**TITLE:**

**GFA REAL-TIME SIMULATION**

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**Project:**
- SIM-S-E1_COSIBA
- GFA real-time simulation

**Task No. Sponsor:**
- HCAA/NATA/CAA Skopje/STS/EEC Brétigny

**Period:**
- November - December 2001

**Distribution Statement:**
(a) Controlled by: Manager – Simulation Programme
(b) Special Limitations: None
(c) Copy to NTIS: YES / NO

**Descriptors (keywords):**
- GFA – Real-Time Simulation
- COSIBA
- HCAA
- NATA
- CAA Skopje
- PALLAS
- Alenia
- TIRH
- TIRL
- NWH
- SKTU
- SKH
- SKW
- SKE
- NH
- NTU
- TSLH
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- LMOH
- LMO
- KVL
- PLH
- SIT
- KFL
- RDSH
- RDS
- ARA
- FEA
- FEB
- FEC
- FED
- FEE
- TMA
- Olympic Games
- Safety Nets
- ASMT
- MUDPIE_Analysis
- OLDI
- KOSOVO
- RVSM
- ARN_V4

**Abstract:**

This report describes an EUROCONTROL real-time simulation study of the Greece, FYROM and Albania upper airspace, conducted on behalf of HCAA Greece, DGCA FYROM and NATA Albania. The study aimed to assist HCAA, DGCA and NATA in testing: unidirectional routes Southeast and Northwest bound of Greece and FYROM; the impact of using OLDI co-ordination; the efficiency of vertical sector limits; upper airspace respecting countries boundaries and using airspace as a continuum; 10NM common radar separation; the impact of the Olympic Games in 2004. The simulation included feed positions simulating the neighbouring countries and the lower airspace (TMAs, TWRs etc.). Automatic Safety Monitoring Tool was used to make Safety Analysis during the simulation. The study was designed based on results of several model-based and real-time simulations. The simulation formed part of the COSIBA project and this report includes only results of the GFA Real-Time Simulation. Traffic samples representing forecast levels for 2004 + Olympic Games and 2005, both with Kosovo opened, were simulated.
SUMMARY

This exercise, a real-time simulation for Greece, the Former Yugoslav Republic of Macedonia (FYROM) and Albania, is the third element of the Common Simulation for the Balkans (COSIBA) project.

The Hellenic Civil Aviation Authority implemented a new ATC system called PALLAS in February 1999. PALLAS required a new operational working methodology with significant changes.

In the short to medium term, the expected implementation of Version 4 of the Airspace Route Network together with the review of regional letters of agreement is going to have a major effect on the ATC operations of the FYROM. In order to be capable of accommodating the future traffic demand, the FYROM will implement a new control room equipped with an ALENIA ATC system. This implementation will require a significant adaptation of the controller working methods1.

The Albania ATC authority (NATA) maintains a radar display system made by Flight Refuelling Ltd. from the UK. In the framework of the Albanian Master ATM Plan, it is foreseen that NATA will acquire a new system to be put it in operation by the end of 2004. The system will include EUROCONTROL recommended features and functions, including safety nets, but not MTCD. It will be RVSM and 8.33 compatible and provide OLDI connections with Athens and possibly Skopje.

The needs of these three countries have been the driving requirements for this simulation activity.

The simulated airspace incorporates the V4 network and RVSM as planned. Traffic scenarios have been built on EUROCONTROL forecasts and results from model studies incorporating the impact of the possibility to reopen and regulate the KOSOVO airspace. The Olympic Games of summer 2004 are also reflected in the traffic scenarios.

For each country the aim is to assess the best possible airspace organisation (routes, sectorisation, RVSM aspects…) and operational methodology (inter sectors/centres co-ordinations, controllers task sharing…) capable of accommodating the expected traffic demand for the next 5/6 years (including the Olympic Games in 2004).

In this context, the GFA Real-Time Simulation took place at the EUROCONTROL Experimental Centre between 12th of November and 7th of December 2001. To simulate the entire airspace of the three countries, the activity was split into two scenarios. Scenario 1, between 12th of November and 23rd of November when the north of Greece, FYROM and Albania was simulated and Scenario 2, between 26th of November and 7th of December when the entire Greek airspace was simulated. During the simulation controllers participated in 7 simulation training exercises and 42 simulation measured exercises comprising a total of 84 simulation hours.

1 This was the background at the time of planning the simulation.
REGIONAL CO-OPERATION

One of the objectives of the simulation was to test cross-border sectorisation to assess the potential value of regional co-operation across the national boundaries. For this purpose a scenario including upper en-route sectors combining Albanian/Greek airspace, and FYROM/Greek airspace in the same volumes was tested. In this scenario the airspace was treated as being one entity, using the same separation minima (10 NM) throughout the airspace, disregarding the current constraint of increased separation minima to cross national boundaries.

The scenario was assessed with consideration to overall savings (elimination of ATC sectors), improved planning due to larger sectors, and improved capacity due to minimised separation across boundaries.

THE SIMULATION EVALUATED:

- Transition to and from non–RVSM levels in the south of the Greek FIR using procedures established in the modelling sub-project,
- Benefits from the use of new unidirectional routings (Southeast and Northwest bound) were identified,
- Whether a FL Allocation Scheme (FLAS) is appropriate in some specific circumstances,
- The efficiency of the defined vertical sector limits,
- Harmonisation of the separation procedures in Greece, FYROM and Albania to achieve a 10NM common radar separation using common procedures between ACCs,
- The simulation identified benefits of changed workload characteristics resulting from introduction of OLDI, including the effects on controller interaction with the HMI,
- An upper airspace (above FL 290) sectorisation was compared respecting country boundaries and using the airspace as a continuum,
- The impact of Olympic Games in 2004 on handling of traffic in Greece, FYROM and Albania,
- Losses of separation and incidents were monitored during the simulation using the Automated Safety Monitoring Tool (ASMT).

In consequence the results were:

RVSM Transition Area

No specific findings regarding the RVSM transition area were found, except further emphasis on the positive value of uni-directional routes.

Use of uni-directional routes

With reference to the five main simulation objectives, it was generally found that the use of uni-directional routes through Greek airspace and also through FYROM airspace was very positive, even essential to the safe and well-organised handling of the traffic. The capacity of the airspace, and of the sector controllers to handle the traffic was greatly helped by these routes. This finding suggests that the uni-directional routes are essential both for the efficient operation of RVSM and an enabler for handling the traffic levels simulated for 2004 with the Olympic Games.
Harmonised separation minima/OLDI connections

The harmonisation of separation minima and the automated co-ordination through OLDI links between the participating countries are closely related. The separation minima applied (10 NM throughout the area) helped the controllers to handle the traffic levels simulated, and the system co-ordination in such a situation was seen as an enabler for handling of the simulated level of traffic. The experience of OLDI co-ordination was only achieved in the first scenario, since the second did not include OLDI. In both scenarios, the participating controllers highlighted the value of harmonised (reduced) separation minima.

