EUROCONTROL

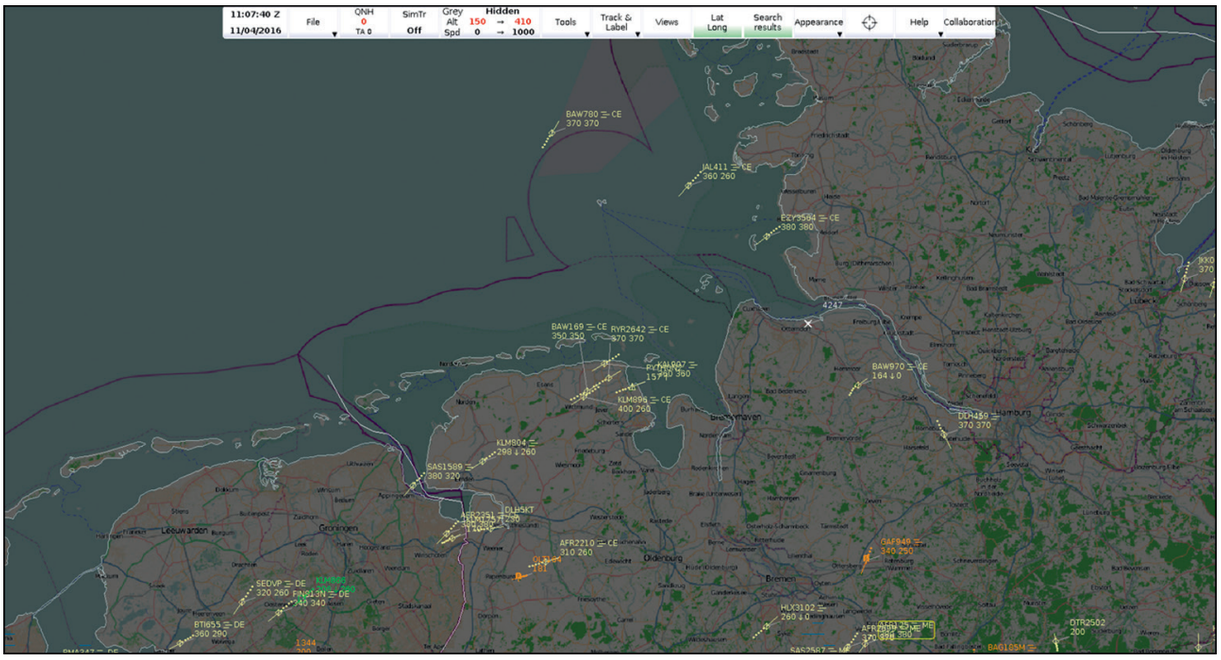
CIMACT

Civil Military ATM Coordination Tool

CIVIL MILITARY ATM COORDINATION TOOL – CIMACT

CIMACT produces a correlated Air Traffic Control (ATC) picture on basic off-the-shelf hardware, by processing a wide variety of surveillance, flight plan and coordination data. The system provides tools, filters and safety nets found in modern Air Traffic Management and Air Defence systems.

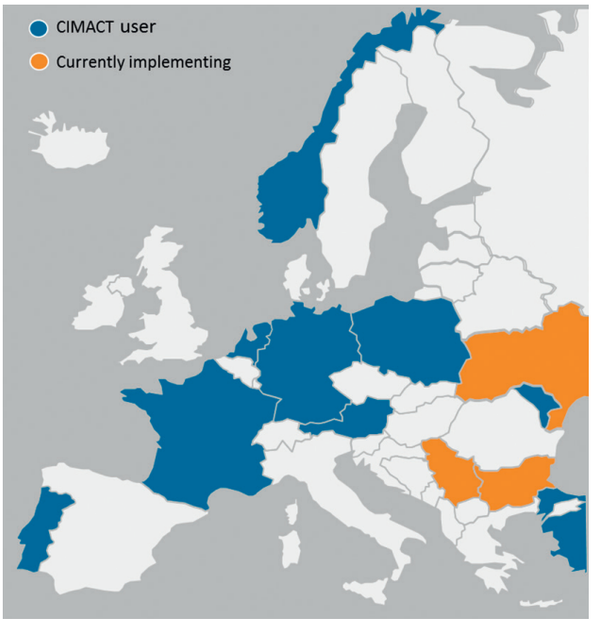
CIMACT is being developed and maintained by EUROCONTROL to improve situational awareness of civil and military control units and facilitating the exchange between civil and military systems, thereby increasing safety and efficiency of air navigation.



