Live, Virtual, Constructive integration

“Train as you Operate, where you Operate and whenever you want”



LVC Programme Objectives

- **Investigate when and how LVC integration benefits MoD wrt Training and Concept Development**
  - **Use Cases**
- **Develop national LVC expertise and establish International cooperation in this area**
  - **Demonstrators**
  - **Guidelines and Recommendations**

Intelligence challenge – Situational Awareness

- Complex and dynamic
- Terrain <> Threat
- Multiple sensors
- Various different goals

ISTAR Assets

RECCE

EW

IMINT

HUMINT

ASIC

RADINT

Why a simulated UAV?

- **Issues**:
  - UAVs are a scarce resource
  - UAV availability for training is limited due to operational needs
  - There are legal restrictions regarding the use in Dutch airspace
  - Weather conditions prevent UAVs from being used

- **A simulated UAV in a Live exercise can alleviate these issues**

LVC Case UAV - Enhance Live Training

- **Objective**
  - Develop a reusable UAV module as an LVC case study
    - Demonstrate added value for live training
    - Generate requirements for UAV module
  - Develop LVC best practices

- **Approach**:
  - Iterative development cycles reusing existing assets
  - Demonstrations with stakeholder interaction for requirements

Planning

- Phase I (Jan-March 2010 – *Virtual/Constructive*)
  - Marnehuizen Environment model
  - Simulated UAV (TNO-Sperwer)
  - Simulated entities (VRForces: vehicles, humans)

- Phase II (June-Sept 2010 – *Live/Virtual*)
  - Marnehuizen Environment model
  - Simulated UAV (TNO-Sperwer)
  - Live entities (MCTC: vehicles, humans)

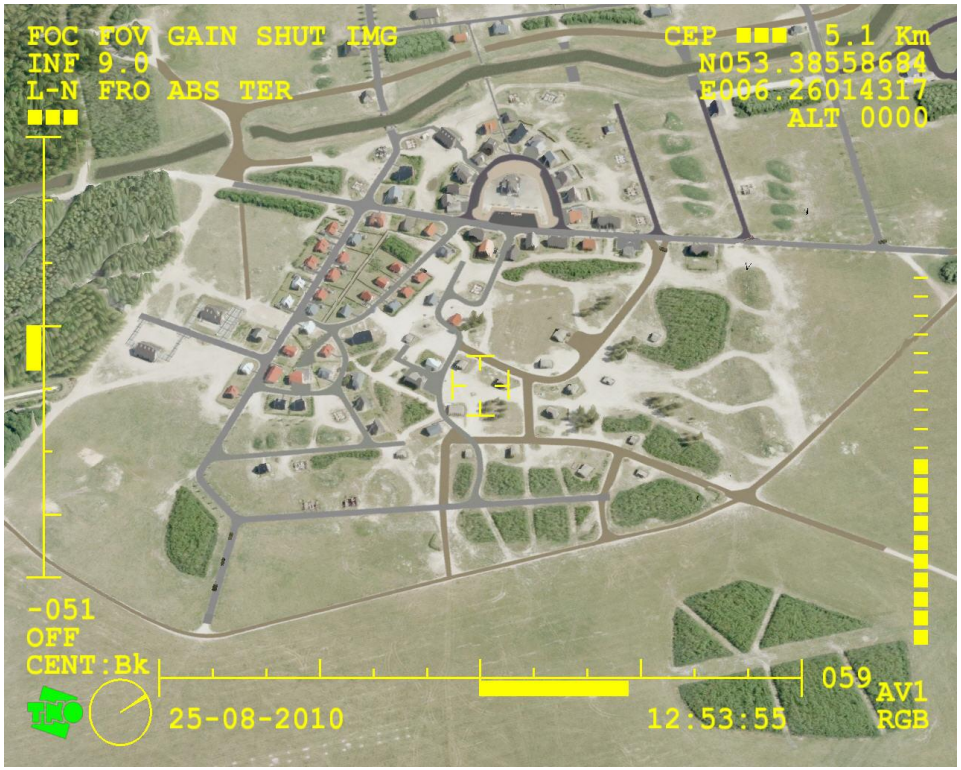
- Phase III (2011 – *Live/Virtual/Constructive*)
  - Marnehuizen Environment model
  - Simulated UAV (TNO-Sperwer & VBS2)
  - Simulated entities (VRForces & VBS2)
  - Live entities (MCTC: vehicles, humans)