Shared use of upper airspace

In the first scenario an airspace consisting of the upper Albanian airspace and the northern part of KRK sector was simulated as one common sector and manned by alternatively Greek or Albanian controllers. In the analysis the general view of the Albanian controllers was positive, preferring this sectorisation before the current. The Greek controllers however rated the current sectorisation as preferable, with overload on the sector controllers in the common scenario.

The other common sector simulated consisted of the upper airspace of FYROM including the northern part of the TSL sector. This was well received by the FYROM controllers, who appreciated the larger area for improved sector planning, while the Greek controllers preferred the current national sectorisation.

Regardless of the subjective appreciation of the sectors tested, the positive benefits of regarding the entire airspace as a continuum, and to pursue optimum sectorisation are clear.

Advantages include:

- Potential elimination of sector(s) translating into lower operating cost with less staff cost.
- Elimination of LoA for separation over FIR boundary resulting in the possibility of applying 10 NM separation instead of the current 20 NM while crossing the national boundaries.
- Improved flexibility for future re-sectorisation.
- Improved redundancy for system failure.
- Reduced number of frequency transfers for aircraft.
NATIONAL FINDINGS

Greece
The assessed impact of the Olympic Games on the simulation was great in the Greek airspace and the controllers identified that system requirements on the Greek system that have to be addressed are:

- Implementation of OLDI co-ordination with neighbouring states is a priority.
- Uni-directional routes are essential to enable the handling of the simulated (expected) traffic level.
- Establishment of control area in place of ATS routes will improve the capacity by enabling radar vectoring to a higher degree.
- Preferred vertical splits in the Greek airspace were identified.

FYROM
- The Olympic Games were not found to have a serious impact on the FYROM airspace.
- Uni-directional routes to/from Greek FIR were found very positive for increased capacity.
- Several vertical and horizontal sector divisions were tested and the preferred choice was identified.
- Flight Level Allocation Scheme was found not necessary or beneficial to FYROM.

Albania
- The Olympic Games were not found to have a serious impact on the Albanian airspace.
- Flight Level Allocation Scheme was found not necessary or beneficial to Albania.
- Several vertical and horizontal sector divisions were tested and the preferred choice was identified.
- Experience of operation with a modern system was achieved, a number of changes to HMI were made and this experience will be drawn on in the specifications of the new ATM system for Albania.
ACKNOWLEDGEMENTS

The project team would like to thank for all their assistance and co-operation during the preparation and testing of the simulations.

- the experts from Greece: Thomas Economou, Kostas Marmaras, George Georgakas and Nikos Varveris;
- the experts from FYROM: Borče Dvojakovski and Sašo Tanevski;
- the expert from Albania: Edmond Metaj

The author would also like to thank all the EUROCONTROL staff who worked with him on the GFA Real-Time Simulation Sub-project. In particular Antoine Demarle the Simulation Technical Co-ordinator who efficiently configured and managed a complex simulation facility.

Thanks also for the STS unit from HQ, who provided a comprehensive support in terms of co-ordination with different units and last but not least in sponsoring the simulation.

Finally, thanks to the Greek, FYROM and Albanian controllers who participated in the simulations. They all displayed a high level of professionalism and enthusiasm and it is their input that provided the results to be found in this report.
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recommendations.

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<tr>
<td>ACCs</td>
<td>Area Control Centre</td>
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<tr>
<td>AMN</td>
<td>EUROCONTROL Airspace Management and Navigation Division</td>
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<td>ARN</td>
<td>ATS Routes and associated Navigation means plan</td>
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<td>ASMT</td>
<td>Automatic Safety Monitoring Tool</td>
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<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
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<td>AWY</td>
<td>AirWaY</td>
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<td>CFL</td>
<td>Cleared Flight Level</td>
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<td>CFMU</td>
<td>Central Flow Management Unit</td>
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<td>COSIBA</td>
<td>Common Simulation for the BAIkans</td>
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<td>CRD</td>
<td>Conflict Risk Display</td>
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<td>CWP</td>
<td>Controller Working Position</td>
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<td>DFL</td>
<td>Dynamic Flight Leg</td>
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<td>DGCA</td>
<td>FYROM Civil Aviation Authority Skopje</td>
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<tr>
<td>EATCHIP</td>
<td>European Harmonisation and Integration Programme</td>
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<td>EATMP</td>
<td>The European Air Traffic Management Program</td>
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<td>EXE</td>
<td>Executive Controller</td>
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<td>FIR</td>
<td>Flight Information Region</td>
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<td>FLAS</td>
<td>Flight Level Allocation Scheme</td>
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<td>FL</td>
<td>Flight Level</td>
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<td>FYROM</td>
<td>Former Yugoslavian Republic Of Macedonia</td>
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<td>GFA</td>
<td>Greece FYROM and Albania</td>
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<td>GFR</td>
<td>Greece and FYROM airspace Reorganisation</td>
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<td>GND</td>
<td>GrouND</td>
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<td>HCAA</td>
<td>Hellenic Civil Aviation Authority</td>
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<td>ISA</td>
<td>Instantaneous Self Assessment</td>
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<td>LoA</td>
<td>Letters of Agreement</td>
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<td>MTCD</td>
<td>Medium Term Conflict Detection</td>
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<td>MUDPIE</td>
<td>A Multi-User Data Processing Interactive Environment for Simulations Tool</td>
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<tr>
<td>NATA</td>
<td>Albanian Civil Aviation Authority</td>
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<td>OLDI</td>
<td>On-line Data Interchange</td>
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<td>PALLAS</td>
<td>Actual ATM Operational System in Greece</td>
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<td>PLN</td>
<td>Planning Controller</td>
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<td>PR</td>
<td>Parallel Unidirectional Routes</td>
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<tr>
<td>RT</td>
<td>Real Time</td>
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<tr>
<td>RVSM</td>
<td>Reduced Vertical Separation Minima</td>
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<td>SIMMOD</td>
<td>Model Based (Fast Time) Simulation Tool</td>
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<td>STCA</td>
<td>Short Term Conflict Alert</td>
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<td>TMA</td>
<td>Terminal Manoeuvring Area</td>
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<td>TR</td>
<td>Traditional Routes</td>
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<tr>
<td>TWR</td>
<td>Tower (Aerodrome Control)</td>
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<td>XFL</td>
<td>Exit Flight Level</td>
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1. INTRODUCTION

The GFA real-time simulation took place at the EUROCONTROL Experimental Centre between November 12th and December 7th 2001. This simulation was designed to meet the requirements of the Hellenic Civil Aviation Authority (HCAA), the FYROM Civil Aviation Authority Skopje (DGCA), and the Albanian Civil Aviation Authority (NATA).

