Naval Surface Fire Support
Concept Development and Experimentation

› MSc. Yntze Meijer

Goal

> Present the application of CD&E by TNO on NSFS for RNLN

Content

> Introduction:

  > Royal Netherlands Navy and its new capability

  > Naval Surface Fire Support

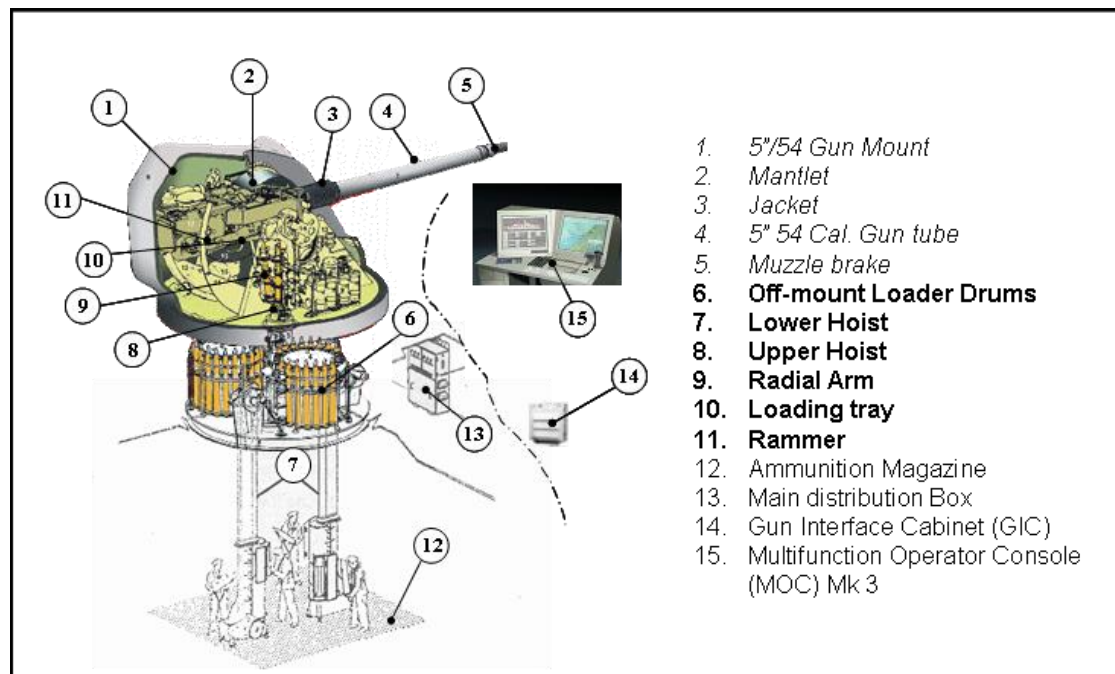> Application of Concept Development and Experimentation

Context (1)

› Expeditionary operations

› By support of maritime forces from the sea
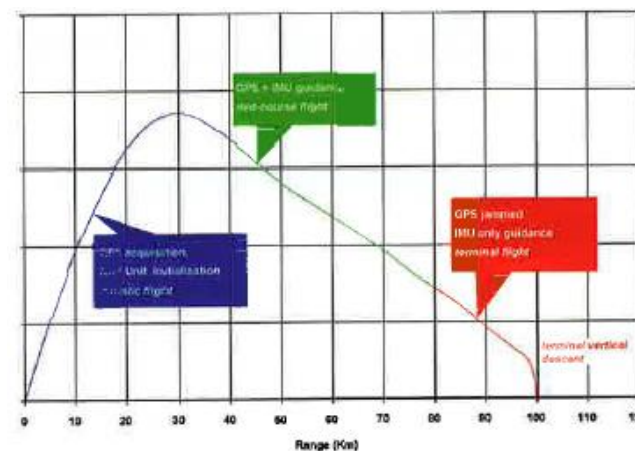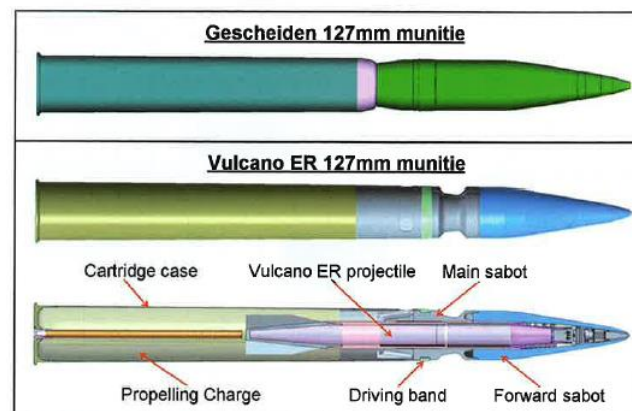
› Air Defence Command Frigate capabilities:

