



PROJECT REPORT



PRISMA at GCAA's Sheikh Zayed Centre in Abu Dhabi

COMSOFT



INTRODUCTION

The aviation industry in the United Arab Emirates has experienced an exceptional growth in recent years and has become one of the driving business factors in the region. In concert with the commercial growth a continuous growth of air traffic occurred in the UAE, and the number of movements has doubled within seven years.

With such a remarkable increase in air movements, the local air navigation service provider was faced with a new situation, which was particularly challenging as the air space under control contains two major international airports and a significant fraction of restricted areas.

In order to take measures concerning the experienced upsurge in air traffic, the General Civil Aviation Authority (GCAA) of the UAE decided on a series of initiatives back in 2006. The predominant aim was to maintain the air traffic safety and improve the efficiency of air space use. One of the most significant pillars of this process was the construction of a new area control centre for the provision of air navigation services that meet international leading standards. Apart from complying with the requirements imposed on today's ATM environments, the top priority for this project was to build up capacity to meet the requirements on air navigation services of the coming years.

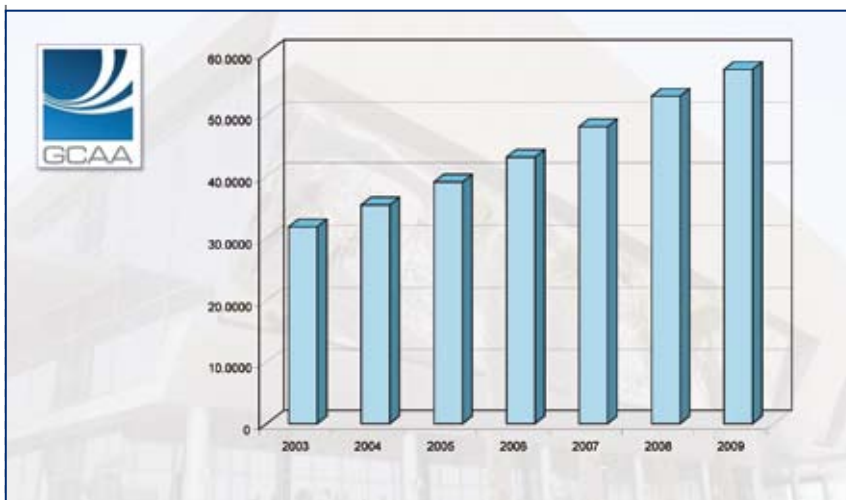


Diagram showing the increase in IFR operations in GCAA controlled air space



COMSOFT'S PRISMA

As a consequence of the imminent need to cope with the soaring air traffic figures, the former data processor of the UAE which was at the time hosted in Bateen ACC, needed to be replaced with an automation solution providing significantly improved automation capabilities and increased capacity and performance. In June 2008, the new PRISMA ATC Automation System in Bateen ACC was taken into operational service supporting the Air Traffic Control Operator's (ATCO) work with the following features:

- Advanced Flight Plan Data Processing System (FDPS)
managing the operational status of all assigned flights
- Surveillance Data Processing System (SDPS)
handling and processing of surveillance data of any kind
- Controller Working Position (CWP)
presenting a structured air situation to its user with numerous auxiliary details for optimized coordination conditions
- Assistant Working Position (AWP)
arranging and processing flight plan information and its corresponding status
- Safety Nets (S/N)
identifying safety critical situations for substantial air traffic services support

In summary, the GCAA was very satisfied with the results regarding both the expeditious completion of the project by COMSOFT's Centre Solution Team as well as the manifold features of the delivered system. With the introduction of PRISMA the workload of the ATCOs was considerably reduced while the integration of new technologies was suddenly feasible: Firstly, ADS-B could be implemented for evaluation purposes and secondly, RNP1 routes could be controlled allowing a higher density of airways. And finally, OLDI was applied - for the first time in the Middle East - for the coordination of flights between neighbouring ATS units, thus evolving the GCAA into a pioneer of this technology in the region.

In summer 2008, the constructions on the new Sheikh Zayed Centre were already well underway. Moving the operational ATC Automation System from Bateen represented a complex task and any of the circumstances threatening daily air navigation service operations could possibly jeopardize a punctual completion. Therefore GCAA entrusted COMSOFT with the planning, delivery, installation and commissioning of the new ATC equipment. Part of the plan was to temporarily combine the processing at two sites to support the migration of services.