This report contains the results of the GFA real-time simulation.

HCAA, DGCA and NATA with the assistance of EUROCONTROL decided to:

- evaluate the transition to and from non–RVSM levels in the south of the Greek FIR,
- evaluate new unidirectional routings,
- evaluate whether a FLAS is appropriate in some specific circumstances,
- evaluate the efficiency of the defined vertical sector limits,
- evaluate separation procedures in Greece, FYROM and Albania to achieve a 10NM common radar separation between ACCs,
- identify benefits from the introduction of OLDI,
- compare the upper airspace (above FL 290) sectorisation respecting country boundaries and using the airspace from contiguous ATCCs as a continuum,
- identify the impact of the Olympic Games in 2004 on the handling of traffic in the Greece, FYROM and Albania airspace.

In order to achieve all these objectives and simulate all the sectors of the three states, the simulation was split into two parts. The first part, called Scenario 1, took place between 12th and 23rd of November 2001 when the entire airspace of FYROM and Albania was simulated together with the northern part of Greek airspace. The second part, called Scenario 2, took place between 26th of November and 7th of December when the entire airspace of Greece was simulated.

A safety assessment has been made using the Automatic Safety Monitoring Tool (ASMT).
2. OBJECTIVES

2.1. GENERAL OBJECTIVES

- To examine RVSM application including the fact that part of the simulated airspace is also a transition area between RVSM and non-RVSM airspace,
- To investigate the harmonisation of separation minima in the area,
- To investigate the benefits of OLDI application and operation,
- To explore the possibilities of the shared use of the upper airspace to obtain an optimised sectorisation,
- To analyse the impact of the expected temporary peak traffic for the summer of 2004 (Olympic Games in Athens) in conjunction with the above objectives.

2.2. SPECIFIC OBJECTIVES

1) To evaluate the transition to and from non–RVSM levels in the south of the Greek FIR using procedures established in the GFR sub-project,
2) To identify benefits from the use of new unidirectional routings (Southeast and Northwest bound),
3) To determine whether a FLAS is appropriate in specific circumstances,
4) To determine the efficiency of the defined vertical sector limits,
5) To harmonise the separation procedures in Greece, FYROM and Albania to achieve:
   a) 10NM common radar separation using common procedures, between ACCs,
   b) an understanding of the feasibility of the implementation of proposed separation criteria with adjacent FIRs.
6) To identify the benefits of changed workload characteristics resulting from the introduction of OLDI, including the effects on controller interaction with the HMI,
7) To compare Upper airspace (above FL 290) sectorisation:
   - Respecting country boundaries,
   - Using the airspace from contiguous ATCCs as a continuum.
8) To identify the impact of the Olympic Games in 2004 on the handling of traffic in Greece, FYROM and Albania Airspace.
3. SIMULATION CONDUCT SCENARIO 1

3.1. AIRSPACE

The simulated airspace included the entire FYROM and Albanian FIRs and parts of the Greek FIR. The simulated airspace was divided into either “Measured” or “Feed” sectors. Measured sectors represented the study airspace of the simulation and were simulated as realistically as possible. Feed sectors provided a realistic interface with the surrounding airspace, without representing in full the actual sectorisation.

3.1.1. Feed Sectors

There were two types of feed sectors, namely marginal feed sectors; and Athens TMA feed sector.

There were five marginal feed sectors that co-ordinated the overflight traffic entering and exiting the measured area. These sectors also handled the arrivals to and departures from the airports located below the measured area in Greece, FYROM and Albania.

The FEA feed sector represented the Brindisi and Beograd FIRs and Tirana TMA.

The FEB feed sector represented the Beograd and Sofia FIRs and the Ohrid and Skopje TMAs.

The FEC feed sector represented the Istanbul and Nicosia\(^2\) FIRs, the Thessaloniki TMA and the airspace below FL80 of the Limnos and Kavalla measured sectors.

The FED feed sector represented the Sitia (SIT) and Paleochora (PLH) sectors and the airspace below FL285 of the Milos (MIL) sector (in organisation 1A2, 1B1, 1B2, 1D); the Cairo, Tripoli and Malta FIRs and the airspace below FL80 of the PLH and SIT sectors (in organisations 1C1 and 1C2).

The FEE feed sector represented the Roma FIR, the Kefallinia sector, the airspace below FL100 of the Kerkira (KRK) sector and the airspace below FL70 of the Skopelos (SKL) sector.

The TMA feed was the actual Athens TMA.

\(^2\) For Organisation 1C1 and 1C2
3.1.2. Measured Sectors

There were eighteen measured sectors simulated. Only thirteen sectors were simulated at a time, because of system limitations.

<table>
<thead>
<tr>
<th>Country</th>
<th>ORG 1A</th>
<th>ORG 1B</th>
<th>ORG 1C</th>
<th>Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>MILH</td>
<td>Milos High</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>LMO</td>
<td>Limnos</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>KVL</td>
<td>Kavalla</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>SKL</td>
<td>Skopelos</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>TSL</td>
<td>Thessaloniki Low</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>PLH</td>
<td>Paleochora</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>SIT</td>
<td>Sitia</td>
</tr>
<tr>
<td>FYROM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>SKW</td>
<td>Skopje West</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>SKE</td>
<td>Skopje Est</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>SKH</td>
<td>Skopje High</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>SKTU</td>
<td>Skopje Top Upper</td>
</tr>
<tr>
<td>Albania</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>TIRL</td>
<td>Tirana Low</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>13</td>
<td></td>
<td>TIRH</td>
<td>Tirana High</td>
</tr>
<tr>
<td>International Sectors</td>
<td>11</td>
<td>11</td>
<td>NWH</td>
<td>North West High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
<td>NH</td>
<td>North High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td></td>
<td>NTU</td>
<td>North Top Upper</td>
<td></td>
</tr>
</tbody>
</table>

- Tested in Org 1C only.
- Missing in Org 1C.
- Transformed in international sectors in Org 1C.

Details of the simulated airspace are contained in the Facility Specification Part 1 & 2 (Ref. 6 GFA Facility Specification Part 1 & 2 Operational and Analysis version 3.0, 05 November 2001).

3.2. Traffic

The traffic samples used during the simulation were based on 24hr traffic recordings from 24\textsuperscript{th} of August 2000.

This traffic sample was compared by EEC experts with the CFMU traffic sample from the same date and adjusted so as to fit in the three countries. (The database we had from each country sometimes did not match the data from other countries so, using the CFMU traffic sample, the traffic was made continuous all along the simulated area).
From this sample, the EEC and client experts took two peak periods of 1hr 30min one from the morning and another one from the afternoon, considered as representative samples to meet the simulation objectives.