ADCF with Oto Melara 5/54 Compact Gun

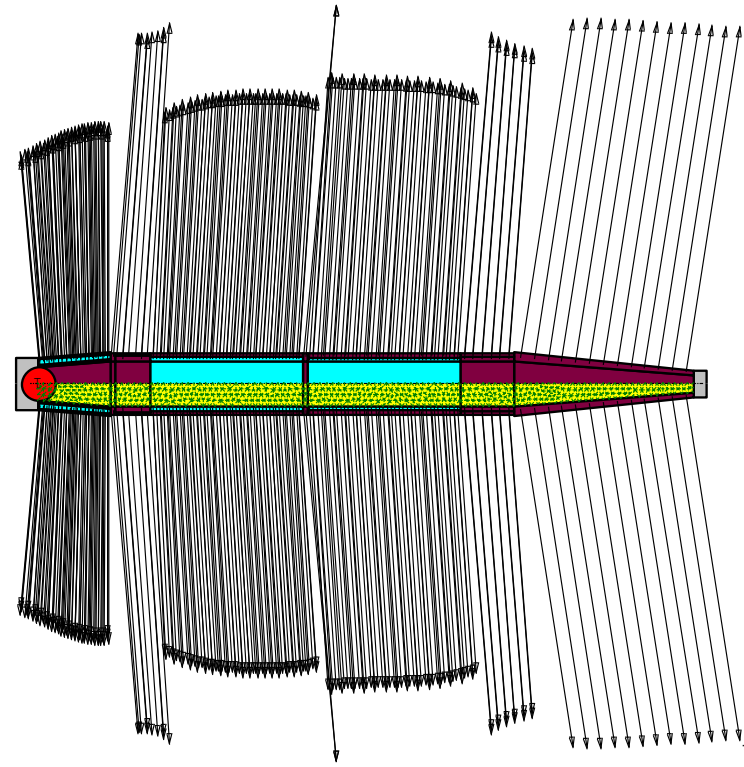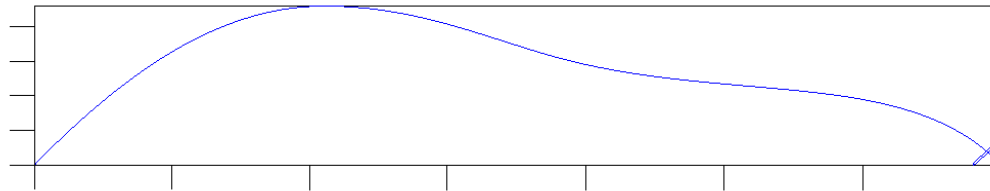|	
1.	5"/54 Gun Mount
2.	Mantlet
3.	Jacket
4.	5" 54 Cal. Gun tube
5.	Muzzle brake
6.	**Off-mount Loader Drums**
7.	**Lower Hoist**
8.	**Upper Hoist**
9.	**Radial Arm**
10.	**Loading tray**
11.	**Rammer**
12.	Ammunition Magazine
13.	Main distribution Box
14.	Gun Interface Cabinet (GIC)
15.	Multifunction Operator Console (MOC) Mk 3

Introduction Vulcano

› Vulcano munition for 127 mm

  › Long range (> 70 km)

  › GPS/INS 127 mm
     (CEP within meters)

Gescheiden 127mm munitie

Vulcano ER 127mm munitie

Cartridge case   Vulcano ER projectile   Main sabot

Propelling Charge   Driving band   Forward sabot

GPS + IMU guidance
mid-course flight

GPS acquisition
IMU Unit initialization
ballistic flight

GPS jammed
IMU only guidance
terminal flight

terminal vertical descent

Range (Km)

New characteristics, concept and possibilities

Context (2)

Command Structure

```
                          NLMARFOR / CATF
                                │
                                │                           Fixed Wing
                                │                           Rotary Wing
                        ┌───────┴───────┐         SACC ─── PZH2000
                        │               │
                       ATF             CLF
                        │               │
                      EVTN          1 Marnsbat ─── Mortar Fire Controller
                      JWIT             CSS          81 mm Mortar
                      RDAM           AGB (-) ─── Joint Fires Team
                      AMBV                         120 mm Mortar
                   ┌────┴────┐
                1 BTCIE   2 BTCIE
```

