PROJECT REPORT

Modular Air Traffic Management System

PRISMA

BEST

Integrated ATC Training Solution for STPI Indonesia

COMSOFT

INTRODUCTION

The Indonesian Civil Aviation Institute Curug is one of the country's leading aviation schools which specialises in commercial and private pilot, air traffic controller and maintenance staff programmes. The centre was founded in 1952 and is a subordinate body of the Ministry of Transportation of the Republic of Indonesia (DGCA). The aviation school offers training programmes that comply with ICAO regulations and national education standards leading to an internationally recognised qualification.

To train air traffic controllers (ATCO) and technical maintenance staff the academy has contracted new equipment that allows trainees to practise in real ATC environments in Tangerang, close to Jakarta. Field-proven off-the-shelf products – generally used by air navigation service providers as operational systems in combination with innovative simulating equipment – are now in use at courses for executive and assistant ATCOs and trainee engineers.

The German ATC equipment supplier COMSOFT together with its partner, the British ATC simulator provider Micro Nav, was awarded a contract to supply various specialist equipment. COMSOFT delivered two independent ATS systems in the form of the modular ATC automation solution PRISMA. These systems interface with the simulator component delivered by Micro Nav responsible for the generation of positional and flight plan data.

Both companies are renowned players in the ATC market for military and civil customers, with successful track records dating back to the eighties. While Micro Nav specialised in simulation and training systems for ATC operations, airport design and fighter control, COMSOFT put its focus on operational equipment such as surveillance networks, ATM solutions, aeronautical message handling and information management systems.

After successful factory training in Karlsruhe, Germany, and on-site training in Tangerang, Indonesia, the overall system was site-accepted in January 2010, enabling the first courses to begin.

Sekolah Tinggi Penerbangan Indonesia (STPI)

Trainees at the centre

PRISMA AIR TRAFFIC MANAGEMENT SYSTEM

PRISMA is a modular system architecture for air traffic management featuring an advanced and powerful solution for ATC automation. Its components are used in various operational environments including tower, en-route control and approach services. Thanks to its flexibility, the system easily adapts to any operational environment. All components are off-the-shelf products that are widely adaptable through configuration parameters.

PRISMA's modular architecture divides the integrated system functionality into a number of subsystems. Each subsystem has its own individual ATC and ATM function and can be easily combined to a fully integrated automated Air Traffic Management system. Each function can be accessed through a common user interface.

- The Surveillance Data Processing (SDPS) receives information from different sources, such as PSR, SSR and Mode S radars, ADS-B and multilateration systems, and produces an air situation picture over a well-defined geographical area. The processed surveillance information is then distributed to a community of user systems. The SDPS is a multi-sensor tracking system (MSTS) applying latest tracking technologies that support Extended Kalman Filtering, PDA, IMM, MHT.
- The Flight Data Processing System (FDPS) incorporates the core functionality of the PRISMA System, receiving, processing and updating flight plans in the area of responsibility. This information is correlated with surveillance information in order to present the aircraft's current position.
- The Controller Working Position (CWP) visualises surveillance data as moving targets on the screen. The presentation is based on the real-time output of the SDPS and depicts the air situation, enriched with flight plan and auxiliary information. The CWP is the controller's tool to interact with the flight data of the individual targets crucial for the coordination with adjacent ATS units.
- The Assistant Working Position (AWP) manages flight plans received through the virtual AFTN of future AMHS network. All messages requiring user attention will be deferred to this position for further manual processing. Unlike the CWP, the AWP generally manages flights before they are coordinated.
- Integrated PRISMA Safety Net (C-S/N) functions use surveillance and flight plan information to identify potentially hazardous situations and attract the controller's attention. Safety Net Functions include Short Term Conflict Alert (STCA) and Minimum Safe Altitude Warning (MSAW).
- The integrated Recording and Replay Module provides synchronous recording of data, audio and screen content for most accurate reconstruction and assessment of any kind of air situation. Data can be exported and imported for long term archiving.