UAV Simulator – Ground Control Station

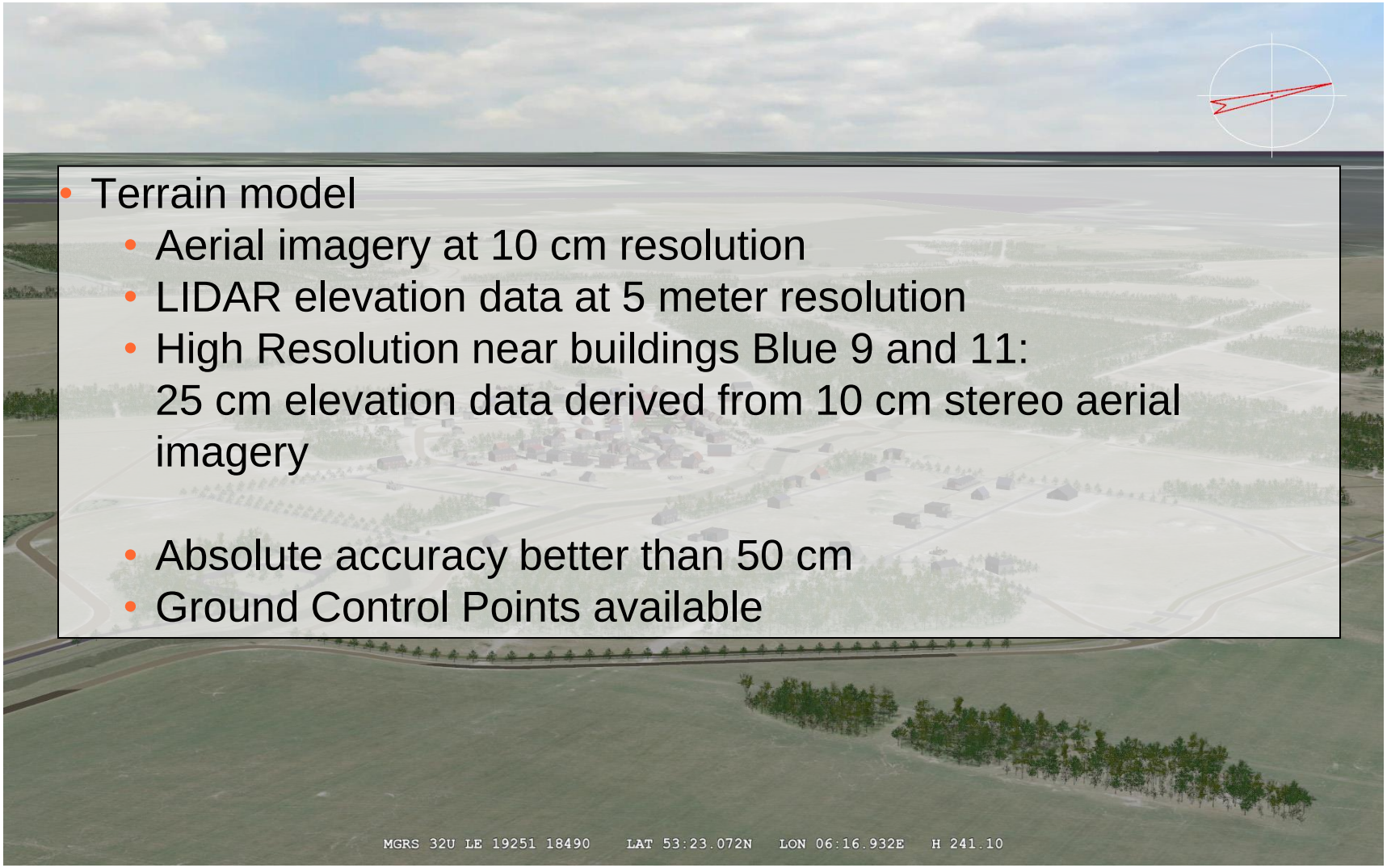
- Flight plan creation
- Sensor control and C2 information, using 2D and 3D maps
- Display of multiple projected video and still imagery, icons for DIS and Link16 entities, and KML overlays
- Intelligence reports