- **NLMARFOR / CATF**
- **SACC**
  - Fixed Wing
  - Rotary Wing
  - PZH2000
- **ATF**
  - **EVTN**
  - **JWIT**
  - **RDAM**
  - **AMBV**
    - **1 BTCIE**
    - **2 BTCIE**
- **CLF**
  - **1 Marnsbat**
  - **CSS**
  - **AGB (-)**
    - Mortar Fire Controller
    - 81 mm Mortar
    - Joint Fires Team
    - 120 mm Mortar
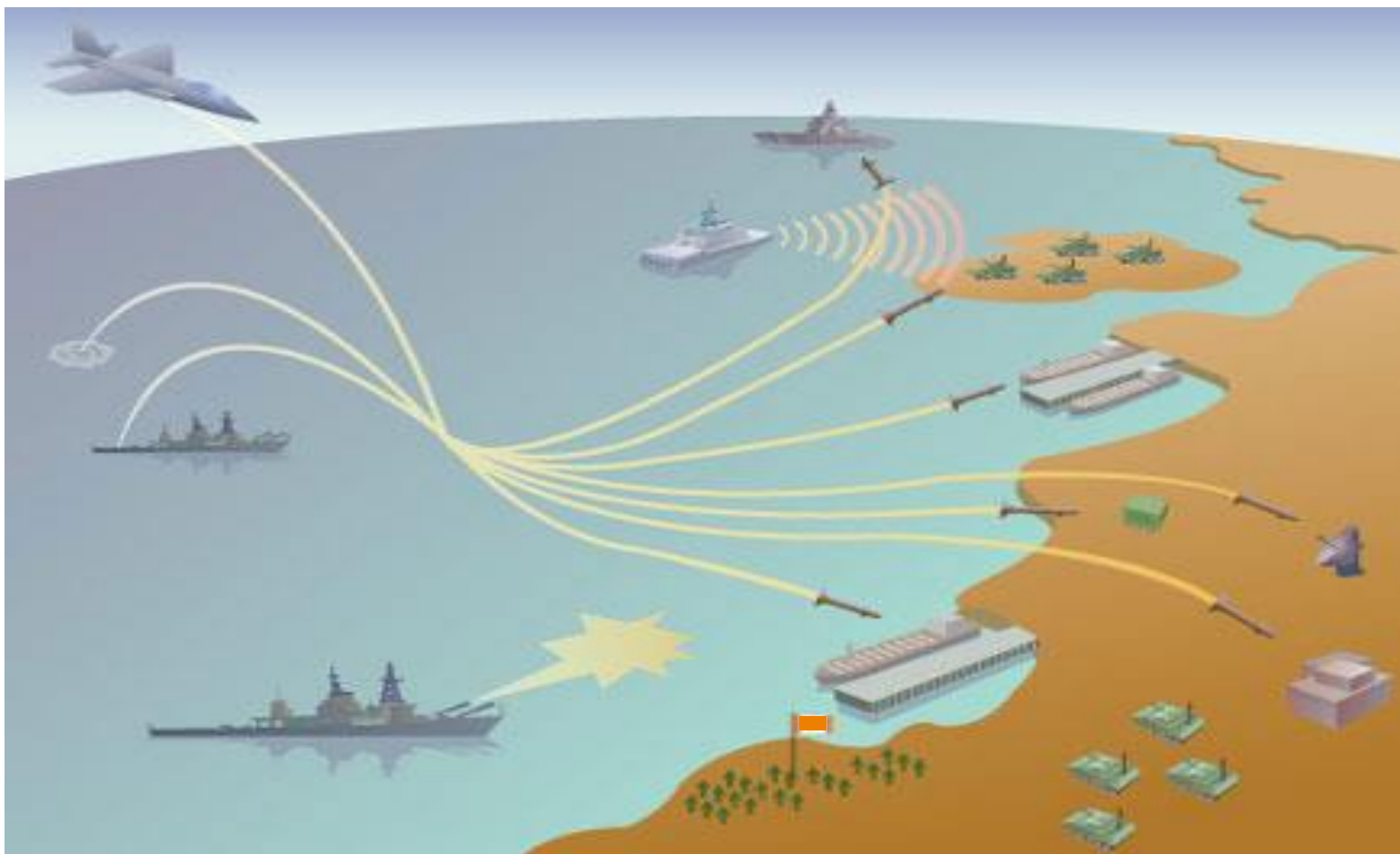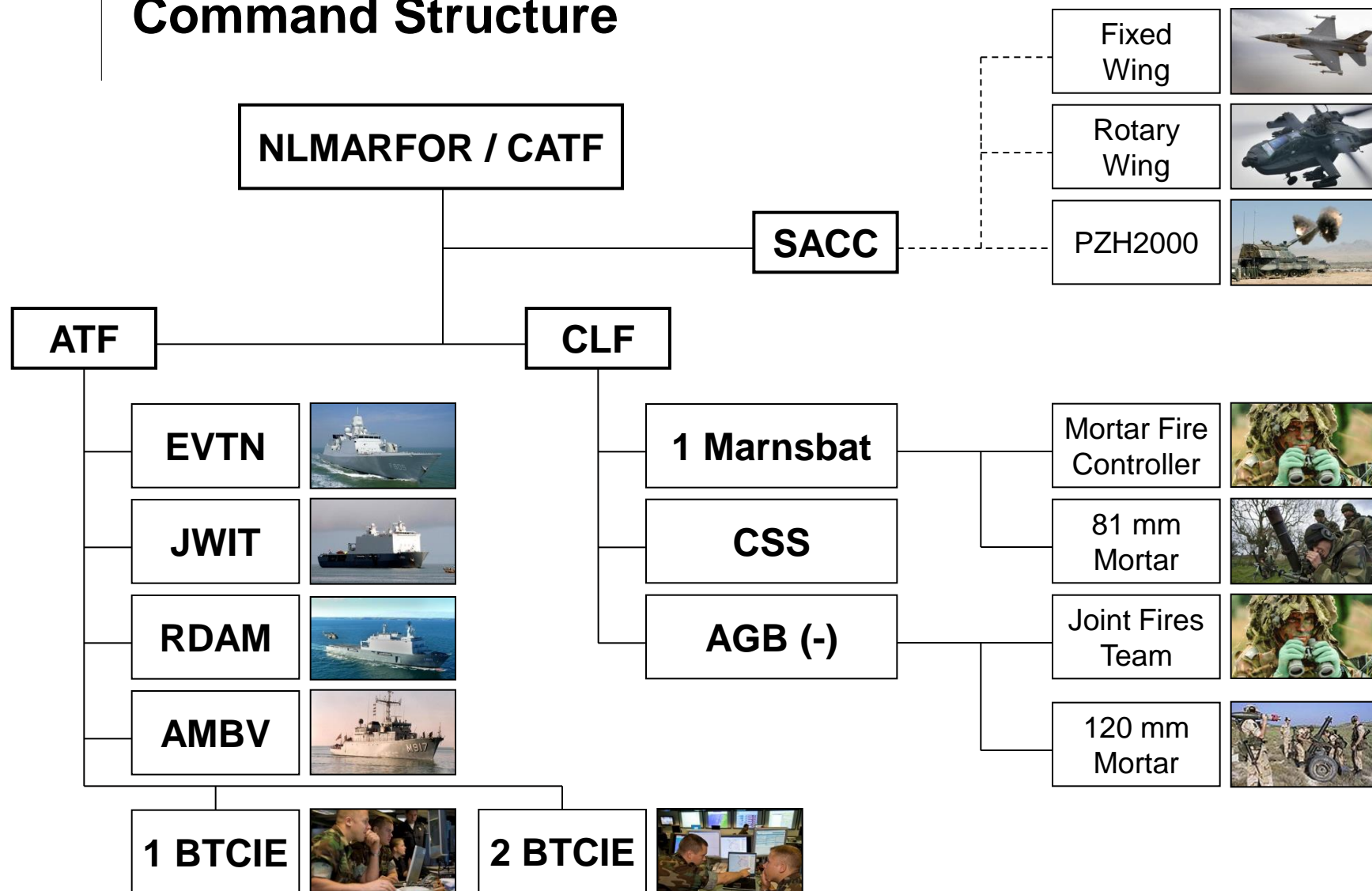
Example amphibious scenario

Grid: NF 3040-5606

Altitude: 50

Direction: 2600 mils

2 buildings

In the Open

100x100

HE Delay in effect

At My Command

NFA

'4 Rounds

HE Delay in effect'