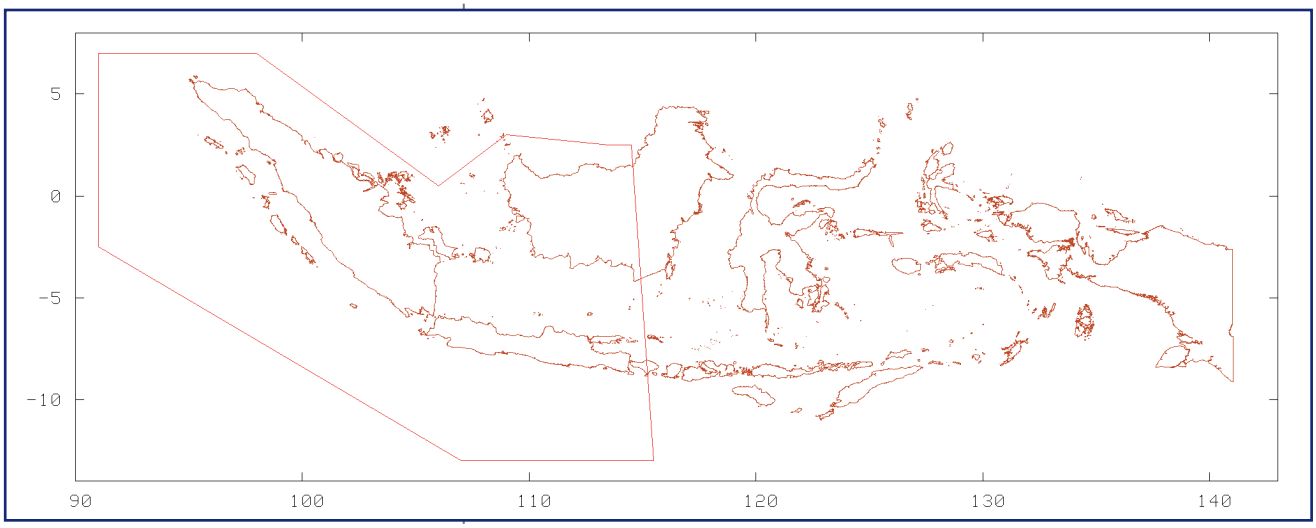
Modular Air Traffic Management System

PRISMA

MSAW Profile

The system's modular structure allows for an evolutionary upgrade to address emerging requirements and new standards. Moreover it is designed for ease of operation following a "user-friendly" approach, while still being flexible and capable of supporting at least 15-years enhancement expansion.

As PRISMA is set up identical to an operational environment, the systems can also accept live data for data processing, provided respective interfacing is made available.