UAV Simulator – Generic UAV platform

- Modelled after a Sperwer UAV
- Sensor system, allowing zoom, terrain and target locks
- Live video broadcast of motion imagery (STANAG 4609) and still imagery (STANAG 4545)
- Flight dynamics



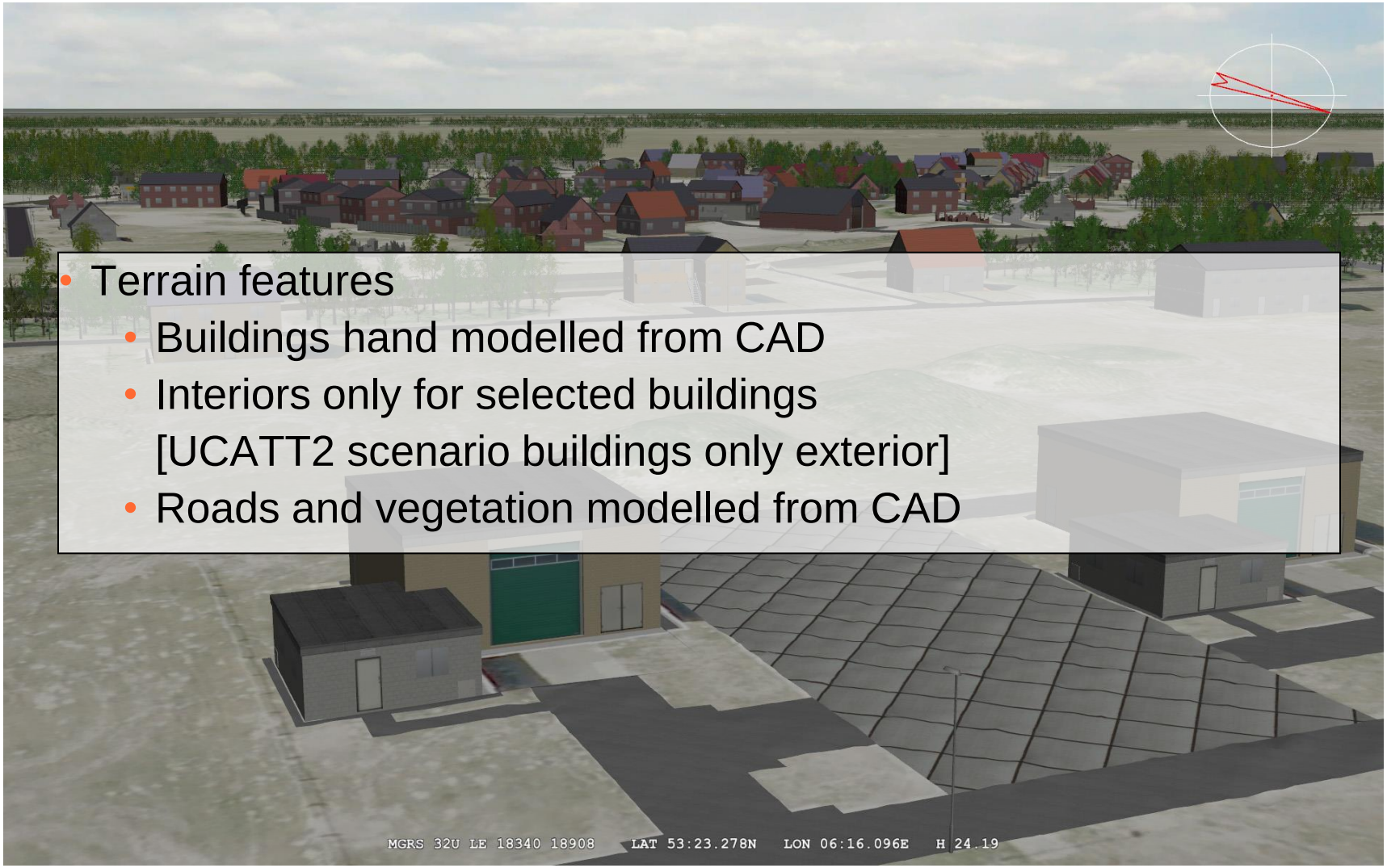
Marnehuizen Environment Model



- Terrain model
  - Aerial imagery at 10 cm resolution
  - LIDAR elevation data at 5 meter resolution
  - High Resolution near buildings Blue 9 and 11:
    25 cm elevation data derived from 10 cm stereo aerial imagery

  - Absolute accuracy better than 50 cm