Shot, over

Splash

Fire, over

Building Destroyed,

End Of Mission

RF1400
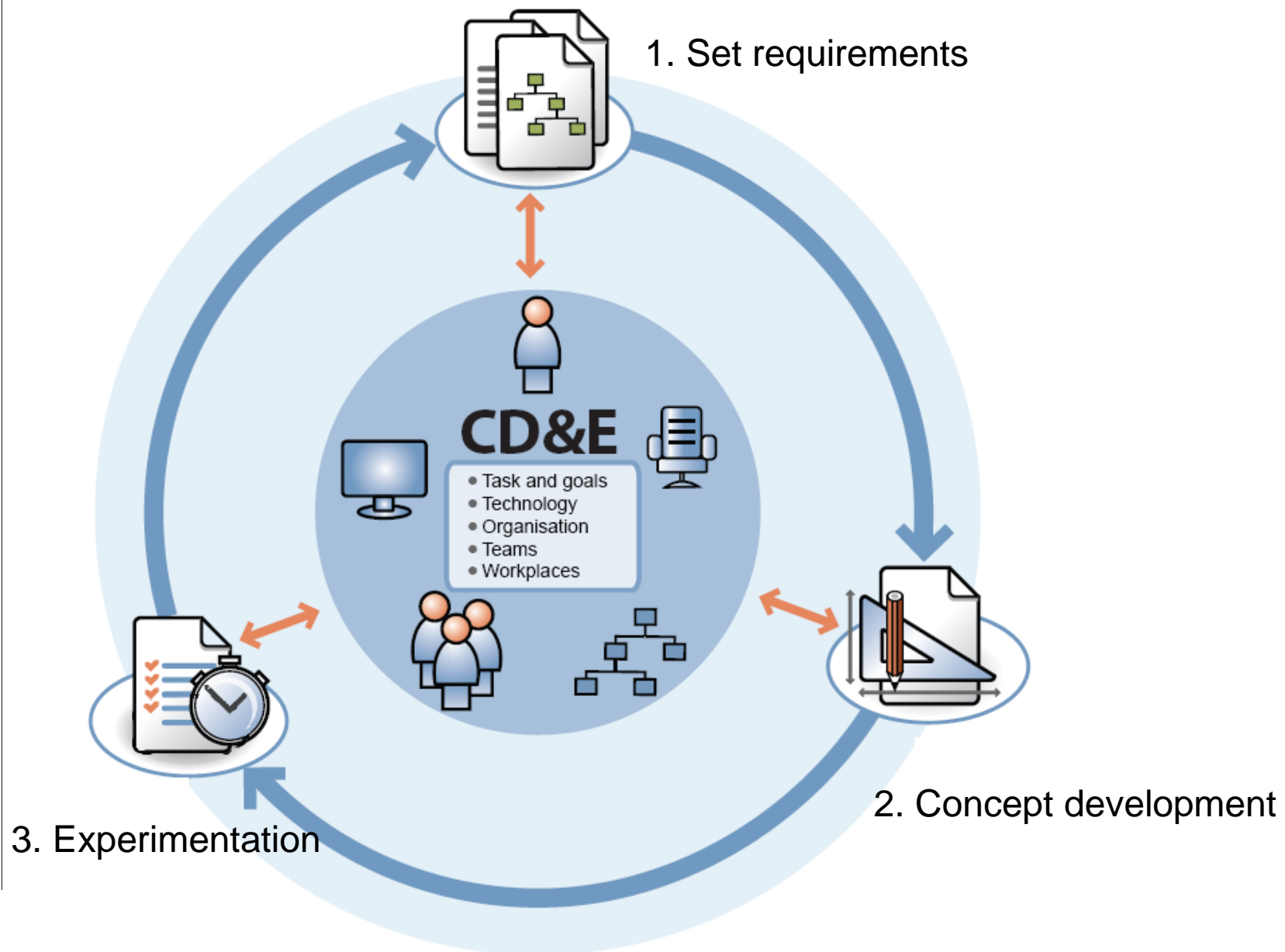
RF1402

Research goals

> To be ready for optimal deployment of Vulcano and its possibilities from the ADCF to support operations on land.

> The integration problems with new and existing NSFS systems should be foreseen and solved.

Research method

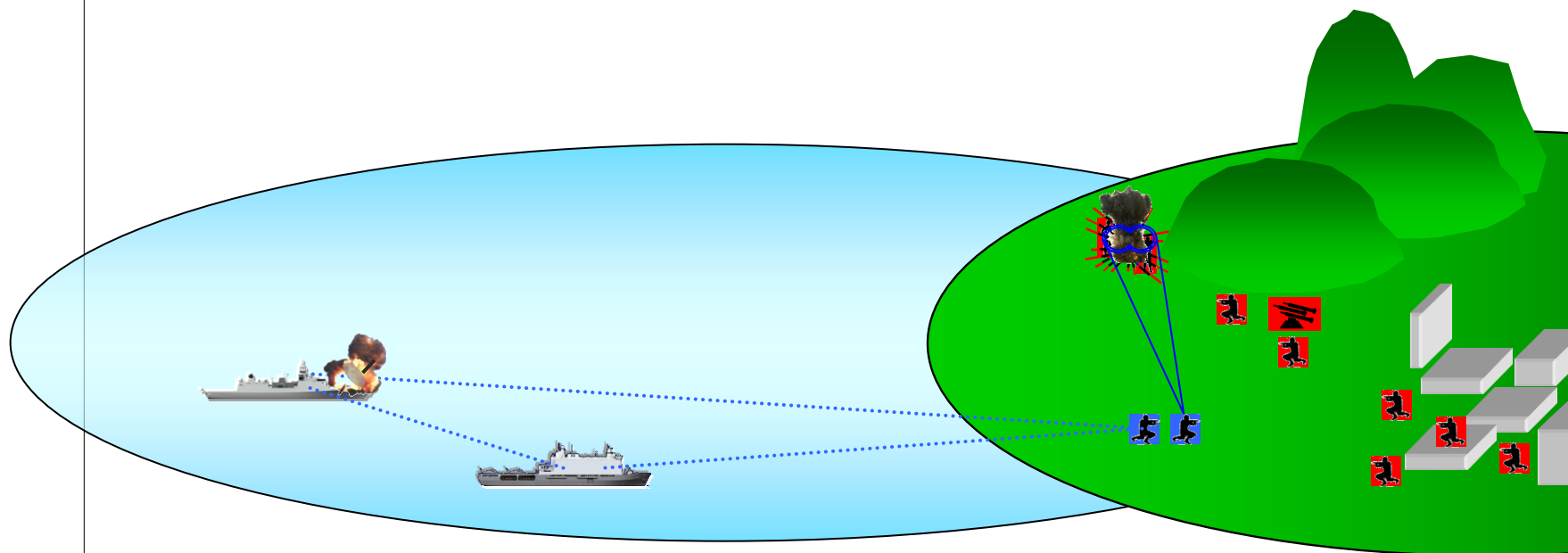> Concept Development and Experimentation

1. Set requirements

CD&E
- Task and goals
- Technology
- Organisation
- Teams
- Workplaces

2. Concept development

3. Experimentation

Zero version NSFS CD&E environment

Initial NSFS concept with Vulcano

> Replace existing ammunition with Vulcano,
> procedures remain unchanged

> What works well?