System Domain of Interest

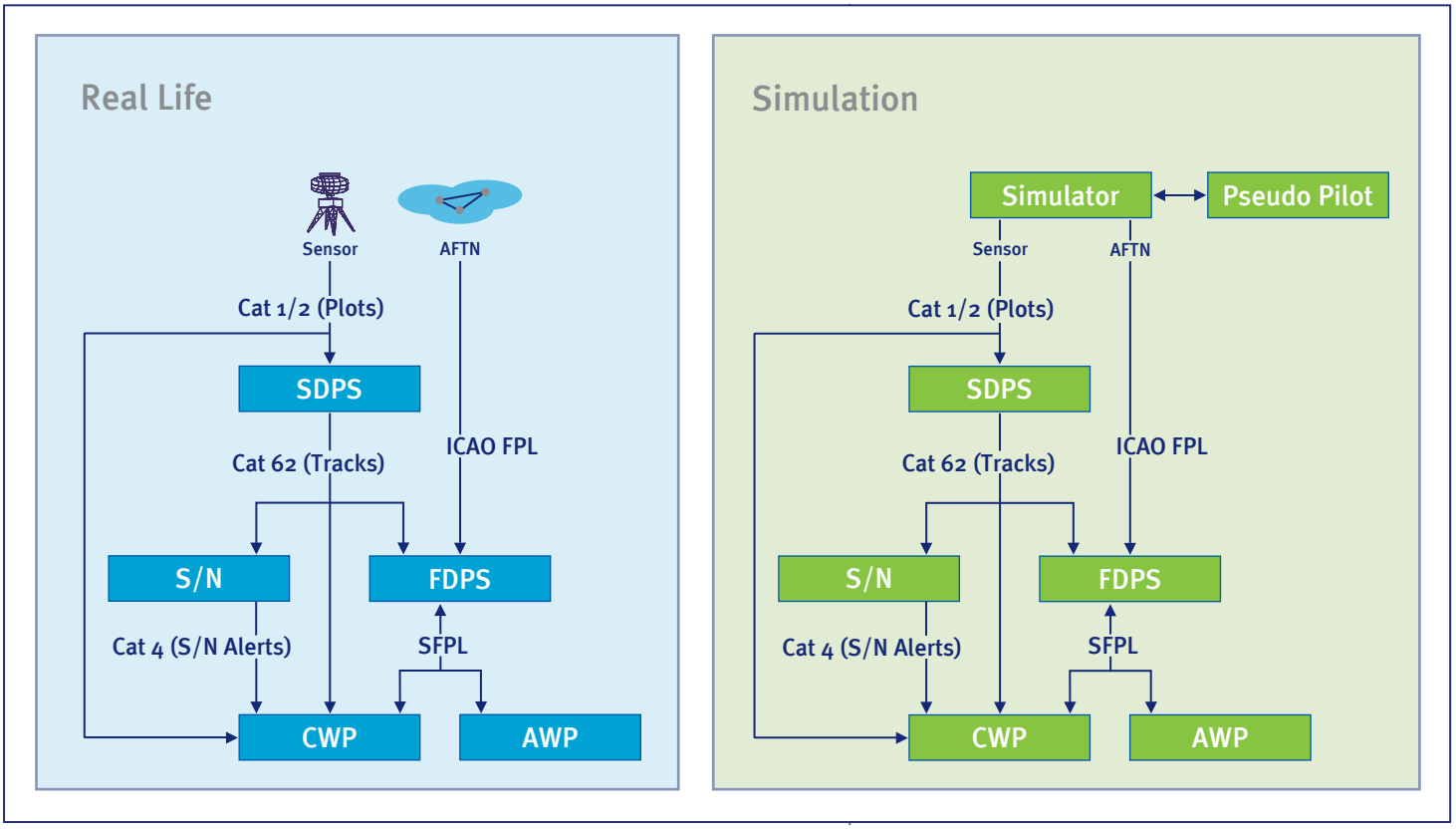
CWP

MICRO NAV SIMULATOR EQUIPMENT

Micro Nav's advanced BEST simulators cover tower, radar and fighter controller operations training. Their Fast Airport Builder tool allows users to create their own 3D visual models of airports quickly and easily. The models run directly with the Micro Nav advanced tower simulators.

Micro Nav specialises in providing simulation engines, or stimulators, to drive operational equipment. Thus their systems are used for design and evaluation tasks and generally have a wide range of interfaces. The simulated data streams match exactly the formats and physical links of the real world radar, flight plan and other data sources. The combined systems give the ultimate fidelity for on-console training and for the testing of new equipment. Capacity limits, emergency capabilities and safety nets can be tested accurately and reliably.

To comply with the requirements of the Indonesian customer, Micro Nav has been asked to provide a BEST simulator stimulating the interfaces of the two COMSOFT subsystems with radar and ADS-B surveillance data as well as AFTN data.



PRISMA Data Flow

THE TRAINING CENTRE

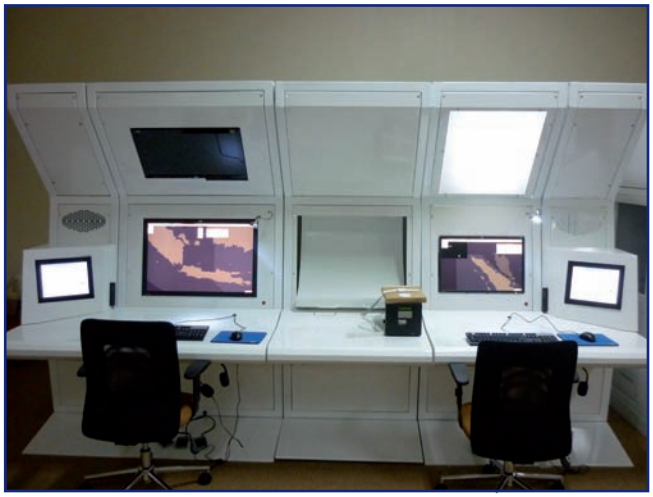
The centre upgrade included the delivery of two independent subsystems adjusted to the requirements of each target application. In detail, the Operational ATS Training System (OATS) was tailored for controller training while the Engineering ATS Training System (EATS) is used for engineering training.