CIMACT HMI displaying a filtered set of air traffic information over North-West Germany

The system has been developed with a focus on flexibility and versatility, making it easily adaptable to a wide variety of operational environments, accepting new or changed data sources and by defining and implementing new data exchanges.
Given its flexibility and cost effectiveness, CIMACT is constantly evolving, already being used in several European countries to serve various operational scenarios:

- Civil-Military ATM Coordination and Airspace Management
- Aerodrome and Approach Control
- Recording, Analysis and Evaluation
- Fallback
- ATM security



CIMACT Users in Europe today

HERITAGE

In order to improve Civil-Military Coordination, the German Air Force in cooperation with EUROCONTROL developed a system called ADMAR (Abgesetzte Darstellung Maastricht Radardaten – "Remote Display of Maastricht Radar Data"). This system was installed in Air Defence Centres in Germany and was used to improve coordination between civil and military units during activation of military areas and to allow civil flights to safely transit these after coordination. In order to modernise this system and to offer its benefits to all EUROCONTROL Member States, EUROCONTROL developed CIMACT as the successor of ADMAR. The primary goal remained to enhance coordination for safer and more efficient operations of both military and civil air traffic. Due to its flexible nature CIMACT has been requested and installed for additional uses, most prominently for Radar Approach Control Service at Military Aerodromes and ATM Security.

CIVIL MILITARY ATM COORDINATION

The Flexible Use of Airspace Concept states that any airspace segregation, for example reserving airspace for military activities shall be limited to the actual usage in time and dimension In order to effectively and safely facilitate this, close co-operation between civil and military controlling units is paramount. CIMACT is providing a correlated (civil) ATM picture at military controller positions to improve situational awareness. The system displays flight and track details including intentions to allow for efficient controller to controller co-ordination.

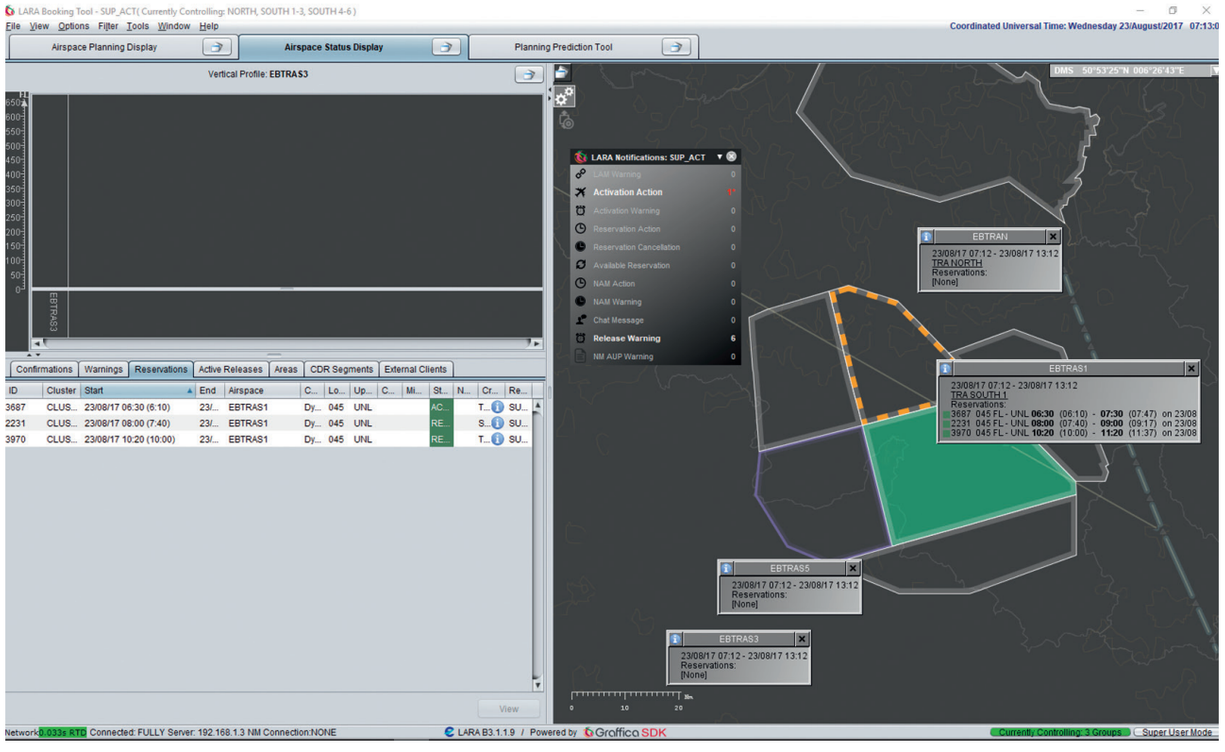
CIMACTs use in the field of Civil Military Coordination splits into the followings:

- Flexible Use of Airspace
- Cross Border Areas
- Surveillance and Identification
- Radar Assisted Flight Information

Flexible Use of Airspace

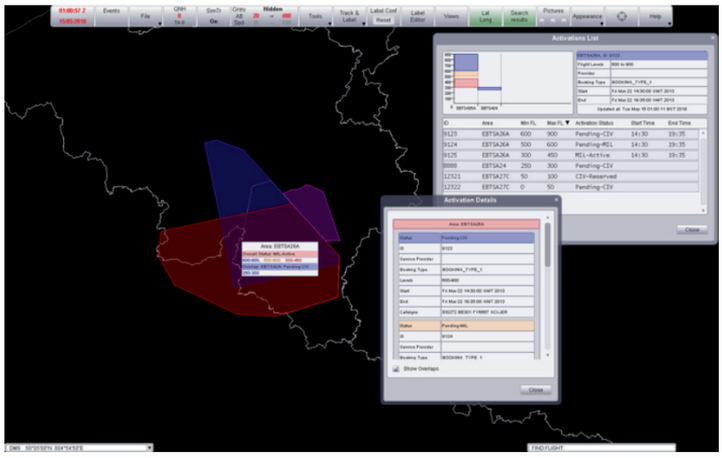
Temporary Restricted Areas (TRA) and Temporary Segregated Areas (TSA) are established to allow training of military aircraft. Pilots are supported during these exercises by ground based Intercept Controllers providing them with information, instructions and assistance. When these areas are activated, close coordination between civil and military controllers is required to guide civil traffic outside this area and thereafter transit military aircraft safely into this reserved airspace to start their exercise.

CIMACT interfaces with EUROCONTROL's LARA (Local and sub-Regional Airspace Management Support System) to safely and efficiently handle airspace activations and deactivations. If an area is being deactivated on LARA, this is displayed on CIMACT with additional information on the short term planning, so the controller is aware of upcoming events in his airspace. LARA and CIMACT are capable to synchronize the airspace data used in order to ensure correctness and completeness of the displayed data.



EUROCONTROL LARA Airspace Status Display

After an area is activated for military use, General Air Traffic (GAT) may penetrate the TRAs if requested by the appropriate ATC controller and approved by the military controller. In order to coordinate these crossings the (military) Intercept Controllers are equipped with a CIMACT Working Position displaying the civil correlated air picture next to their tactical control system.

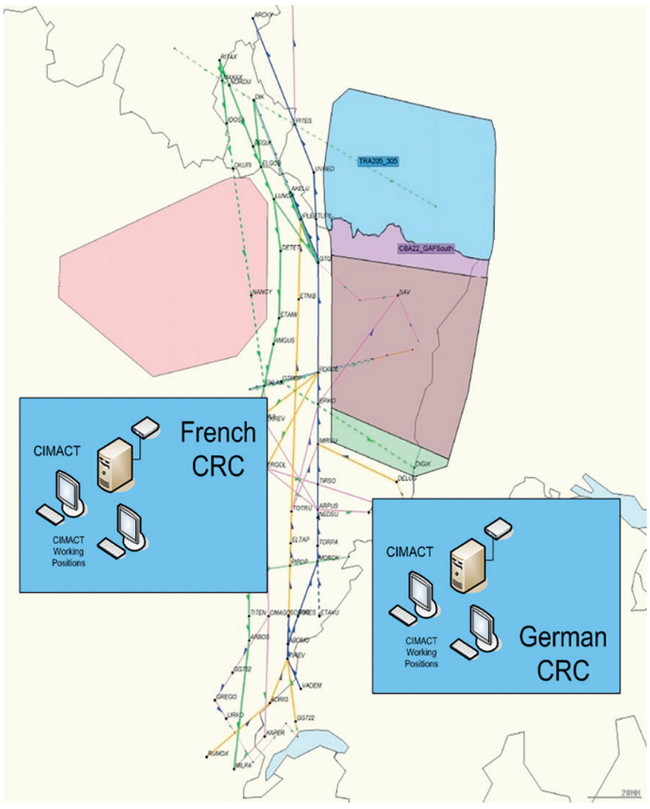


LARA information displayed on CIMACT

CIMACT allows them to quickly identify the civil flight and approve the transit if possible. This reduces telephone coordination between military and civil controllers, thus reducing workload on both sides. Secondly the situational awareness of the military controller is greatly improved and contributes to a safer and more efficient handling of flights. The increased possibility of penetrating an active TRA improves capacity, efficiency and fuel consumption, thus contributing to the performance of the ATM system.