  - Ground Control Points available

Marnehuizen Environment Model



- Terrain features
  - Buildings hand modelled from CAD
  - Interiors only for selected buildings
    [UCATT2 scenario buildings only exterior]
  - Roads and vegetation modelled from CAD

Phase I Architecture

UAV Simulator

UAV
Ground Control Station

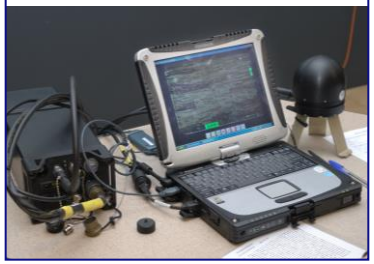
commands,video

Simulated UAV

MH
terrain
database

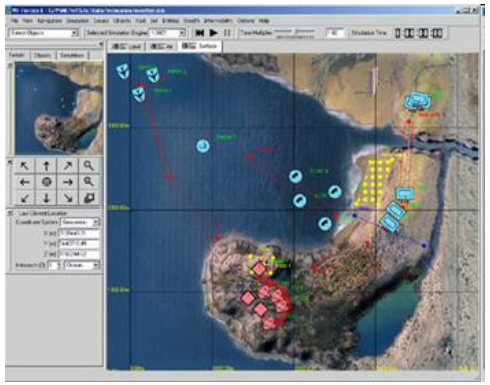
streaming video

Rover



position data, weapon fire,
detonations (DIS or HLA)