COMSOFT components of both variants are identical to a real world ATC environment in operational use. Radar, ADS-B and AFTN information is generated by the BEST simulator.

The interface messages from the BEST simulator to the COMSOFT operational system are provided via an Ethernet LAN connection.

EATS

OATS



Operator Working Position

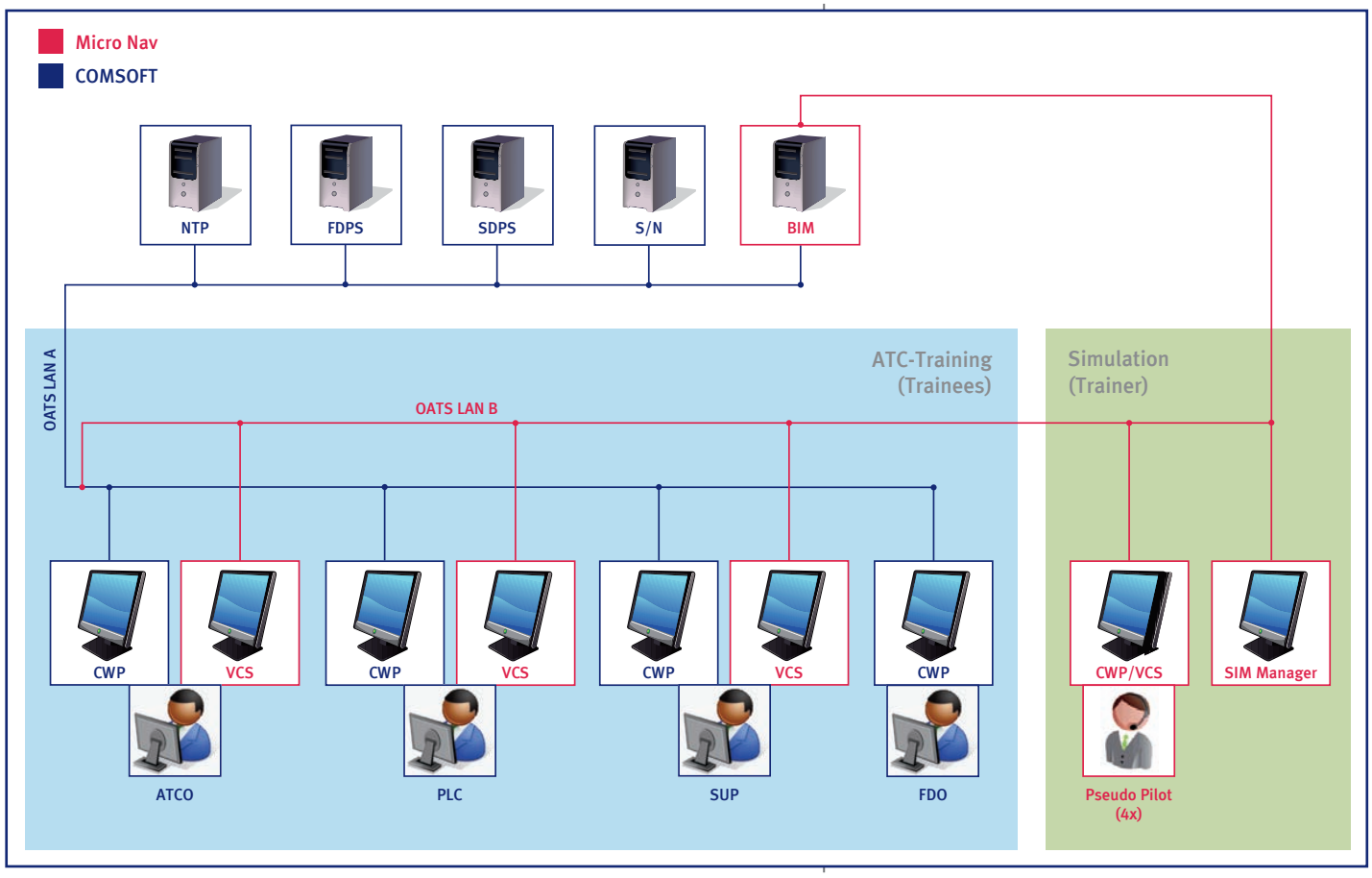
Live Training

OPERATIONAL ATS TRAINING SYSTEM (OATS)