SHEIKH ZAYED CENTRE

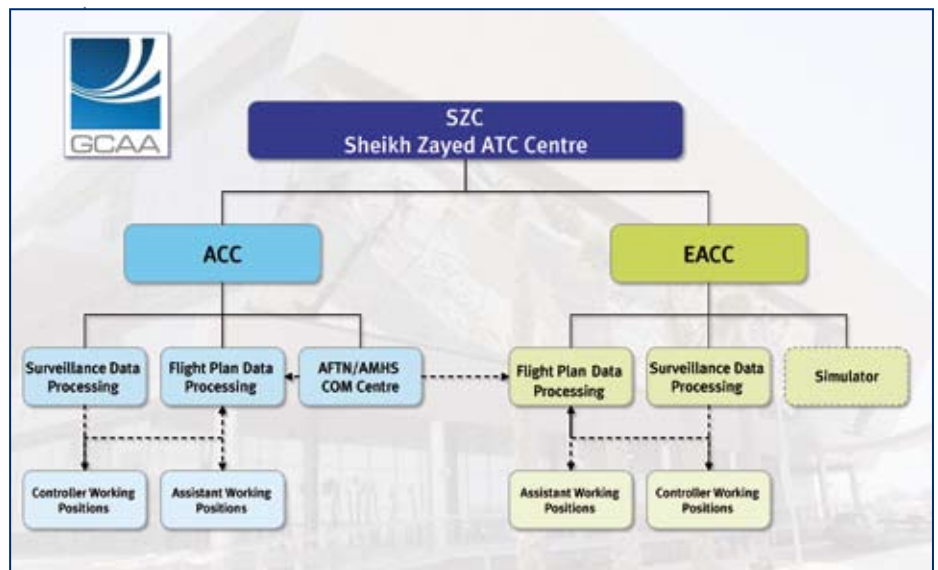
The new Sheikh Zayed Centre is composed of two main buildings: the Air Traffic Control Centre (ACC) building and the Emergency Air Traffic Control Centre (EACC) building.

Each of the main buildings accommodates a largely independent ATC system, including voice communication, flight plan and surveillance data processing. The respective equipment is installed in dedicated equipment rooms for servers and additional infrastructure installations. The ATC control rooms host sufficient Sector Suites for possibly forthcoming air traffic expansions and the COM centre.

As a prerequisite to operating both ATC systems independently, the ACC and the EACC building each accommodate autonomous communication and data processing units as well as separated ATC rooms.

During normal operation, the EACC serves as training facility. For that purpose, it is equipped with a simulator incl. pseudo pilot position. A changeover from training to operational mode is performed within a few minutes. To enhance the system's overall availability, but also for contingency and validation reasons, the two systems are interconnected.

Top Level View on ATC/ATM Automation Infrastructure



The GCAA has decided to implement additional contingency measures that allow the administration to provide air traffic control services even if external connectivity is not given. In such a case the Sheikh Zayed Centre uses local VHF/UHF antenna installations and a nearby installed ADS-B ground station for navigation services. The antenna systems were mounted on four towers at a height of 60 meters and placed on the compound; two towers provide services to the ACC communication while the remaining two serve the EACC.