Computer Generated Forces



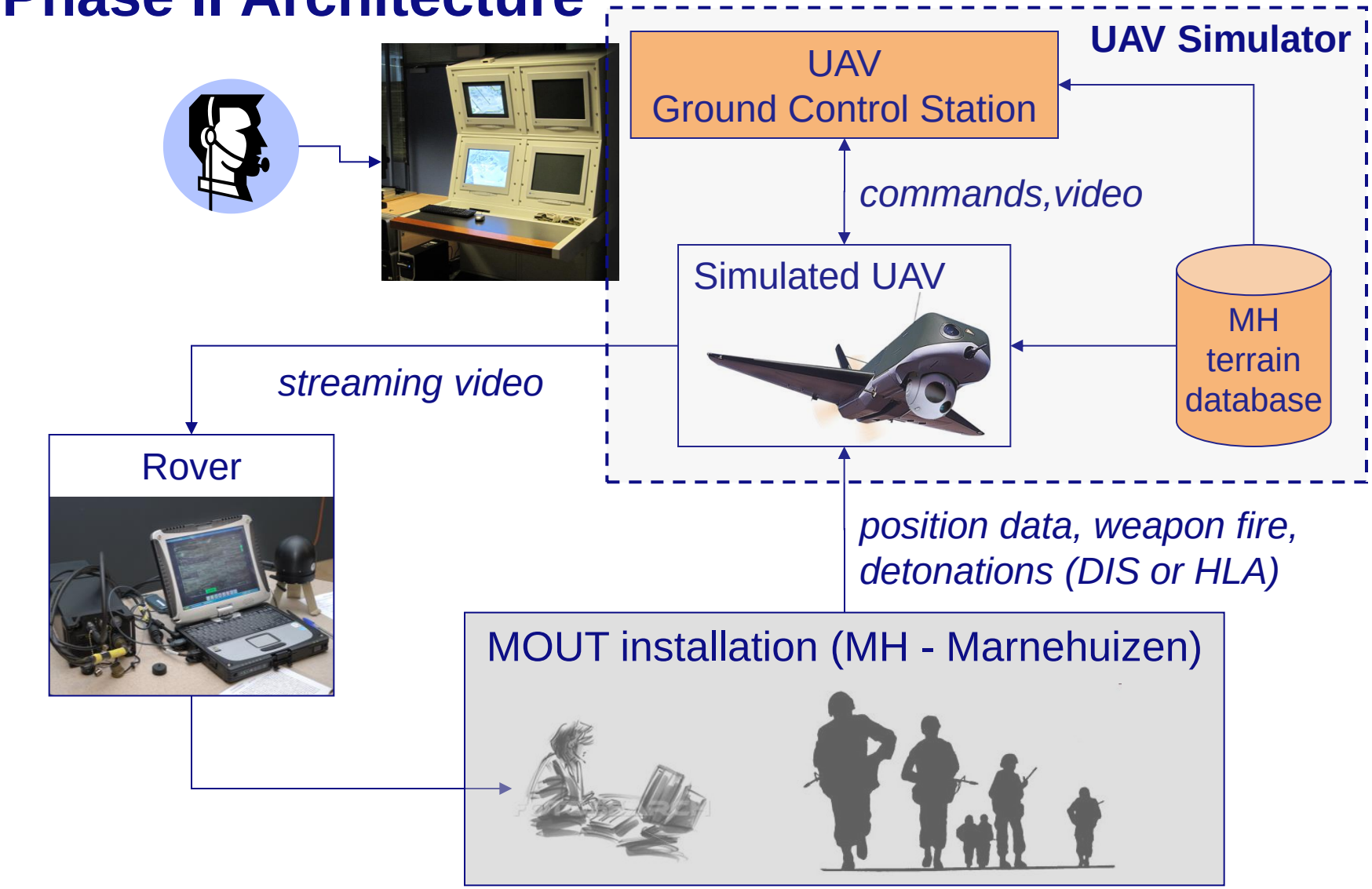
Phase II: UAV at Marnehuizen, Live entities

- Integrate UAV Simulator with Live entities during MSG-063 (UCATT2) demonstration (Marnehuizen, 15-16 September 2010)

- Identify requirements for virtual UAVs in a Live environment
  - Tracking of Live entities
  - Sensor correlation
  - Terrain correlation

- MSG-063 main objective:
  - Identify a suitable architecture and a standard set of interfaces that enable interoperability of MOUT Training components