Cross Border Operations

The need for efficient military-military and civil-military coordination becomes very apparent during cross border operations and for the establishment of Cross Border Areas (CBA). Different military controlling systems and diverging levels of civil-military integration challenge the exchange of data for civil-military coordination.



CIMACT is very flexible in adapting to various data formats and very efficient in data processing, conversion and relay, allowing otherwise incompatible systems to interface.

CIMACT's subsystem GAFPLAN is used to collect flight plans in different formats from various air traffic control centres to translate, merge and relay these to external systems as a single stream of data. This is used to produce a correlated air picture for Germany, Benelux and parts of France on CIMACT. This pre-processed data are used by Military Air Defence Systems as well. Cross-Border Civil-Military Coordination via CIMACT is operationally used for several years already between the Maastricht Upper Area Control Centre (MUAC) and the French Air Force. The CIMACT system is installed to enhance civil-military coordination between MUAC and three Air Defence Centres of the French Air Force to coordinate activities in the CBA1 located in France on the border of Maastricht's Area of Responsibility.

The CIMACT systems in France are provided with data from the Maastricht Data Processing System (MADAP) to display the position, identification and intentions (flight plan) of General Air Traffic (GAT) controlled by MUAC. Short Term Conflict Alerts (STCA) involving civil and military traffic are relayed and displayed to serve as an additional safety net.

Surveillance and Identification

Every state is responsible for the integrity of its own airspace and is taking measures to protect and monitor all aerial movements within their boundaries. Typically, Air Defence Units are responsible and operate a Surveillance and Identification Section to perform this task.

Multiple controllers are monitoring the airspace and identify every aircraft crossing the border into the respective country. This is done by assessing the available flight plan information and coordination with civil ATC Units responsible for the particular airspace.

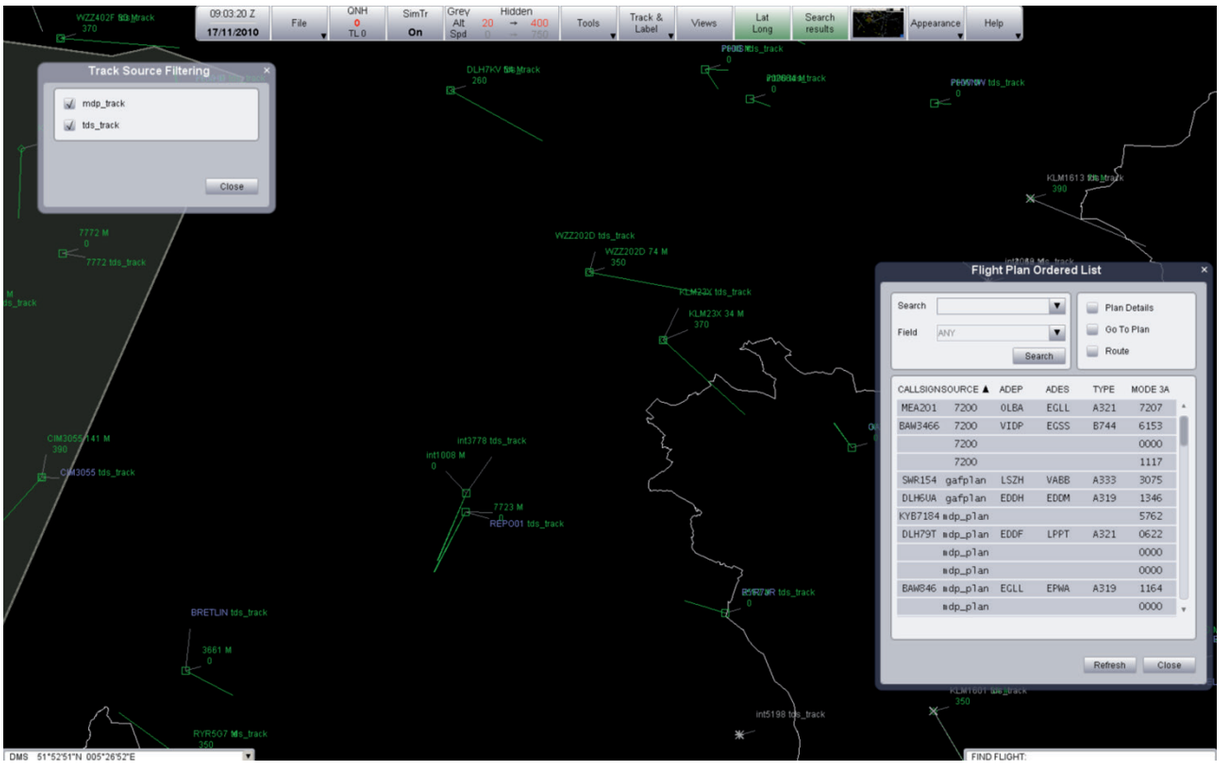
CIMACT provides these units with a consistent air picture with detailed information for all correlated flights. Before the use of CIMACT, information on these flight details would have had to be requested manually from the ATC Unit handling these flights resulting in a dramatic increase of workload of both parties. As the CIMACT data is based on common standards, the data can be fed directly into Air Defence Systems for correlation and display.