> What is to improve?

> Testing NSFS CD&E environment:
>> Ad hoc solutions for problems by participants;
>> Level of realism?

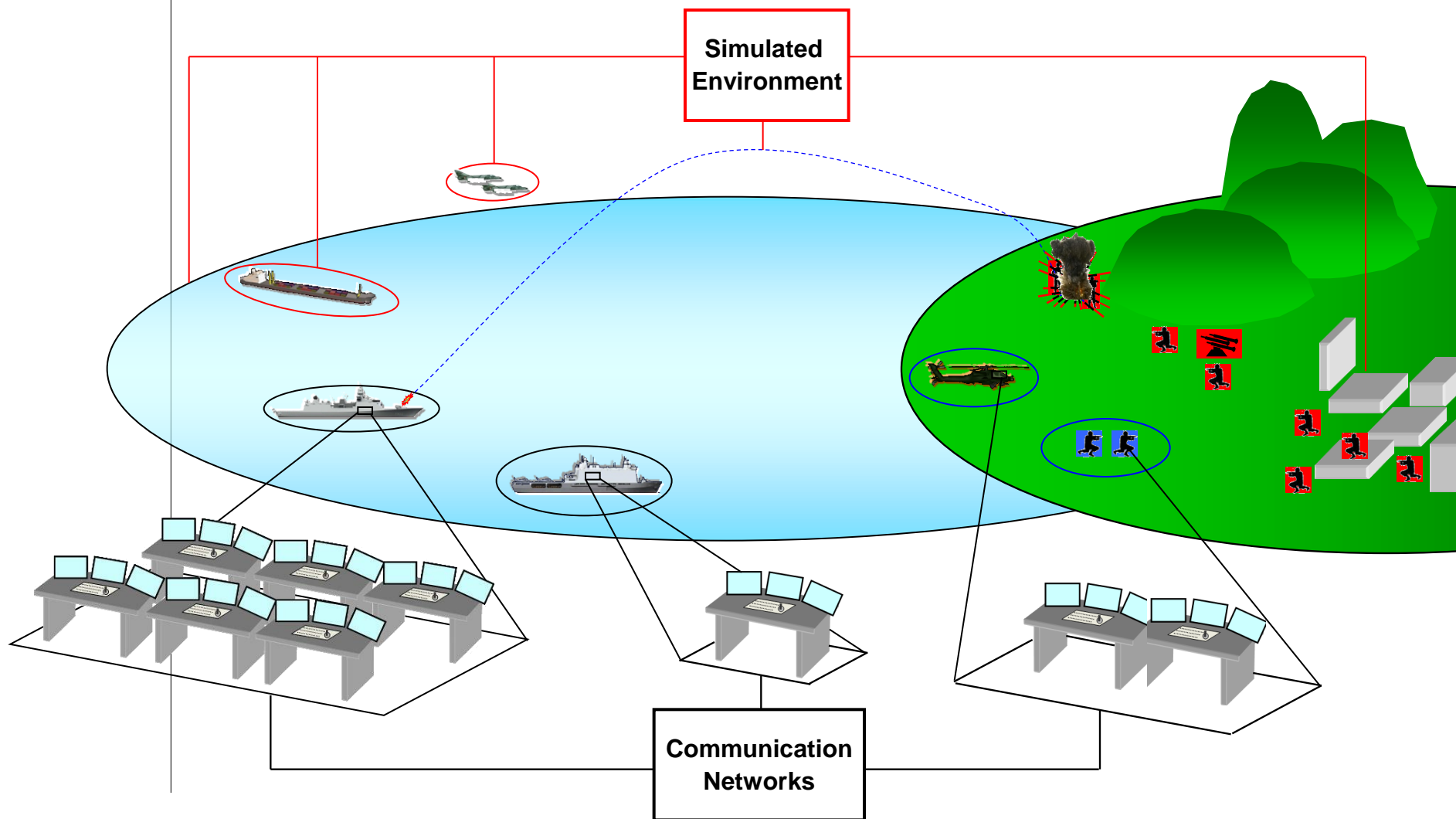