Flights in the resulting traffic samples were re-routed by the clients and EEC experts according to the ARN V4 Kosovo open strategy, flying on standard routes and/or parallel routes (developed by the clients). Following the “Kosovo opened” scenario, a lot of traffic normally flying via TIMUR and RODOP was re-routed via Kosovo and some traffic flying via Albania was re-routed via Kosovo as well. No extra traffic was added in place of the re-routed traffic.

Once validated, the resulting traffic samples were increased to reach the forecasted level from the year 2004 + Olympic Games and 2005 in the following way:

- **2004:**
  - 25% total increase for 4 years (6% per year)
  - 10% Simulation factor
  - \[ \text{35\% increase} \]
  - 20% Olympic games of the traffic increased 35% for destination and departure LGAV until 65 movements /hour than LGTS and LGIR
  - \[ \approx \text{aprox. 55\% increase} \]

- **2005:**
  - 30% total increase for 4 years (6% per year)
  - 10% Simulation factor
  - \[ \text{40\% increase} \]

The simulated traffic flows can be found in *Annex F*.

### 3.2.1. Training Samples

Some reduced traffic samples were used to cater for initial training (equipment familiarisation, system debugging, and acceptance test). These were developed from the basic samples of 2004 + Olympic Games but randomly reduced by 50% so as not to overload the controllers during the familiarisation and training phase.

### 3.2.2. Traffic Sample Analysis

The analysis of the traffic samples is described in *Annex A*. 
3.3. ORGANISATION

To achieve the simulation objectives, eight airspace organisations were foreseen.

A different number of organisations were developed for each state: six organisations for Greece, eight organisations for FYROM and four organisations for Albania.

The basic elements of the simulated organisations are described below.

Details of the simulated organisations are contained in the Facility Specification Part 1 & 2 (Ref. 6 GFA Facility Specification Part 1&2 Operational and Analysis version 3.0, 05 November 2001).

Maps of each organisation are shown in Annex C.

3.3.1. Organisation 1A2

Traditional routes, TIRL - TIRH vertical limit FL295, SKW/SKW – SKH vertical limit FL305, SKH – SKTU vertical limit FL335, TSL - TSLH vertical limit FL325, KRK SKL MILH LMO and KVL as single sectors.

3.3.2. Organisation 1B1

Traditional routes, TIRL - TIRH vertical limit FL295, SKW/SKW – SKH vertical limit FL305, SKH – SKTU vertical limit FL345, TSL - TSLH vertical limit FL325, KRK SKL MILH LMO and KVL as single sectors.

3.3.3. Organisation 1B2

Traditional routes, TIRL - TIRH vertical limit FL325, SKW/SKW – SKH vertical limit FL315, SKH – SKTU vertical limit FL345, TSL - TSLH vertical limit FL325, KRK SKL MILH LMO and KVL as single sectors.

3.3.4. Organisation 1D

Parallel routes, TIRL - TIRH vertical limit FL325, SKW/SKW – SKH vertical limit FL315, SKH – SKTU vertical limit FL345, TSL - TSLH vertical limit FL335, KRK SKL MILH LMO and KVL as single sectors.

3.3.5. Organisation 1C1

Common international sectors over Albania - part of Kerkira (NWH – North West High), FYROM – Thessaloniki (NH – North High). Parallel routes were used. TIRL - NWH vertical limit FL285, SKW/SKW – NH vertical limit FL325, SKL MILH LMO PLH and SIT as single sectors.

3.3.6. Organisation 1C2

Identical with Org. 1C1, common sector NH was split in two sectors at FL355 creating a new sector on top NTU (North Top Upper), SKL MILH LMO PLH and SIT as single sectors.
3.4. PROGRAM OF EXERCISES

Three simulation exercises were conducted each day, with a main debriefing period scheduled after the final exercise of the day.

Exercises were of 1hr 10mins duration that started with an initial traffic charge which gradually grew during the first 10mins after which the next 1hr was conducted at the appropriate traffic level.

The tables below show the programs of exercises that were completed.

Table 2: GFA RT scenario 1 exercise program

<table>
<thead>
<tr>
<th>Week</th>
<th>Org</th>
<th>No of Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1A2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1B1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>1B2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1D</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1C1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>1C2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total 19** Representing 28 hours of simulation time.

The staffing of positions followed a strict rotation which took into account controller’s provenance and which ensured that each controller experienced each variation of organisation from as many different control positions as possible, from his own centre.

3.5. PARTICIPATING CONTROLLERS

![Controller Ages](image)

**Figure 1: Controller ages by country for S1**
Participating controllers’ age was equally spread from 25 to 55 years old.

Figure 2: Controller ages for S1

Figure 3: Controller experience by country for S1
Participating controllers’ experience was nicely spread from less than 6 years experience to more than 20 years experience, most of the participants had between 6 and 15 years of experience.

3.6. SIMULATED ATC SYSTEM

The simulated ATC Systems used for GFA RT represented:

For Greece the PALLAS system, which is already in use in Athens, simplified for the simulation. In terms of RVSM that was not implemented in PALLAS at the moment we wrote the specifications:

- State flights – not simulated,
- RVSM approved flights departed from LGXX below FL290 an "R" displayed after CFL in the track label and below CFL in the electronic strip,
- RVSM approved flights above FL290, no particular sign displayed,
- Non-RVSM approved flights below FL290, no particular sign displayed,
- Non-RVSM approved flights above FL290, a mustard callsign displayed in the track label and in the electronic strip.

For FYROM the ALENIA system, which is already in use in Skopje, simplified for the simulation. In terms of RVSM:

- State flights – not simulated,
- Non-RVSM approved flights, above FL290, a mustard callsign displayed in the track label and in the electronic strip.
For Albania, a generic EUROCONTROL HMI, with a stripless system operation was simulated. In terms of RVSM:

- State flights – not simulated,
- Non-RVSM approved flights, above FL290, mustard callsign displayed in the track label and in the electronic strip.
- OLDI co-ordination was used as inter centre co-ordination. In Greece only TSL, TSLH and KRK were using this type of electronic co-ordination.


### 3.6.1. Non Simulated Elements of PALLAS System

**Automatic Handover.** During the acceptance test, because of a client change request, some trials were made to implement it. Because of the complexity of the vertical sectorisation in Greece, the tool was not working satisfactorily. It was decided to run the simulation using only manual handover.

**Label Overlapping Avoidance.** This functionality was not provided because of system performance limitations. A Drag-and-drop function to rotate (move) labels was provided instead.