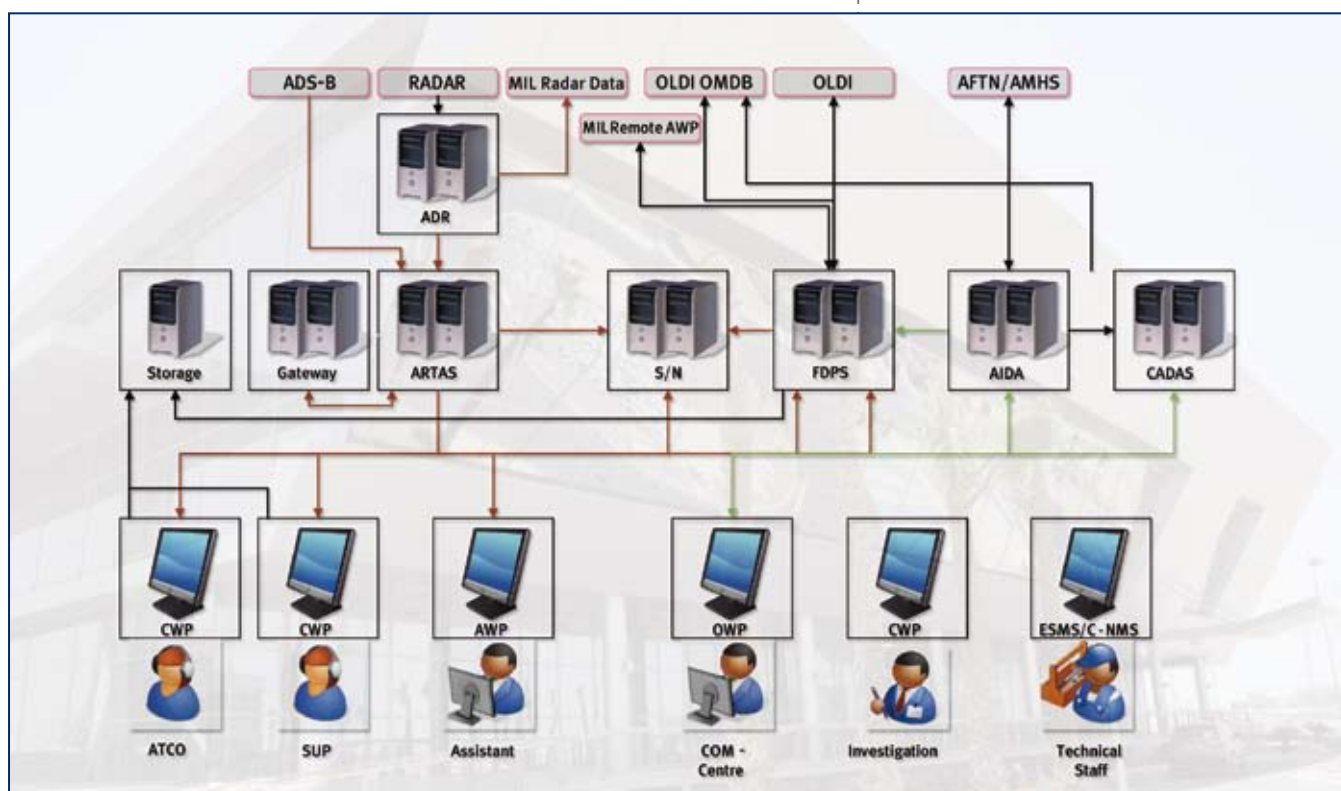
ARCHITECTURE

The PRISMA ATC automation system pairs processes surveillance data with up-to-date flight plans and presents the result as one piece of integrated information to the ATCO.

Besides various back-end servers the PRISMA ATC automation system itself is built of the following segments:

- ADR Surveillance Data Processing Front End
- ARTAS Surveillance Data Processing
- PRISMA Flight Data Processing System
- PRISMA Safety Nets
- PRISMA Controller and Assistant Working Positions
- PRISMA Storage Server

Apart from integrating data from the COMSOFT systems CADAS and AIDA-NG for aeronautical messaging and information services, the ATC Automation system PRISMA also interfaces to external data sources in the vicinity of the Sheikh Zayed Centre. These include e. g. PSR, SSR and Mode S radars and ADS-B systems, as well as OLDI interfaces for flight coordination.



PRISMA – Architecture at Sheikh Zayed Centre



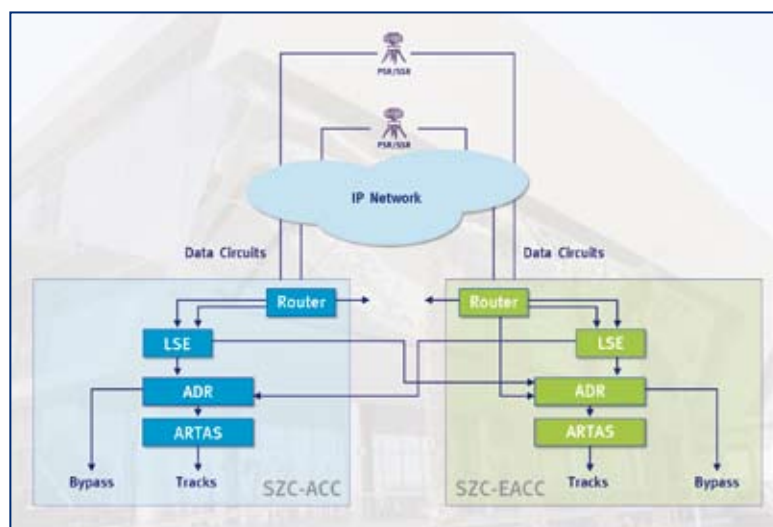
In order to improve service availability, the workstations of both individual ATC rooms can optionally be crosswise interconnected to the servers of the opposite equipment room.