Radar Assisted Flight Information Service

While Air Combat Exercises generally take place at higher altitudes in the vicinity of en-route traffic, other military exercises are executed at low altitudes. Here the potential conflicts arise from low flying civil and military VFR traffic and arriving and departing traffic in the vicinity of aerodromes. In order to improve safety and situational awareness CIMACT is used to provide flights with Radar Assisted Flight Information Service (RAFIS).

These exercise areas are often declared RAFIS Mandatory Areas and VFR traffic is required to contact the RAFIS Controller prior entry. This contact is kept up until leaving the respective area. These flights will be identified and monitored on CIMACT, and provided with information on other flights.

In case potential conflicting traffic is observed these flights will be informed about distance, bearing, altitude and moving direction of the potential conflict. In case the pilot is not able to establish visual contact a recommendation for avoiding action is given in accordance with ICAO Regulations.



The CIMACT Human Machine Interface (HMI) displaying Track and Flightplan Data from the Maastricht Upper Area Control Centre. This is used in Air Defence Centres in Germany and in France to coordinate effectively with Civil Area Control Centres

Air Traffic Control

CIMACT is used for the provision of Radar Approach Control Service and Flight Information Service at several Military Aerodromes in Germany and Portugal. A working position is installed additionally on the Tower (Aerodrome Control) for enhanced situational awareness and coordination.

The Radar Approach Control Unit is responsible for enabling a safe, expeditious and continuous flow of air traffic within their area of responsibility. To facilitate their task they issue clearances to aircraft under their control based on the air situation picture that is provided by CIMACT.

Radar Approach Control at a German Air Force Base using CIMACT

Within the scope of Radar Approach Control close coordination with the respective ACC, adjacent aerodromes and the local Aerodrome Control Tower is of utmost importance. Manual co-ordination and transfer of aircraft impose a high workload on the controller team. To support this task CIMACT is providing the coordinating controller with a separate CIMACT Working Position allowing him to access detailed flightplan and track information as well as following the proceedings within the area of interest. If an additional working position is available on the Tower this coordination is further enhanced and simplified. CIMACT offers the functionality to "Assume" traffic and allow for automated transfer of traffic within the CIMACT network.

Area Proximity Warning (APW) and Minimum Safe Altitude Warning (MSAW) are available to further improve safety levels.

CIMACT as Fallback Display System

Air defence units use their own tactical air situation display for controlling operational traffic. In case of outages of this main system, CIMACT is used as a fallback display in order to maintain flight safety and fulfil high priority tasks.

CIMACT is considered by various Air Navigation Service Providers as an ultimate fall back – as it can run completely independently from the main systems.

CIMACT itself offers two types of fallback facilities:

In case the data reception is stopped due to network problems or the central server stops working/shuts down, CIMACT will inform the controller by displaying a "data transmission disrupted" warning on the display and continues to display the last given air situation on the HMI. A transfer of control to other units is thereby simplified as the last known information is still visible on the screen.

Sites with a safety and mission critical task are normally equipped with two independent CIMACT Servers configured in a "Hot Standby" mode, which will automatically switch to the back-up server in case of failures.

ATM Security

CIMACT has been chosen as the Information Exchange System (IES) of the NATO-Russian Council Corporative Airspace Initiative (CAI) and was developed to function as operational ATM Security System.

The CAI started in 2003 and lead to three NATO nations exchanging ATM data with the Russian Federation using CIMACT as display and data exchange system for NATO. Two coordination centres, one in Warsaw and one in Moscow facilitated efficient coordination during ATM Security incidents. In the meantime this data exchange is on hold due to political reasons.

However, the concept is still very valid: the exchange of information between CIMACT system and other systems is foreseen to form an airspace security network, which allows early warning of suspicious air activities through commonly agreed procedures. In situations where an aircraft behaves erratically, this system offers increased information sharing and communication to ensure rapid, joint response to terrorist threats. The Regional Airspace Security Programme is currently implementing CIMACT in the Ukraine to become part of such network. Other European nations and the US (Federal Aviation Administration – FAA) actively support the project and consider connecting in the future.