**Second Radar Window.** This functionality was not provided because of system performance limitations.

All the above-mentioned elements that were not simulated might have had a strong impact on controllers’ workload.

### 3.6.2. Operations Room Configuration

The operations room was configured as required for the various organisations of the simulation.

The original configuration of the operations room was with 26 measured CWPs as follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>Executive Positions</th>
<th>Planner Positions</th>
<th>CWPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>FYROM</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Albania</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Differently from real life, PLN controllers were using 28’ screens for all sectors apart from the KVL PLN in Greece and the SKE PLN in FYROM.
Figure 5: Floorplan org ABD
Figure 6: Floor plan org C
A Measured Controller Working Position consisted of:

- a 28inch square colour display, used to provide a multi-window working environment for Executive and Planner Positions,
- a main CPU Processor and display driver,
- a 3-button mouse,
- a keyboard, (for Greece only),
- a simulation telecommunication system with headset, handsets, footswitch, and panel-mounted push-to-talk facility.

The measured positions were comprised of identical CWPs configured as either Executive (EXE) or Planning (PLC) positions. Each CWP provided access to the same facilities; controllers had the possibility to determine display preferences depending on the control task.

Each CWP included a subjective workload panel (Instantaneous Self-Assessment – ISA) used by the controller for periodic input throughout the measured exercise.

Feed sectors were provided with the same CWP as the Greek executive measured positions.

3.7. **ATC PROCEDURES AND CONTROLLER TASKS**

ATC procedures and controllers tasks were based on Letters of Agreement in force at the date of the simulation.

3.7.1. **RVSM**

RVSM operation was simulated. State Aircraft were not simulated, flights were flagged as RVSM approved or non-RVSM approved.

3.8. **SAFETY ASSESSMENT**

3.8.1. **Automated Safety Monitoring Tool (ASMT)**

ASMT was used to have a quick look at losses of separation for the purpose of understanding why they were happening.

Data was available from the ASMT about 10 minutes after an exercise was finished.

The aims of using the ASMT were:

1. to have a fast graphical feedback of separation infringements,
2. to have the basis of discussing with the controllers after each exercise why separation infringements occurred,
3. to accustom the Greek controllers to the ASMT,
4. to accustom the ASMT team to the operational environment of a real-time simulation.
3.8.2. MUDPIE

MUDPIE is “A Multi-User Processing Interactive Environment for Simulations”.

This tool was used for most of the analysis of the Spata 2000 Simulation. This tool also provided a set of graphics and tables in relation to losses of separation.

3.9. METHODOLOGY

The simulation results contained in this report were compiled from the notes taken at the simulation de-briefing sessions, the questionnaire responses and the observations of the project team.

Simulator recordings of controller inputs, pilot inputs and aircraft flight paths were analysed to provide further supporting evidence for the results.

The Instantaneous Self-Assessment (ISA) method was used to assess controller workload. Participants were asked to respond to a prompt every 2 minutes by pressing a button that reflected their perceived workload at the time; the five buttons available were assigned the values Very High, High, Fair, Low and Very Low.
4. SIMULATION CONDUCT SCENARIO 2

4.1. AIRSPACE

The simulated airspace included the entire Greek FIR.

The simulated airspace was divided into either “Measured” area or “Feed” sectors. The Measured area represented the airspace under study of the simulation and was simulated as realistically as possible. Feed sectors provided a realistic interface with the surrounding airspace, without representing in full the actual sectorisation.

4.1.1. Feed Sectors

There were two types of feed sectors: Marginal feed sectors; and the Athens TMA feed sector.

There were five marginal feed sectors that co-ordinated the overflight traffic entering and exiting the measured area.

The FEA feed sector represented the Tirana, Skopje, and Sofia FIRs, the Thessaloniki TMA and the airspace below FL70 of the Skopelos (SKL) measured sector.

The FEB feed sector represented the Istanbul, Ankara and Nicosia FIRs, the Rodos TMA, the airspace below FL80 of the Limnos measured sector and the airspace below FL60 of the Rodos measured sector.

The FEC feed sector represented the Cairo, Tripoli, and Malta FIRs and the airspace below FL80 of the Paleochora (PLH), Sitia (SIT) and Milos Low (MIL) measured sectors.

The FED feed sector represented the Roma FIR and the airspace below FL100 of the Kefallinia (KFL) and Araxos (ARA)\(^3\) measured sector.

The FEE feed sector represented the Roma and Brindisi FIRs and the airspace below FL100 of the Kerkira (KRK) measured sector.

The TMA feed was the actual Athens TMA.

\(^3\) In Organization 2C.
4.1.2. Measured Sectors

There were sixteen measured sectors simulated. Only thirteen sectors were simulated at a time because of system limitations.

Table 3: Measured sectors

<table>
<thead>
<tr>
<th>ORG 2A</th>
<th>ORG 2B</th>
<th>ORG 2C</th>
<th>Sector</th>
<th>Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>KFL</td>
<td>Kefallinia</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>PLH</td>
<td>Paleochora</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>4</td>
<td>TSL</td>
<td>Thessaloniki</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>TSLH</td>
<td>Thessaloniki High</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>KRK</td>
<td>Kerkira</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>KRKH</td>
<td>Kerkira High</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>6</td>
<td>SKL</td>
<td>Skopelos</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>SKLH</td>
<td>Skopelos High</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>7</td>
<td>MIL</td>
<td>Milos</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>8</td>
<td>MILH</td>
<td>Milos High</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>9</td>
<td>SIT</td>
<td>Sitia</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>10</td>
<td>RDS</td>
<td>Rodos</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>11</td>
<td>RDSH</td>
<td>Rodos High</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>LMO</td>
<td>Limnos</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>13</td>
<td>LMOH</td>
<td>Limnos High</td>
</tr>
</tbody>
</table>

Details of the simulated airspace are contained in the Facility Specification Part 1 & 2 (Ref. 6 GFA Facility Specification Part 1 & 2 Operational and Analysis version 3.0, 05 November 2001).

4.2. TRAFFIC

See chapter 3.2.

4.2.1. Training Samples

See chapter 3.2.1.

4.2.2. Traffic Sample Analysis

The analysis of the traffic samples is described in Annex B.
4.3. ORGANISATION

To achieve the simulation objectives, three organisations were foreseen.

The basic elements of the simulated organisations are described below.

Details of the simulated organisations are contained in the Facility Specification Part 1 & 2 (Ref. 6 GFA Facility Specification Part 1 & 2 Operational and Analysis version 3.0, 05 November 2001).

Maps of each organisation are shown in Annex D.

4.3.1. Organisation 2A


4.3.2. Organisation 2B


4.3.3. Organisation 2C

Parallel routes network, MIL – MILH vertical limit FL285, RDS – RDSH vertical limit FL285, LMO – LMOH vertical limit FL335, KFL horizontally divided into ARA and KFL.