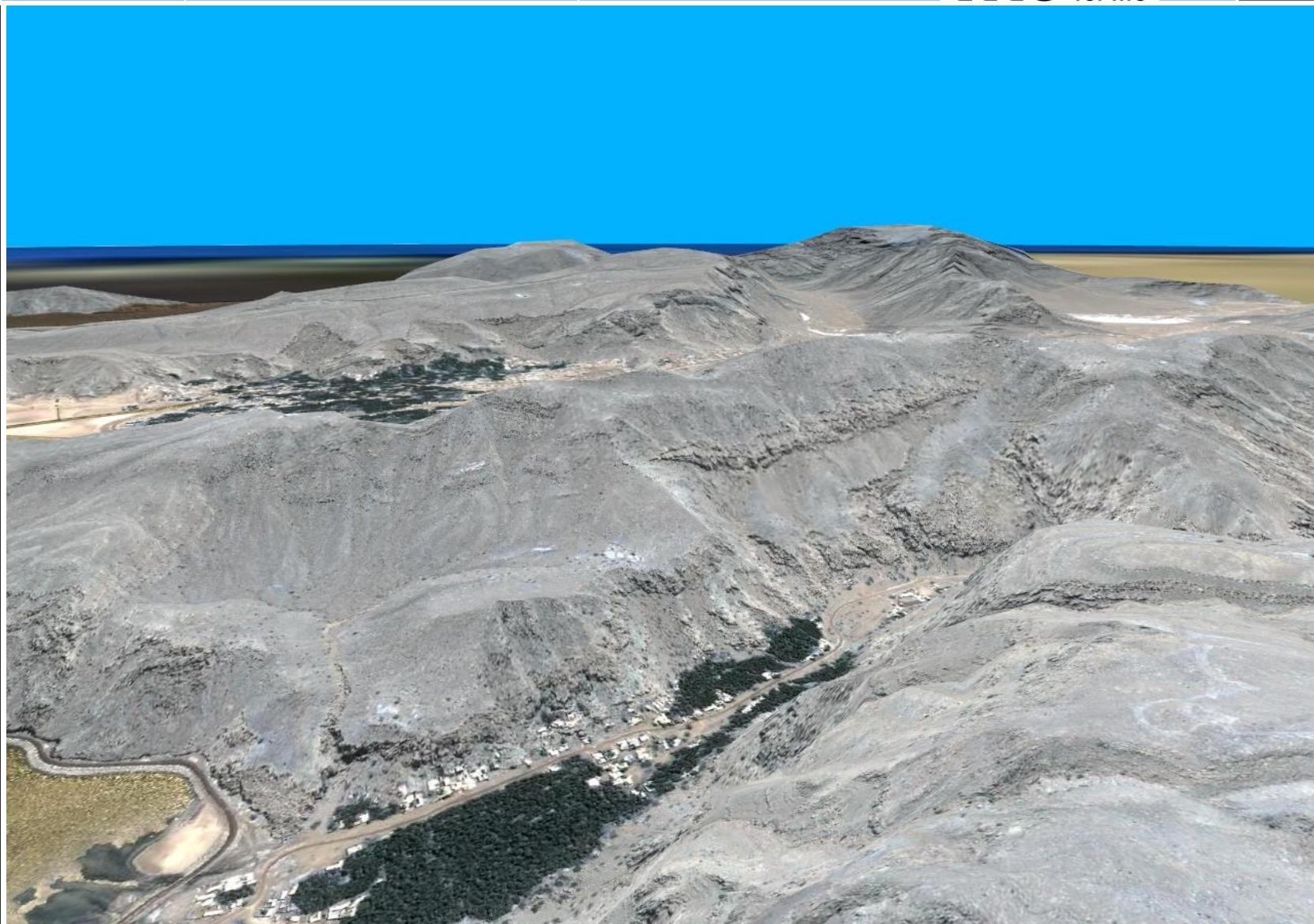Fire support and battle damage assesment
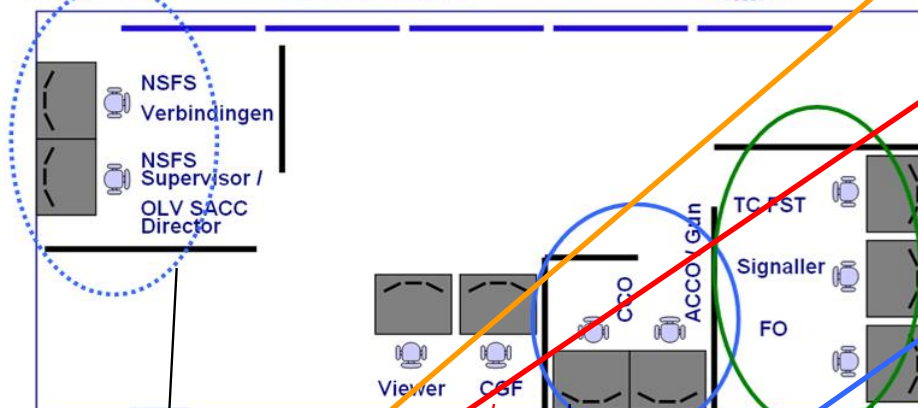
Naval Surface Fire Support