The capabilities of CIMACT within the ATM Security domain are widely recognized and serve as baseline for an Airspace Security Incident Management System (ASSIM) in Europe.

CIMACT is being used by NATO and the German Air Force during high – profile events like important sport events, state visits and alike for increased situational awareness and coordination.

The Regional Airspace Security Programme 2018

System capabilities

The CIMACT Human Machine Interface provides the controller with the means to quickly identify and follow flights of interest. CIMACT displays various types of flights in a range of different colours and symbols to enable the operator to quickly acquire an overview of the complete situation and supporting him or her in accessing detailed information in a minimum of time. The planned flight routes and flight levels as well as the cleared and current flight levels are available for correlated flights[1].

The identification of flights is supported by having a range of data available on tracks, flightplans and the aeronautical environment. All flights and flightplans in the system can be queried to find flights matching the desired criteria.

Flights can be highlighted and marked for adjacent controllers and filtered for de-cluttering the screen.

Individual flights can be tagged with configurable criteria to coordinate with other units and indicate flights of interest (Potential Renegade, Loss Com, Deviating from flight plan etc.)

Controllers can exchange free text (chat functionality), link tracks, flight plans, and geographic locations in their messages and unlock increased situational awareness and coordination potential among its users.

CIMACT can import and display aeronautical information in AIXM from EAD (European Aeronautical Database) and EDQ (EUROCONTROL Enhanced Data Quality Tool). To complement this data, CIMACT contains a full-featured Map-Drawing Tool for creating and maintaining aeronautical maps. It is possible to display a graphical map based on image tiles as a background of the Air Situation Display. Currently Open Street Map is used for this purpose, but other map sources can be implemented as well.

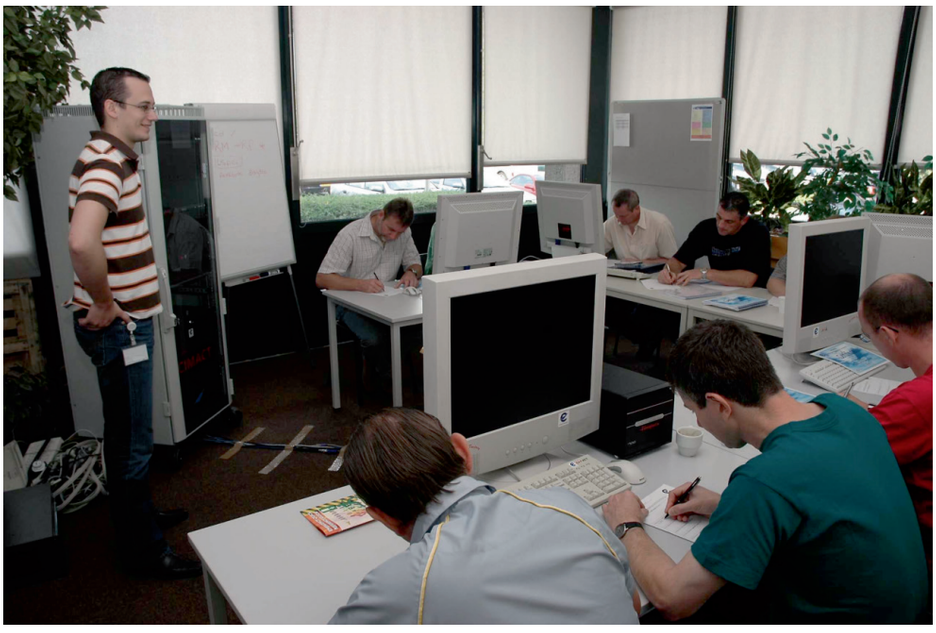
The CIMACT Pilot Working Position allows injecting and operating simulated traffic on the connected CIMACT positions for exercises and training. This can range from individual flights to complete scenarios, where any type of behaviour can be simulated (turn of transponder, change heading, altitude etc.) supporting complex and simulation and training requirements. For a full and detailed description of the available functionality, please refer to the Systems Users Manual, available on request.

Training and Proficiency

After installation of CIMACT at a user site, EUROCONTROL provides a hands-on instructions for operators and technical staff prior entering operations. User Manuals are provided in hard- and softcopy for reference.

CIMACT System administrators can attend a three day course at Maastricht Upper Area Control Centre. This enables them to handle routine operations, start first investigations in case of problems and support the CIMACT Team for other maintenance activities.