\(^4\) LMO and LMOH are a combination of actual LMO and KVL sectors.

\(^5\) LMO and LMOH are a combination of actual LMO and KVL sectors.
4.4. PROGRAM OF EXERCISES

Three simulation exercises were conducted each day, with a main debriefing period scheduled after the final exercise of the day.

Exercises, which were of 1hr 10mins duration, started with an initial traffic charge which gradually grew during the first 10mins after which the next 1hr was conducted at the appropriate traffic level.

The table below shows the programs of exercises that were completed.

<table>
<thead>
<tr>
<th>Week</th>
<th>Org</th>
<th>No of Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2A</td>
<td>8</td>
</tr>
<tr>
<td>2A</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2C</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total 22</td>
<td>Representing 28 hours of simulation time.</td>
<td></td>
</tr>
</tbody>
</table>

The staffing of positions followed a strict rotation which took into account controller’s provenance and which ensured that each controller experienced each variation of organisation from as many different control positions as possible, from his own centre.

4.5. PARTICIPATING CONTROLLERS

![Figure 7: Controller ages for S2](image)
In this scenario we were missing controllers of the age group between 20 to 35 years old.

![Controller experience for S2](image)

**Figure 8: Controller experience for S2**

In terms of experience, the participating controllers belonged to different ATC career phases.

### 4.6. SIMULATED ATC SYSTEM

The simulated ATC Systems used for GFA RT Scenario 2 represented the PALLAS system, which is already in use in Athens, simplified for the simulation. RVSM characteristics:

- State flights – not simulated,
- RVSM approved flights departed from LGXX below FL290 an "R" displayed after CFL in the track label and below CFL in the electronic strip,
- RVSM approved flights above FL290, no particular sign displayed,
- Non-RVSM approved flights below FL290, no particular sign displayed,
- Non-RVSM approved flights above FL290, mustard callsign displayed in the track label and in the electronic strip.

Details of the simulated systems are contained in the Facility Specification Part 3 Technical (Ref. 7 GFA Facility Specification Greece Part 3 Technical version 3.2).

#### 4.6.1. Non Simulated Elements of PALLAS System

*See chapter 3.6.1.*
4.6.2. Operations Room Configuration

The operations room was configured as required for the various organisations of the simulation.

The configuration of the operations room was: 13 Executive measured Positions (13 CWP), 13 Planner measured Positions (13 CWP) and 6 Feed Positions (6 CWP).

Different from the real life, PLN controllers were using 28 inch screens for all sectors apart of SIT PLN and PLH PLN.
Figure 9: Floorplan org 2ABC
The Measured Controller Working Position consisted of:

- a 28inch square colour display, used to provide a multi-window working environment for Executive and Planner Positions,
- a main CPU Processor and display driver,
- a 3-button mouse,
- a keyboard,
- a simulation telecommunication system with headset, handsets, footswitch, and panel-mounted push to talk facility.

The measured positions were comprised of identical CWPs configured as either Executive (EXE) or Planning (PLC) positions. Each CWP provided access to the same facilities; controllers had the capability to determine display preferences depending on the control task.

Each CWP included a subjective workload panel (Instantaneous Self-Assessment – ISA) used by the controller for periodic input throughout the measured exercise.

Feed Sectors were provided with the same CWP as the executive measured positions.

4.7. ATC PROCEDURES AND CONTROLLER TASKS

ATC procedures and controllers tasks were used based on Letters of Agreement in force at the date of the simulation.

4.7.1. RVSM

RVSM operation was simulated. State Aircraft were not simulated, flights were flagged as RVSM approved or non-RVSM approved.

4.8. SAFETY ASSESSMENT

See chapter 3.8.

4.9. METHODOLOGY

See chapter 3.9.
5. GREECE RESULTS – OBJECTIVE 1

Evaluate transition to and from non-RVSM levels in the south of the Greek FIR using procedures established in the GFR sub-project.

Generally, the RVSM transition area was found safe by the participating controllers and traffic was easy to handle mainly because of simulated unidirectional routes.

Simulated procedures were found adequate and no particular problem was identified.

Military traffic and state aircraft were not simulated.
6. GREECE RESULTS – OBJECTIVE 2

Identify benefits from the use of new unidirectional routings (Southeast and Northwest bound).

Unidirectional routings were very much liked by all participating controllers in both scenarios. The advantages (as described by participating controllers) were:

- more FL were available,
- a capacity increase,
- they eliminate the potential conflicts between overflying and departing/arriving aircraft, no conflicts are expected to occur due to opposite traffic,
- easier maintaining of separation,
- traffic can be clearly observed,
- northbound and southbound traffic is separated giving free airspace for climbs and descents,
- aircraft will get their levels through a continuous smooth climb (no step climb or vectoring to avoid opposite traffic),
- facilitates traffic expedition and reduces the workload of the controllers,
- traffic is much easier to handle,
- traffic is safer because there is no opposite traffic and the risk of conflict reduces considerably.

Having the positive experience of the simulated unidirectional routes, participating controllers explored the possibility to have more routes like this implemented, especially in the overloaded sectors.

Creating unidirectional routes might be a solution for overloaded sectors in Greece for the Olympic Games. This is the easiest and the cheapest way to increase capacity and to make the airspace safer.

Below, there is an example of workload analysis for the KVL sector, with and without unidirectional routes, in the simulated Scenario 1.

To have a more explicit presentation of the results, from the controllers workload recordings a sum was made only from "Very High" and "High" percentages. This means that the value you see on the graphics is only the ("Very High" + "High")%. The ("Fair" + "Low" + "Very low")% is the difference to 100%.
Below, there is an example of workload analysis for the LMOH sector, with and without unidirectional routes, in the simulated Scenario 2.

Figure 12: Workload of LMOH with parallel and traditional routes
7. GREECE RESULTS – OBJECTIVE 3

Determine whether a FLAS is appropriate in specific circumstances.

Unlike the Albanian and FYROM controllers, the Greek controllers almost unanimously regard a FLAS as an essential part of the safe operation of Greek airspace.

The need for a FLAS was identified in the border areas with Bulgaria and FYROM, and mostly confirms the existing FLAS.

For the simulation, some assumptions were made, as so how traffic will fly with Kosovo opened (See chapter 3.2, how traffic sample was built). Additionally, traffic entering TIMUR – TSL was flying mainly at FL350, FL310 and FL250 although all are opposite FLs for this traffic flow, due to LoA with Sofia.

The supporting comments of participating controllers for a FLAS included:

“A FLAS gives more safety”, probably because they believed that if aircraft are coming at different FLs this gives more safety.