Simulated Environment

Communication Networks

TNO innovation for life

Terrain Database

CGF

Ship Simulation

Spotter Components

Radio Simulation

NSFS Verbindingen

NSFS Supervisor / OLV SACC Director

TC FST

Signaller

FO

CCO

ACCO Gun

Viewer   CGF

Raised questions

Usage:

– Which type of targets are most suited for Vulcano?

Doctrines:

– Old procedures are less efficient with Vulcano

Eg. procedure to assess accuracy of impacts

Element of surprise:

– *Spotters adjust:* Element of surprise vanishes before 2nd salvo

Vulcano characteristics:

› What is safe zone for own personnel?

› How will collateral damage work out?

› Simultaneous engagement capability against multiple targets?

NSFS tool for operators

› Identification promising concepts:

› › Plan fire support, crest avoidance, air space deconfliction, etc.

› Focus on planning by SACC and WO execution

2 phases in experiment: planning and execution

› Concept Development with stakeholders.

› Goal: demonstrate and improve concept.

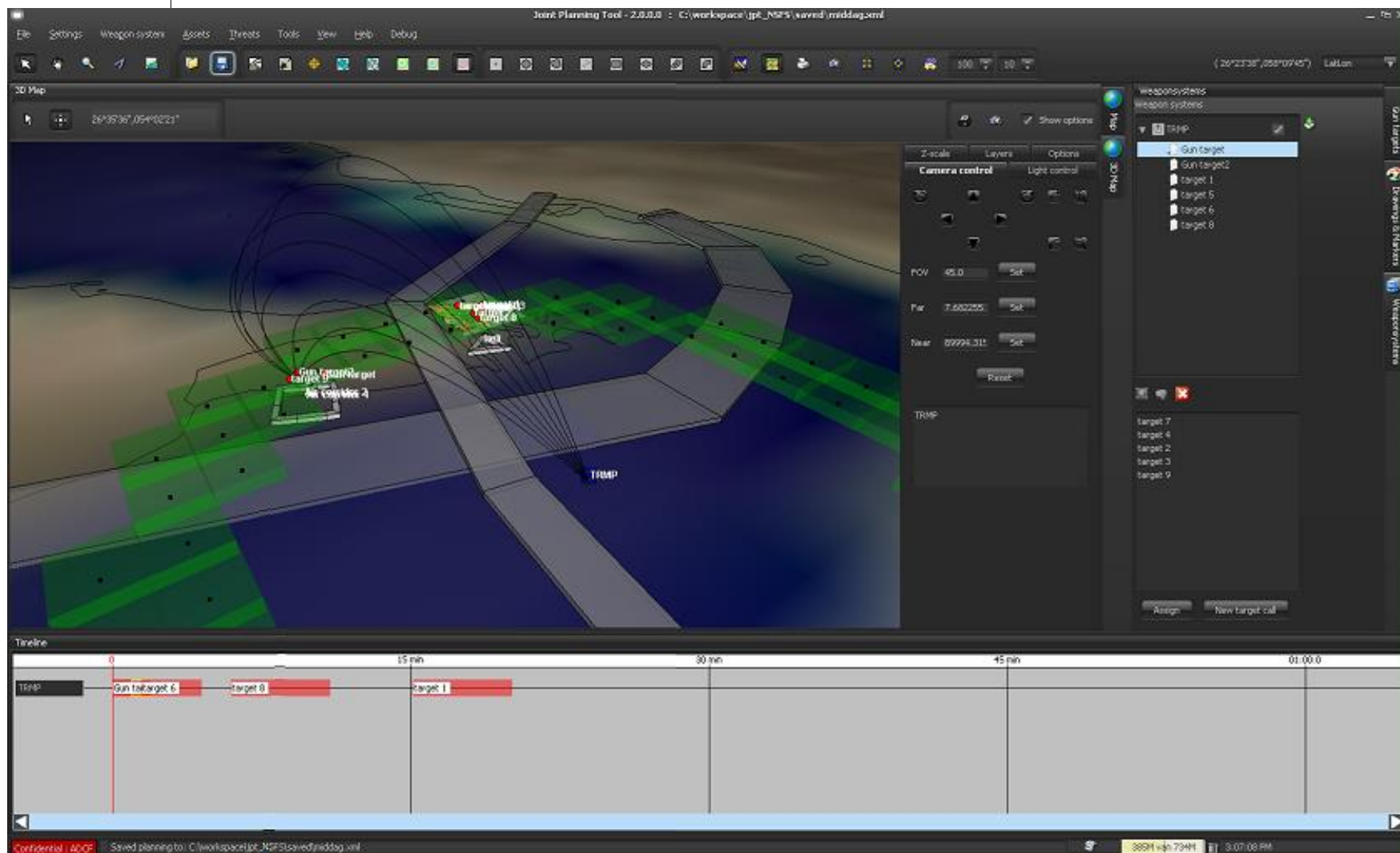# Smaller set-up, more parallel experiments
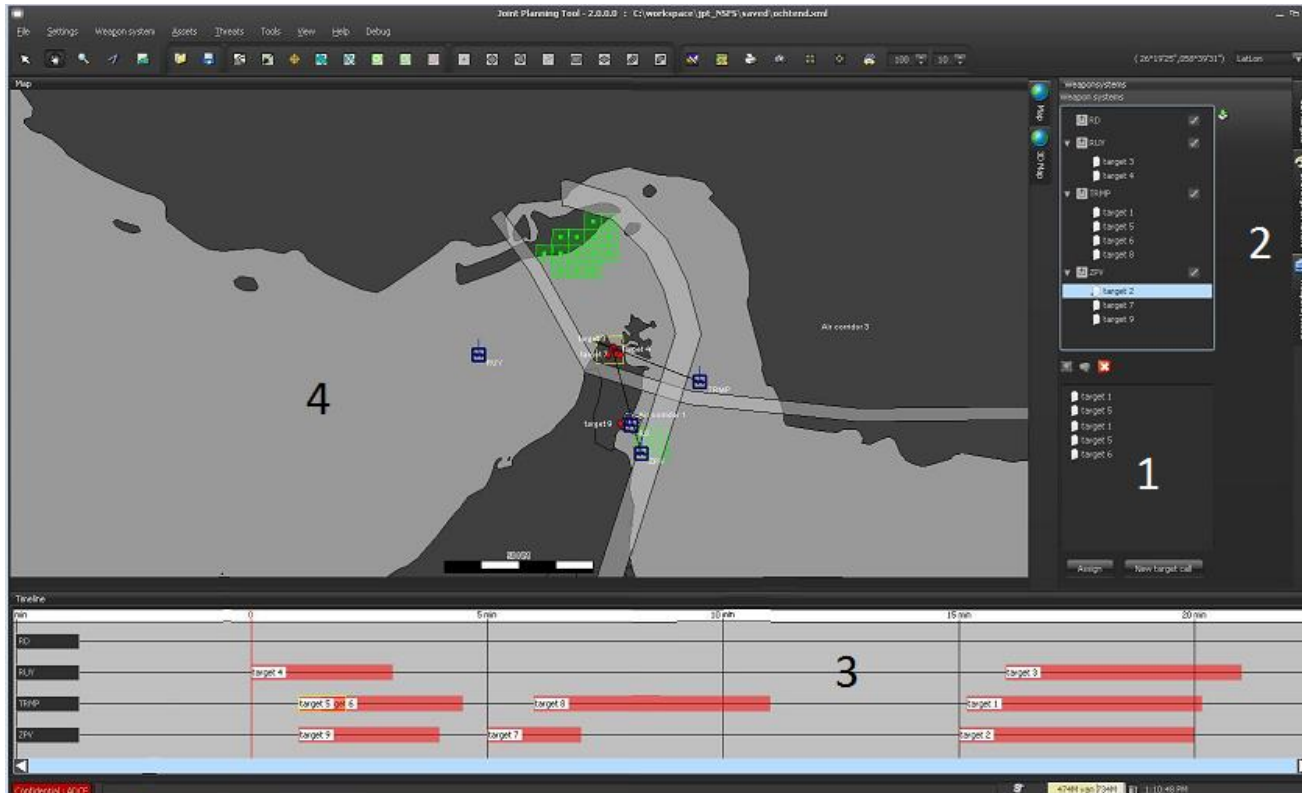
1. Properties.
2. Crest
3. Assignment
4. Deconfliction

Feedback from participants

- ❯ "Tool combines information"
- ❯ "Tool gives a good situation overview, also in time"
- ❯ "Tool supports communication"
- ❯ "Visualisation helps to explain/deconflict with other participants"
- ❯ "Nice to be able to reach firing positions backwards from target"

General conclusions

> Return on Investment CD&E:

> > Find issues to improve;

> > Simulation as concept tester and trainer.