1 Please note that the data items for display on CIMACT is closely linked to the data made available locally.

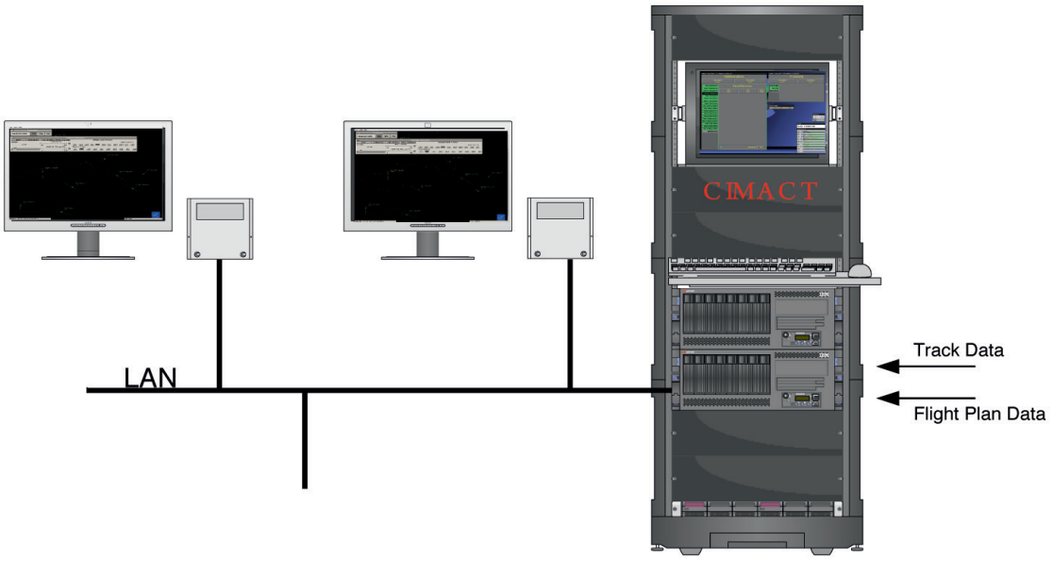


CIMACT Administrator Training at Maastricht Upper Area Control Centre

Each CIMACT Site has a team of trained CIMACT System Administrators responsible for the operation of the CIMACT System. They are in the position to remedy first problems and coordinate additional support from the CIMACT Team at Maastricht if required.

Technical Aspects

A typical CIMACT System consists of a Central CIMACT Server and a number of connected CIMACT Working Positions. Track information is correlated to flight plan Information and a seamless air situation pictures is being produced. This is sent to connected CIMACT Working Positions running the CIMACT HMI allowing the user to select from a variety of tools and filters. Data can be processed and enriched and exchanged with other (CIMACT) systems. All hardware is "commercial off the shelf". The detailed hardware requirements are available on request.



Data Provision

The CIMACT System can be fed by a variety of data sources. In most cases, the system is being provided with surveillance and flight plan data by the appropriate Area Control Centres (ACC) and/or local sensors.

CIMACT is able to connect over various fixed and mobile network infrastructures and various network protocols. Redundant network interfaces are available on the CIMACT Server and can be handled by the CIMACT Application.

The received data is used to generate the CIMACT Air Situation Picture enabling the operator to access detailed information about surveillance and flight plan data, filter, search and highlight traffic and environmental data as required. Data can be exchanged with other systems.

Depending on the local setup and requirements, the redundancy of datalines and data providing systems are supported, same accounts for the CIMACT network connecting the server and the working positions (hot standby, dual networks etc). The CIMACT Server records all incoming and processed data for later replay on a designated data storage facility. Depending on the amount of data and the size of the recording medium CIMACT can record data for a period of multiple months to more than a year.

Surveillance Data

The System can be fed with various types of surveillance data – most commonly tracks and/or plots from one or more local and regional surveillance sensors. These can be connected directly to the CIMACT Server or via a tracker installed as part of the CIMACT System (ARTAS). This tracker is then provided with various sensors forming the track picture.

Normally the ACC will forward surveillance data in real time over a suitable network to the CIMACT Server. This data is directly taken from the ACCs processing system and is identical with the data used within the ATM System.

In order to fulfil requirements for low level coverage around the airfield, a local sensor based at or near the aerodrome can be included in forming the air situation picture.

Among the extensive amount of radar and flight plan data formats CIMACT supports, are the following:

ASTERIX Categories
000; 001; 002; 003; 004; 008; 009; 030; 034; 048; 062 (v0.19; v1.13; v1.16); 065; 142; 143; 148; 149; 150; 152; 252.

ADEXP (version 3.1) messages
BFD; CFD; TFD.

ICAO (version 2012) messages
CPL; FPL; CNL; ARR; CHG.

CIMACT will accept most common surveillance data formats with the possibility to interface to any other kind of surveillance data given the appropriate Interface Control Documents (ICD) and sample data to develop a suitable interface.