“It helps in specific areas close to the FIR boundary” in the way that two crossing traffic flows are coming at different FLs.

There are no recommendations concerning a FLAS except to maintain the current use of FLAS.

For the simulated traffic sample a FLAS was not needed and losses of separation did not happen in the areas where a FLAS might have been needed.
8. GREECE RESULTS – OBJECTIVE 4

*Determine the efficiency of the defined vertical sector limits.*

8.1. INTRODUCTION

Different vertical splits of the sectors were among the main things to test in both scenarios. To harmonise the sector splits, common level splits were chosen with both Skopje and Tirana FIRs and between the Greek sectors internally.

With the introduction of RVSM the need for uni-directional parallel routes has been identified more and more. Testing of these routes where the number of conflicts, and thereby the controller workload, decreases has had an impact on the evaluation of vertical sector splits.

Even today several sectors in Greece are highly loaded and so it is obvious that, for the Olympic Games in 2004, something will have to be done to make these sectors workable. The "problem sectors" were identified in the previous fast time simulations and some solutions were coming from here.

8.2. RESULTS

8.2.1. LMO

In Scenario 1, comparisons were made of the LMO sector alone (ORG 1C1/2) and this sector split in two lateral sectors LMO and KVL using traditional routes (ORG 1A2/1B1/1B2) and using unidirectional routes (ORG 1D).

In Scenario 2, comparisons were made of the LMO sector split into two vertical sectors: LMO and LMOH. Two division level were tested: FL335 (ORG 2A/2C) and FL285 (ORG 2B/2C).

LMO as a single sector can not work because of the very high workload in the sector; with the 2004 + Olympic Games traffic level, controllers were not able to control the traffic and several very serious losses of separation took place (See annex E Chapters E5/E6).
The LMO sector is overloaded in ORG 1C1/1C2 as shown in the graphic above.

The KVL sector is nicely loaded especially with unidirectional routes.
The LMO EXE is loaded but workable, especially with the unidirectional routes.
The LMO PLN appears overloaded with unidirectional routes, but in the reality participating controllers considered it not loaded in the debriefings. The causes of the workload recorded (in this case) might be external (simulated system not working properly in this sector).

![LMO sector divided into LMO and LMOH](image)

**Figure 15: LMO sector divided into LMO and LMOH**

This is Scenario 2 with LMO split into two vertical sectors.

In the graphic above, LMOH EXE appears to be highly loaded while LMOH PLN has a low workload (division FL285). This might be because the controller tasks in this sector are not equally shared between EXE and PLN controllers.

This type of sectorisation was found to be better than the horizontal split and the division flight level should be FL285, because the workload is reduced in both sectors.
8.2.2. TSL

The TSL sector was compared as a single sector (ORG 2B/2C) and a sector split into two vertical sectors TSL and TSLH, with the division level at FL325 (ORG 1A2/1B1/1B2), and FL 335 (1D).

The best division FL for this sector was found to be FL335 because the workload in both sectors TSL and TSLH was proportional.

TSL as a single sector can not work because of the very high workload.
The TSL sector was divided into two vertical sectors TSL and TSLH with the division level at FL325. The TSL sector is not loaded and the TSLH sector is very highly loaded.

The TSL sector was divided into two vertical sectors TSL and TSLH with the division level at FL335. The TSL sector is not loaded and the TSLH sector is very highly loaded.
The TSL sector was divided into two vertical sectors TSL and TSLH with the division level at FL335. This is the best organisation of the TSL sector. Both upper and lower sectors are equally loaded.

8.2.3. KRK

The KRK sector was compared in terms of workload as a single sector in Scenario 1, ORG 2B, 2C from Scenario 2 and split into two vertical sectors with the division level at FL285 in ORG 2A.

![Workload for KRK as a single sector (ORG 2B/2C)](image)

Figure 19: Workload in KRK as a single sector

The KRK sector as a single sector can not work because the controller workload is too high (see the graphic above measurement made in ORG 2B and 2C). The sector is too long and has a lot of conflicting points at the opposite edges.
A possibility to reduce the workload in this huge sector is to vertically divide this sector in two (KRK and KRKH). The tested division level was FL285. The results are better than a single sector but they still have to be improved, because the KRKH sector still had a very high workload sometimes. Participating controllers had the opinion that a sector division at FL305 reduced the workload in KRKH. This division was tested only in the last exercise because the idea arose during the simulation.
8.2.4. SKL

The SKL sector was compared in terms of workload as a single sector in Scenario 1, ORG 2A, 2C from Scenario 2 and split into two vertical sectors with a division at FL285 in ORG 2B.

![Figure 22: Workload in SKL as a single sector](image)

The SKL sector can not work as a single sector because the controller workload is too high (see in the graphic above measurement made in ORG 1A2/1B1/1B2/1D/1C/2A and 2C).

![Figure 23: Workload in SKL divided at FL285](image)
A possibility to reduce the workload in this sector is to vertically divide this sector in two (SKL and SKLH). The tested division level was FL285. The results are better than for a single sector. SKLH looks on the recordings as very highly loaded for a short time but the participating controllers had no special comments about it.

FL285 seems to be the best division level for the SKL sector.

8.2.5. MIL

The MIL sector can not work as a single sector because of the MIL point where all ten airways cross. In addition, because of military activity in the area, aircraft can fly only inside the airways; all other airspace is uncontrolled and it is used by the military. There was no point in comparing the workload from a single sector with two sectors because this was done in the GFA FT simulation and the result was that the sector has to be split, otherwise the workload is very high.

The MIL sector was simulated in Scenario 2 divided into two vertical sectors MIL and MILH with a division at FL285.

The participating controllers all agreed that the best division level is FL285 but this doesn't help too much. In terms of workload, both sectors are still very highly loaded. The reason for the load is that all airways converge in a single point, namely "MIL".

The workload of the two sectors can be reduced by decongesting the MIL point and by creating unidirectional routes in this area as well.

With the 2004 + Olympic games simulated traffic, this sector was overloaded and unsafe. Several important losses of separation took place in these two sectors (See Annex E).
8.2.6. RDS

RDS was simulated only in Scenario 2. Workload was compared from ORG 2A where a single sector was simulated, with ORG 2B/2C where RDS was split into two vertical sectors with the division at FL285.

![Average workload of RDS sector alone Org 2A](image)

**Figure 25: Workload in RDS alone**

The RDS sector, as a single sector as simulated in Org 2A, cannot work because of the very high workload. This sector is very long and contains a lot of conflicting points at opposite edges (See Annex E).
The RDS sector divided at FL285 decreased the workload in both sectors.

Participating controllers agreed on a division level of FL285. The RDSH sector seemed to be workable with the simulated traffic levels but the lower sector RDS is workable but still very highly loaded. Nothing else was tested during the simulation but for 2004 RDS low has to be taken into consideration and the workload should be reduced (dividing the sector into two lateral sectors or simplifying the route network in the lower airspace).