ATCOs working with the PRISMA undoubtedly appreciate the following feature as it considerably reduces workload: the Online Data Interface for automated coordination. It allows for automatic exchange of data necessary for the coordination of flights and produces an accurate picture, while simplifying the entire procedure. Further PRISMA modules that supplement the initial delivery to the former Bateen ACC are:

- Arrival Management
- Departure Flow Management

In the GCAA's configuration, PRISMA receives surveillance data from radar and ADS-B via an IP infrastructure or via leased circuits. To guarantee utmost availability of such information, great care was taken to ensure a diversity routing of data.

Independence of both ATC buildings is achieved by establishing individual links between the radar sites and the ACC and EACC. The Line Splitter Equipment (LSE) then splits the incoming surveillance information, feeds the derived data to its assigned building, and finally forwards the information to the opposite building via a fibre connection.

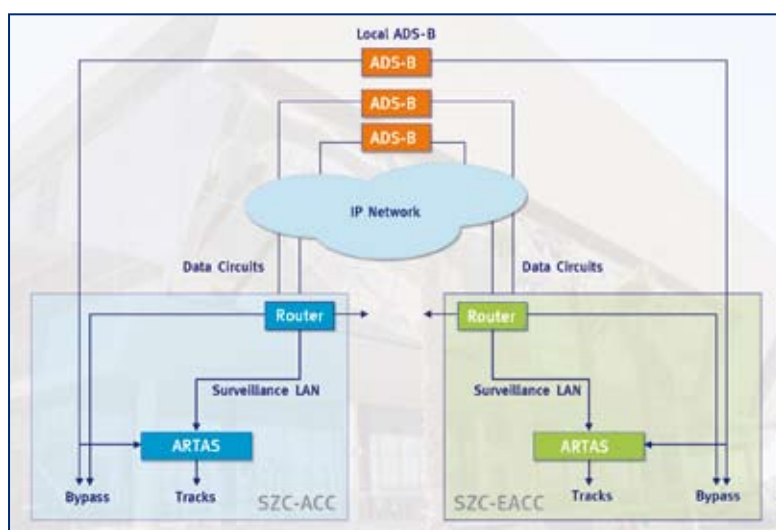


Surveillance Interfaces

Radar data is conveyed via Virtual Circuits (VC) through the "IP Cloud". Similar to a modem connection the VCs provide RS-232 or RS-422 signalling at both ends. These signals are then fed into the Line Splitting Equipment which is connected to the All-purpose Data Stream Replicator (ADR), the front-end of the ARTAS Surveillance Data Processing System.

In detail, ADR is responsible for converting radar data if necessary, and delivering it to the main LAN of the automation system. After that, the information can be accessed by all connected subsystems such as the ARTAS surveillance data processor.

The connections to three redundant ADS-B ground stations are realized as IP based communication, and appropriate connections have been implemented. Two of the ADS-B ground stations are located at remote sites; the third sensor pair is mounted on Sheikh Zayed Centre's antenna towers.



ADS-B Data Flow

All ADS-B stations can be monitored and controlled by the central control and monitoring system QCMS. All commands and investigations addressing the respective system are sent via the same lines as data is transferred on but at a limited bandwidth.

For the exchange of messages in AFTN and AMHS format with neighbouring ATC centres, the COMSOFT's AIDA-NG message handling system is used. The task of handling such messages is as usual assigned to staff of the COM centre. Both centres - the ACC and the EACC - are equipped with a fully featured AFTN/AMHS switch, which includes an AIDA-NG message handling system and the complimentary CADAS Terminal Server System with ROBEX functionality.

Regarding aeronautical messaging operations, GCAA was able to accomplish another milestone in the Middle East: In March 2009 they established the first operational AMHS connection with its communication partner Oman.





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