Phase II Architecture



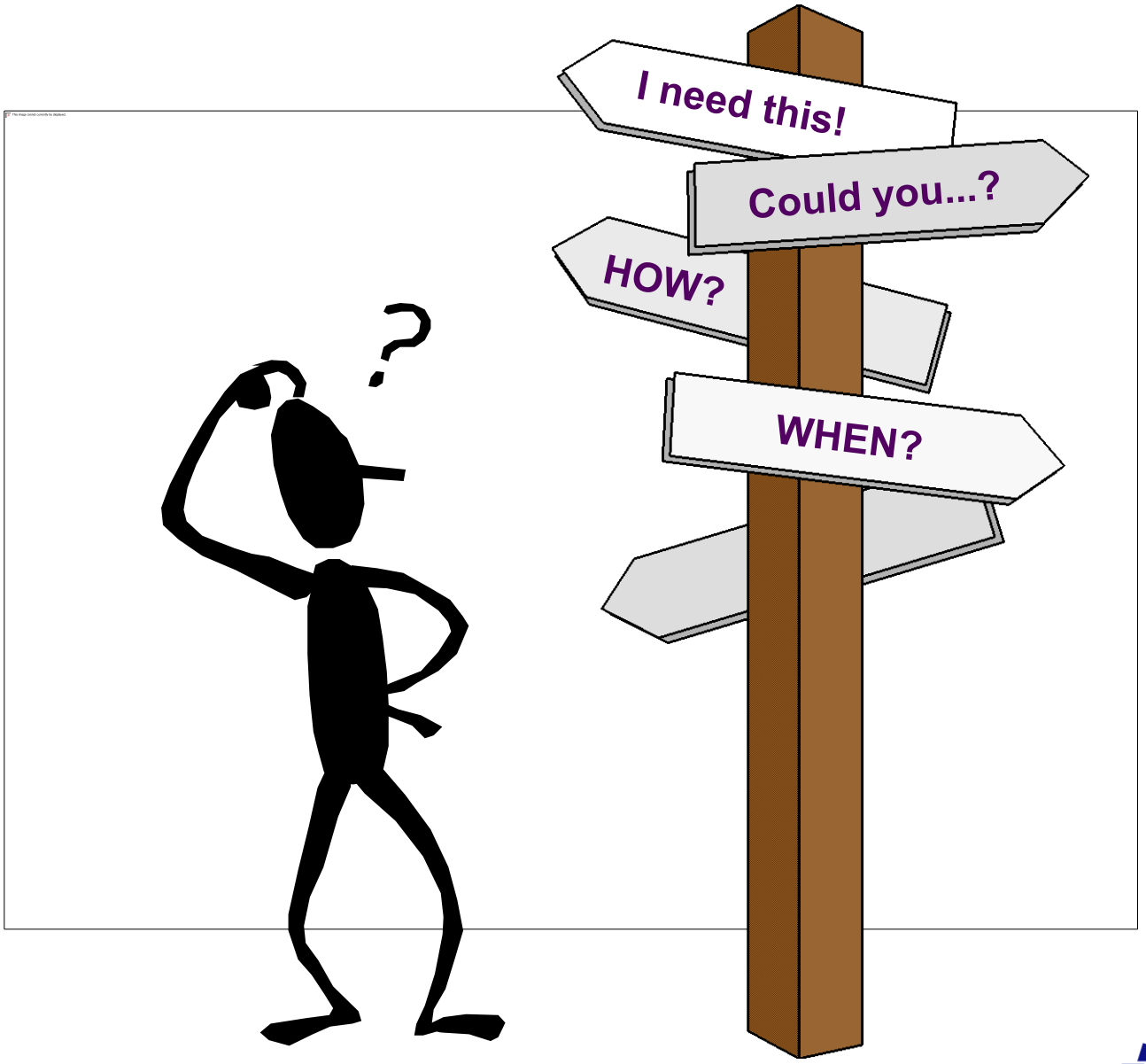
Future plans

Plans for Phase III:

- Addition of Computer Generated Forces to embed UAV in a larger scenario (virtual wrapper)
- Validation of simulated UAV sensor imagery using actual sensor imagery
- Improved tracking of entities
- Daylight simulation (shadows)

QUESTIONS ?

COMMENTS ?



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Back Up

LVC is Live, Virtual, Constructive Simulation

- **Real People, Real Systems**

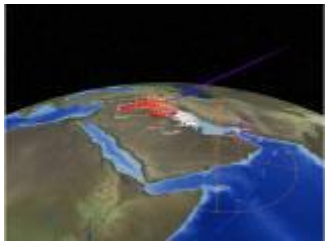
Top Gun, Red Flag,
MCTC, Marnehuizen….