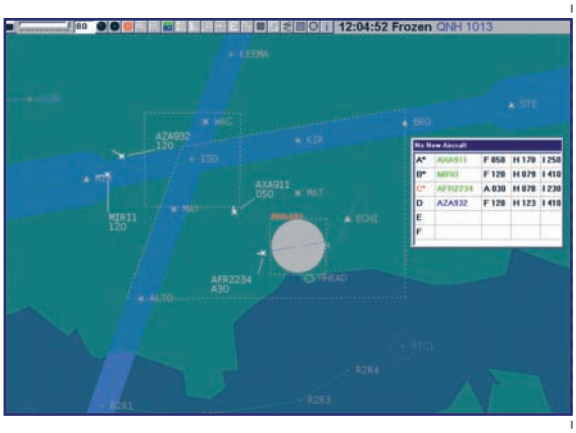
In order to deliver high quality training both the look and feel as well as the functionality were modelled on a real-world environment. In addition to the presentation of the air situation, the OATS also includes four pseudo pilot positions allowing real-life traffic operations to be imitated by ground-based pilots. Each position provides integrated access to the simulated voice communication.

The OATS is capable of supporting the simulation of the entire Indonesian airspace. Within this airspace, the simulation assists the exercises for en-route control, as well as for the following radar approaches:

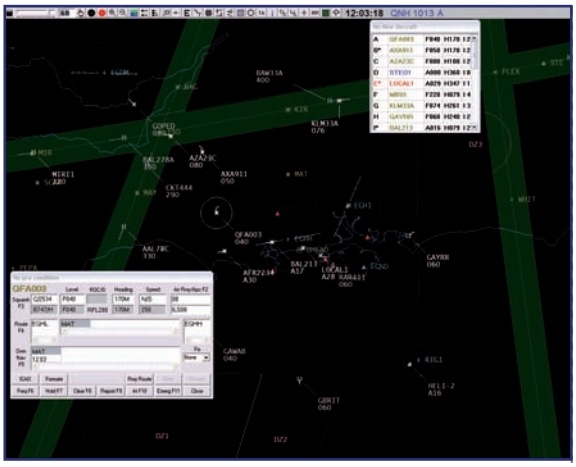
- Bali
- Balikpapan
- Jakarta
- Makassar
- Medan
- Palembang
- Pekanbaru
- Surabaya
- Yogyakarta



Architecture OATS



Pseudo Pilot Screen



Pseudo Pilot Screen

The OATS system is composed of:

- A Multi Sensor Surveillance Data Processing System (SDPS) that supports the simultaneous processing of more than 40 radars as well as ADS-B data sources.
- Flight Data Processing System (FDPS) that supports Jurisdiction, Automatic Time over Point Profiling, processing of wind profiles.
- Advanced predictive Safety Net functions (S/N) for short term conflict alert and minimum safe altitude warning.
- Simulation server (BEST Interface Manager - BIM) for stimulation of the PRISMA ATC automation system.
- Radar simulation creating a real-time, multi sensor scenario comprising PSR, SSR and ADS-B.
- NTP server synchronising all sub-systems.