> Spiral development to innovations
before the real implementation of new capabilities.

> Create support for implementation
by participation end users during design proces

Thank you for your attention

Yntze.meijer@tno.nl

+31-888663921

Concept Maturity Levels (CML)

CML 6
CML 6: Implemented concept. Requirements are defined and capability is developed and implemented.

CML 5
CML 5: Proof of Concept. Concept is complete and demonstrated in a relevant operational environment.

CML 4
CML 4: Refined Concept. Concept refined in all or most lines of development through experiments and demonstration.

CML 3
CML 3: Selected Concept. Hypotheses tested and application formulated in detail for all or most lines of development.
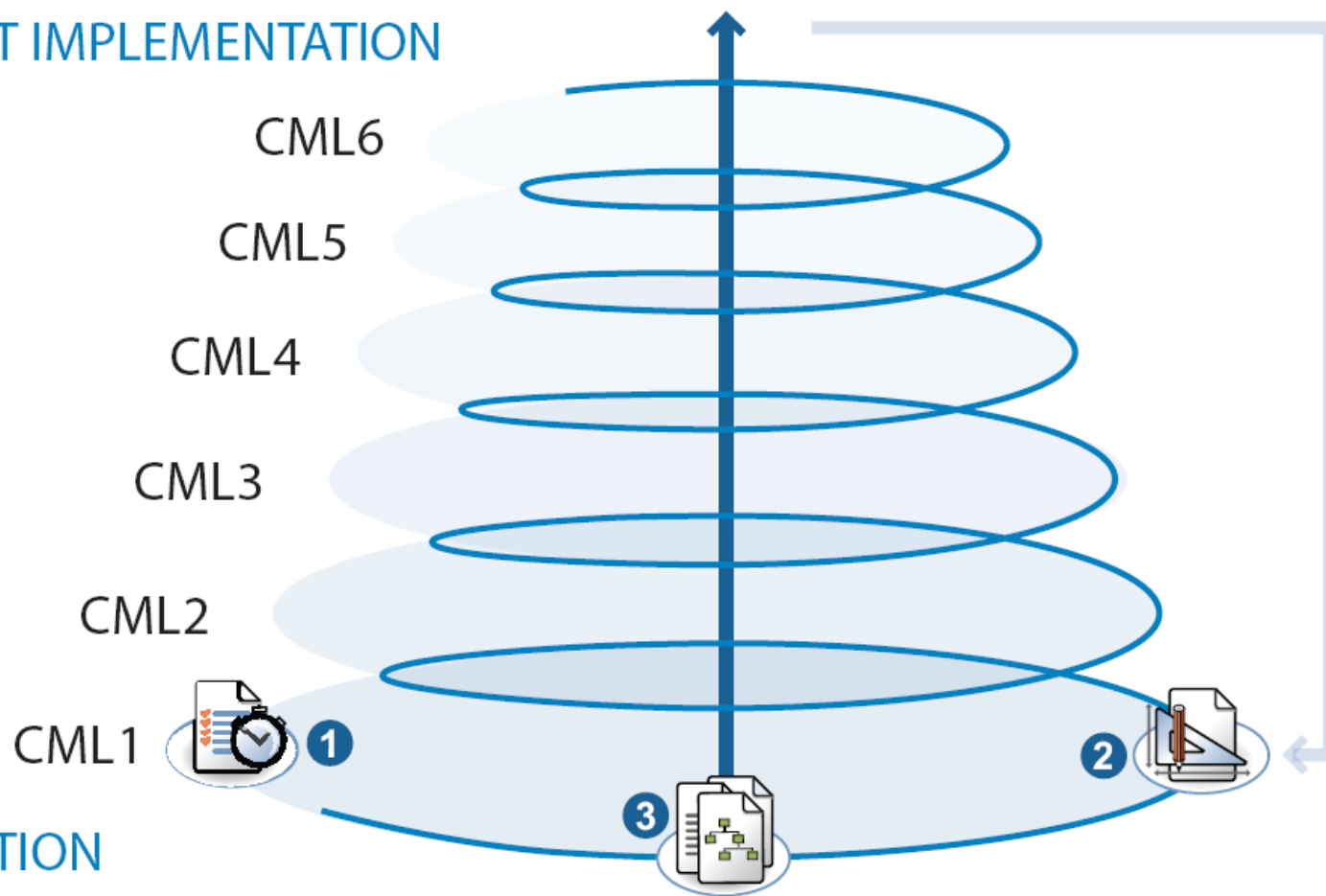
CML 2
CML 2: Promising Concept. Promising ideas are selected and reported according to the first draw of hypotheses.

CML 1
CML 1: Idea of Concept. Basic and out-of-the-box ideas observed and reported in relevant situations and cases.

Typical activities per CML

What   How

Implementation phase
Organisation for implementation, acquire the
necessary equipment, education etc.
                                              Project group   CML 6

Demonstration phase
Demonstration of the concept in a
realistic operational setting
                                              M&S and live
                                              experiments   CML 5

Refinement phase
Develop selected concept on
all lines of development
                                              M&S experiments   CML 4

Experience phase
Experience concepts on several development
lines and select 1 or develop into 1
                                              Tabletop games,
                                              M&S experiments   CML 3

Selection phase
1 – 3 promising concepts based
on hypotheses
                                              Brainstorming,
                                              tabletop games   CML 2

Creative brainstorming phase
3 – 5 concept ideas
                                              Brainstorming   CML 1