- **Real People, Gesimulated systems**

KM Bridgesim, F16 ULTs, TACTIS,
FACsim, VBS, MS Flight Sim…

- **Simulated people, Simulated systems**

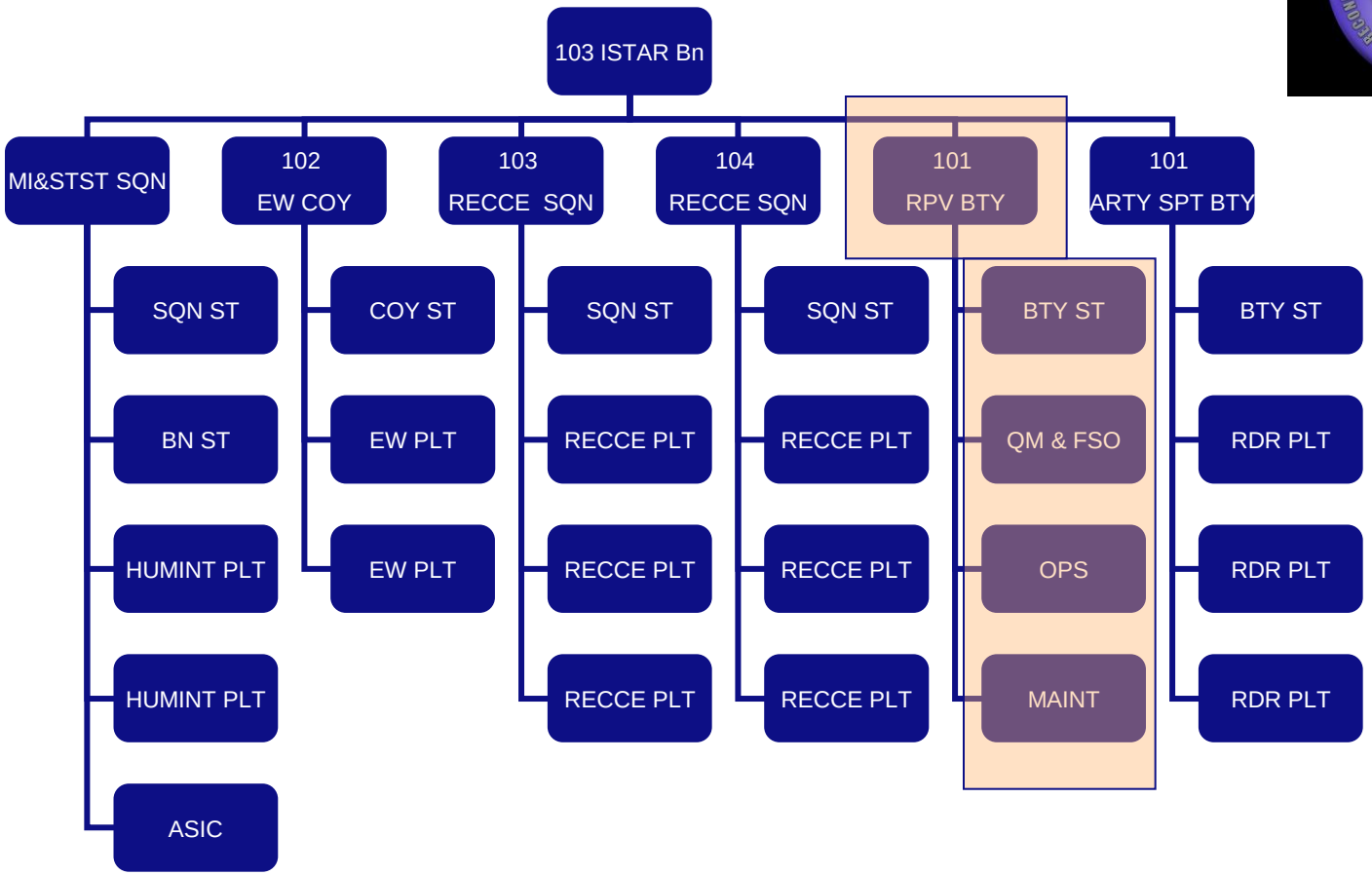
JROADS, KIBOWI, IWARS,
OneSAF…



LVC Programme Results

- **LVC Knowledge and International cooperation**
- **Guidelines for LVC (architecture, I/Fs, VV&A, best practices,..)**
- **Toolbox with (prototype) solutions (SAF control thru BML, environment modelling,…),**
- **Demonstrators of LVC cases**

Organisation of 103 ISTAR BN



- Sperwer UAV is operated by 101 RPV for collection of imagery intelligence