PRISMA integrates all system functions on central hardware serving multiple working positions simultaneously. Each working position has a designated field of application:

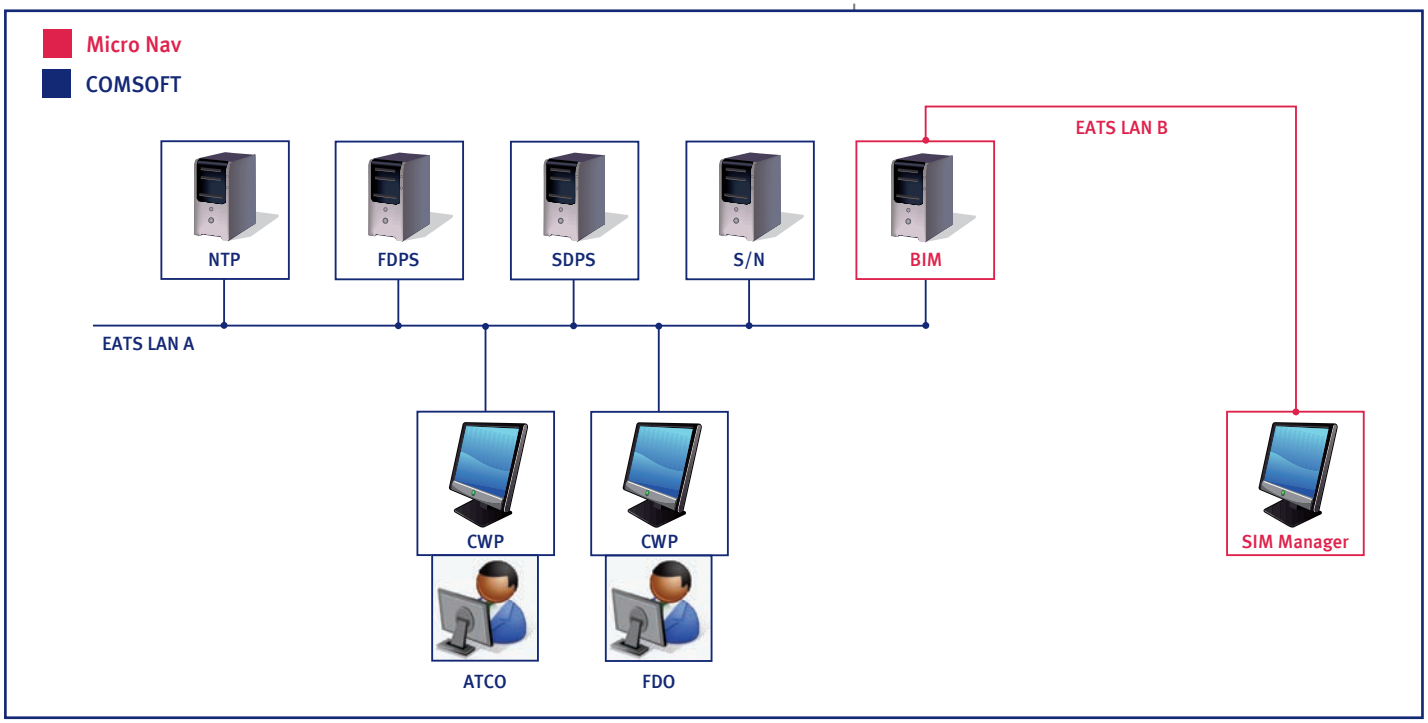
- The Air Traffic Controller (ATCO) has the overall responsibility for an assigned sector.
- The Planning Controller (PLC) assists the ATCO.
- The Supervisor Position (SUP) controls the operational status of the working positions and assigns sectors to the respective executive controller.
- The Flight Data Operator position (FDO) manages AFTN/AMHS messages.

The Micro Nav BEST components complete the package with:

- The Voice Communication (VCS) for instructions and requests between controller and pilot.
- The Pseudo Pilot Positions representing the pilots.

ENGINEERING ATS TRAINING SYSTEM (EATS)

Compared to the OATS, the EATS is equipped with fewer workstations and no pseudo communication units owing to its disparate purpose. Its primary objective is to train and educate the ATC staff involved in the operation and maintenance of ATS automation systems. This approach does not require communication facilities.



Architecture EATS

CONCLUSION

The demands on ATC environments and users are constantly increasing. Therefore it is vital to ensure the system‘s extensibility in order to cope with these emerging demands, e. g. through the development of new standards and technologies.

Apart from future innovations there are also plenty of options to enhance the functionality and thus quality of training by adding additional system components. As a matter of fact the Indonesian training academy already has enlarged their agenda and is considering the integration of an aeronautical message handling system to feed real AFTN/AMHS traffic into the training environment. An AIM solution for the generation of dynamic data is also envisaged.

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