

# NATO Armaments Meteorological Kernel (NAMK) Project

Part of the SG/2 Shareable (Fire Control) Software Suite (S4)

Under the Auspices of NATO AC/225, Integrated Capability Group-Indirect Fires, Sub-Group 2 on Ballistics, Effectiveness and Fire Control Software, using controlling authorities from the STANAG 4537 and AOP-37 documents, a suite of shareable software kernels has been created conforming to the SG/2 Quality System defined in AOP-49.

The indirect and direct fire land and sea forces of the NATO nations are the key stakeholders and the integrators of S<sup>4</sup> products within NATO systems are the principal customers.

Technology for the NAMK products is developed with support from the Military Meteorology (MILMET) Panel within NATO.

## Contributions

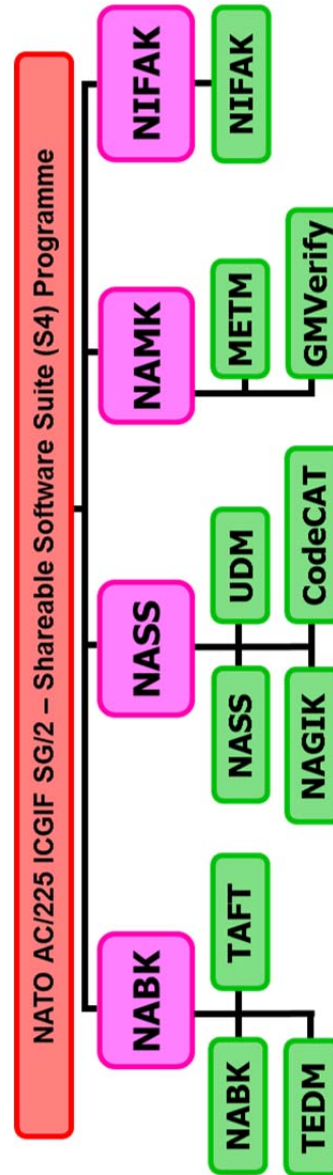
**CAN** provides the role of project Independent Safety Auditor (ISA).

**FIN** provides the role of Quality Assurance Leader for the METM and GMVerify products.

**GBR** contributes to both the METM product and the GMVerify products as peer reviewer.

**NOR** provides the role of Project Leader, as well as Product and Development Leaders for both of the two products.

The SG/2 Shareable (Fire Control) Software Suite chartered by NATO AC/225 ICGIF-SG/2 is organised in four coherent co-operative projects. Each of the projects (pink boxes) develops one or more product (green boxes). The organization brings clarity to a complex software system and adds significant resources required for configuration management, release timing and testing.



NASS - NATO Armaments Support Services – underpins all other Projects with generic functions.  
 NABK – NATO Armaments Ballistic Kernel – supplies only ballistic routines (not generic functions)  
 NIFAK – NATO Indirect Fire Appreciation Kernel – evaluates weights of fire and distribution of fire



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The NAMK project consists of two products that are released in November each year:

**METM – MET data Manager:**

Provides services to handle meteorological data for other S<sup>4</sup> products and any Operational Processor (OPr), i.e. determine meteorological data values in 4D space, as well as validation, sub-setting and conversion to other formats. The source data format can be METGM or METCM.

**GMVerify:**

End user software tool to validate and subset METGM and conversion to other formats. The core functionality is provided by METM.

**For more information visit:**

<https://aop-37.org>

**or email:**

[namk\\_pl@aop-37.org](mailto:namk_pl@aop-37.org)

## METM:

### The MET data Manager Product

The scope of the product is solely limited meteorological data handling, and does not provide any forecast capability. The main format is the gridded meteorological message, METGM, which is detailed fully in STANAG 6022.

Services include the validation of supplied data files in METGM format (initially only ballistic parameters supported), spatial and temporal sub-setting from a large METGM to create smaller areas and/or fewer time-slices and sub-setting of parameters.

Services also include the extraction of various text messages, METCM (STANAG 4082), METB (STANAG 4061), METTA (STANAG 4140) and CBRN Weather Reports (BWR, CDR and EDR), for a given location and time.

The key operational service includes calls to supply meteorological parameters at given coordinates, heights and time e.g. for ballistic computations in NABK. METCM functionality is in the process of being transferred from the NABK to METM.

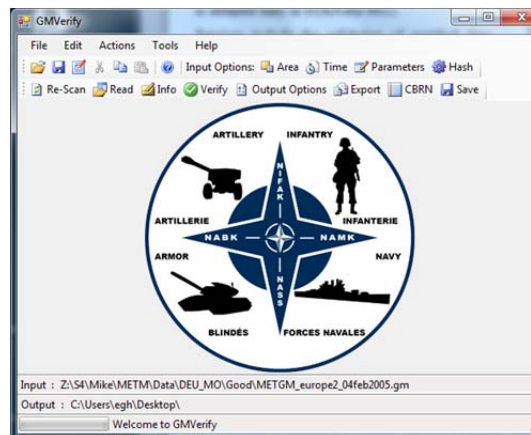
The METM is written in the Ada programming language with code conforming to the S4 Ada Coding Standard (S4ACS).

## GMVerify:

### The GMVerify Product

Although the core functionality is provided by METM, GMVerify is considered to be a separate product. The GMVerify product is a tool for use by producers and manipulators of METGMs. Services include the validation of supplied METGM data files, spatial and temporal sub-setting from a large METGM to create smaller areas and/or fewer time-slices, sub-setting of parameters, adding hash (fingerprint) for integrity checking as well as conditioning and compression of a METGM data file (core functionality provided by the NAGIK product).

The product consists of the command driven GMVerify back-end written in the Ada programming language and the GMVerify front-end for Windows (GMVerifyWin) as shown below. GMVerifyWin is written in Visual Basic and requires the .NET framework 4.0 or newer to run. The GMVerify back-end is platform independent as all other S<sup>4</sup> products are. Typical use of GMVerify is at the WAC (Weather Analysis Centre) to process METGM data files before shipping to theatre.



## Formats and Standards:

Supported meteorological message formats

METB – Standard Ballistic Meteorological Message (STANAG 4061) including METB2 for anti-aircraft fire and METB3 for surface-to-surface fire

METCM – Standard Artillery Computer Meteorological Message (STANAG 4082)

METGM – Standard Gridded Data Meteorological Message (STANAG 6022)

METTA – Standard Target Acquisition Meteorological Message (STANAG 4140)

CBRN Weather Reports (APP-11) including  
BWR – Basic Wind Report  
CDR – Chemical Downwind Report  
EDR – Effective Downwind Report