CIMACT is capable to display two or more track pictures from independent sources on its air situation picture.

Flightplan data

The CIMACT Server is capable to receive flight plans in various formats and various sources, convert these into standardized formats and merge all into one consistent flight plan repository.

Flight progress data will be made available by the appropriate ACCs and fed into CIMACT. The quantity and quality of data is dependant on the ACCs data output. CIMACT is capable to process the initial flight plan, flight plan activation and deactivation and flight plan updates.

The CIMACT Server processes surveillance and flight plan information and correlates both into one consistent air situation picture.

Latest developments

CIMACT – Version 5 is available since February 2018.

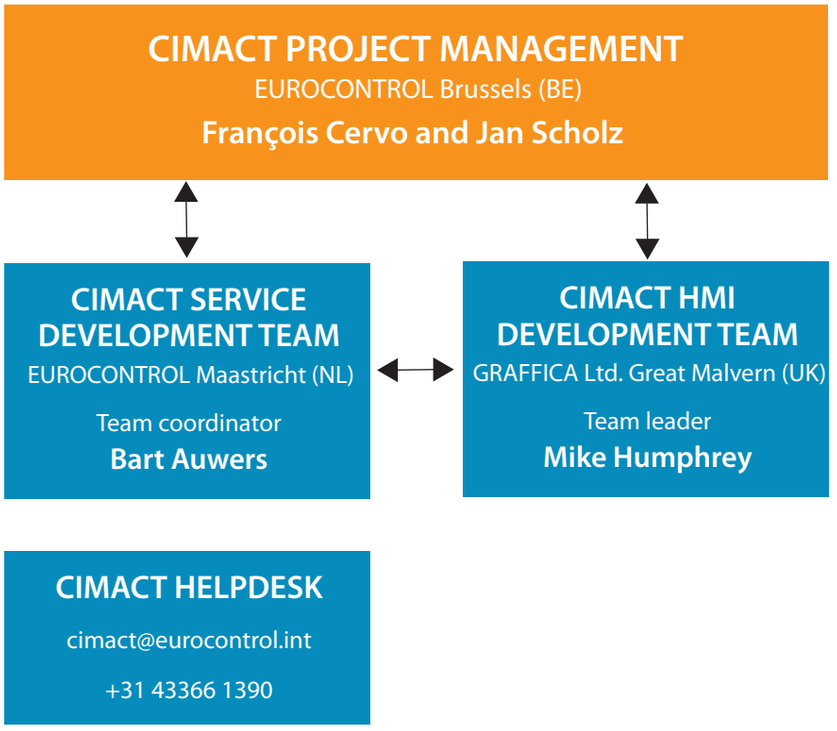
The most important features of this release are:

- Running 64bit natively
- New Operating System (Debian) for additional flexibility and regular updates and support
- Event Manager (Chat)
- Improved Interface to LARA
- Map interface to display AIXM Data from EUROCONTROL's External Data Quality tool (EDQ)

Programme Management

The CIMACT Service is managed by EUROCONTROL's Civil-Military ATM Coordination Division. The development and maintenance of CIMACT is coordinated by the CIMACT Team based at EUROCONTROL Maastricht Upper Area Control Centre (MUAC). EUROCONTROL delivers the software, required interface adaptations, installation/configuration on site, training and helpdesk support. The User Pay Principle applies, i.e. missions and effort will be charged on a cost-recovery basis. The software itself is provided to ECAC states without additional charge. Presentation and demonstration at a user's site is available for EUROCONTROL Member States at no additional cost.

Hardware (standard COTS) and required networks are to be obtained and maintained by the nation/user themselves, while EUROCONTROL provides assistance and information for both.



CIMACT User Group

The CIMACT User Group is a yearly meeting for representatives of each CIMACT stakeholder. The meeting's main focus is to inform users about the progress and latest developments of CIMACT. The User Group meetings are held either in Maastricht, Brussels or at a user's site.

If a stakeholder requires new functionalities in CIMACT, these will be discussed at the User Group. If multiple nations show interest in the software change, these will be targeted for an upcoming release, subject to the availability of resources. If the functionality does not meet general interest of other users, or exceeds the available budget, the interested users can opt to fund the development themselves through a special agreement with EUROCONTROL. All changes will form part of a new CIMACT Release. This self-funding option has been utilized by different nations repeatedly in the past and has significantly contributed to the current capabilities of CIMACT.

If you would like additional information, or to request a presentation and demonstration in your premises, please contact:

François CERVO
CIMACT Project Manager
francois.cervo@eurocontrol.int

Jan SCHOLZ
CIMACT Stakeholder Support
jan.scholz@eurocontrol.int