8.2.7. KFL

KFL was simulated only in Scenario 2. Workload was compared from ORG 2A/2B where a single sector was simulated, with ORG 2C where KFL was split into two lateral sectors KFL and ARA.
Figure 27: KFL and ARA sectors
KFL as a single sector can not work with the simulated traffic samples because of the very high workload.

The original KFL sector, divided into KFL and ARA sectors, was much better than the single sector because the workload on both sectors was reduced.
The workload was, however, still too high in both sectors and it was considered by some participating controllers at the debriefings that the boundary between the two sectors has to be revised because this might have created some extra workload.

9. GREECE RESULTS – OBJECTIVE 5

Harmonisation of the separation procedures in Greece, FYROM and Albania to achieve:

a) 10NM common radar separation procedures, between ACCs,
b) an understanding of the feasibility of the implementation of proposed separation criteria with adjacent FIRs.

This objective was interpreted as being to test a 10NM common and internal radar separation and to see where problems might occur.

After the simulation, it was generally agreed that the 10NM common radar separation minima is feasible, and that, from an operational viewpoint, implementation would be possible.

However, the Greek controllers listed a number of prerequisites for such an implementation:

- OLDI co-ordination with the adjoining ACC.
- Constant or increasing distance between aircraft of no less than 10 NM.
- Under constant mutual radar coverage across the boundaries.
- Under perfect radio communication conditions.

The 20NM separation used for silent co-ordination today includes a buffer that makes operation safe even when the 20NM separation is infringed. By reducing this to 10 NM minimum separation there were some worries that the minima cannot be compromised under any circumstances, anymore.

The answers to the question of harmonisation and reduction of separation minima are strongly related to the assessment of the system’s ability to withstand the impact of the forecast 2004 traffic load in relation to the Olympic Games. In response to this, the 10 NM separation minima and OLDI implementation are seen as “essential to be able to accept the proposed levels of traffic”.

10. GREECE  RESULTS – OBJECTIVE 6

Identify benefits of changed workload characteristics resulting from introduction of OLDI, including the effects on controller interaction with the HMI.

10.1. INTRODUCTION

The controllers worked with an HMI emulating the current “PALLAS” system in Athens, but with some limitations.

The Greek controllers constantly had problems with overlapping labels on the screens. This was clearly more difficult than with the PALLAS system.

Two types of fonts were provided: a font with a smaller size and a font with bigger size. There was no other technical possibility to have another font size apart from these two. Anyhow, participating controllers found the provided fonts either too big or too small.

The absence of an automatic anti-overlap function meant that there were often problems in busy sectors to manually move aircraft labels to be able to read the information presented.

Also, it was not possible in the simulator to implement a system of automatic hand-over, which is used in Athens, and this caused some dissatisfaction.

On the whole though, the system replicated the PALLAS system with inputs through a keyboard and with label information in colours according to specifications.

The OLDI co-ordination, used only in scenario 1 with Albania and FYROM, was also new, but worked well after an introductory training session.

10.2. RESULTS OF INTERFACE WITH HMI

The only new functionality introduced in the simulation for Greece was the OLDI co-ordination and the RVSM label information; everything else emulated the existing system.

Both FYROM and Albania were examining specifications for new systems and the Greek controllers showed an interest in some of the functionality as possible improvements to the PALLAS system, e.g. the use of a three-button-mouse for input instead of the keyboard. Mouse input is generally felt to be easier, and it also allows the controller to maintain focus on the screen while making the input.

The overwhelming majority of the Greek controllers were very positive about the use of OLDI. Among the answers to questionnaires given were the following:

- it was easier to co-ordinate with other FIRs,
- messages and co-ordination were more clear than when using the telephone,
- it reduces controller workload,
- it reduces verbal communication.

The OLDI HMI was accepted without any requirement for modifications. There were some problems with individual flights where the hand-over function did not work properly. This was due to system problems with the simulator and not due to the general functioning of OLDI.
From OLDI only ACT, LAM, and REV messages were simulated.

Because of the way PALLAS was designed, there is no need to exchange OLDI messages between the sectors in Greece but before 2004 it is mandatory to have an exchange of OLDI messages with the neighbouring ACCs, especially with FYROM and Bulgaria.

The best use of OLDI is to use it as it was simulated (integrated in the controller HMI). To be able to do this, the PALLAS system must be adapted specially. The Message In Window; Message Out Window; XFL (Exit Flight Level) – should be defined in the radar label and in the electronic strips; CFL (Cleared Flight Level); colour and position of XFL co-ordination in/out should be defined in radar label, electronic strips.
11. GREECE RESULTS – OBJECTIVE 7

Compare Upper airspace (above FL 290) sectorisation:
- Respecting country boundaries,
- Using the airspace from contiguous ATCCs as a continuum.

The common sector organisation was found to be unsuitable by the majority of the Greek controllers. Unlike the controllers from Tirana and Skopje, who were generally in favour of the common sectors, but only tested one of the two common areas, the Greek controllers tested both the “NWH” and the “NH” sectors.

The reasons given for the negative assessment of the common sectors were, amongst others:
- “Unfamiliarity with the foreign airspace”.
- “Need for uniformity of the ATC rules, procedures and methodology”.
- “No perceived benefits from sectorisation across national boundaries”.

The benefits quoted by the controllers from FYROM and Albania for the NH and NWH sectors (improved planning ability, improved ability to analyse traffic situation) were not identified by the Greek controllers, there was rather a focus on problem areas already known to them in the southern parts of the sectors.

This could indicate that the groups saw things differently depending on their backgrounds. The problems normally facing them in their existing sectors were easier to assess than the complexity of the new area with which they had no previous experience. The Albanian and FYROM controllers, used to geographically-limited sectors, saw benefits, while the Greek controllers, used to more complex traffic situations, saw the larger areas as liabilities.

It was therefore not easy to compare the views of the different groups of controllers, although they manned the same sectors during the simulations.

From an economical viewpoint, the common sectors were beneficial since they reduced the total number of sectors in operation in the area.

![ISA workload for the common sectors manned by Greek controllers](image)

Figure 30: ISA workload for Greek manned common sectors
12. GREECE RESULTS – OBJECTIVE 8

Identify impact of Olympic Games in 2004 on handling of traffic in Greece, FYROM and Albania Airspace.

The vast majority of the participating Greek controllers in Scenario 1 responded that the impact of the Olympic games was of great significance. The reactions of the controllers show both surprise and astonishment at the amount of traffic expected, and disbelief that the scenario had been prepared in a realistic fashion.

The system response times were problematic, and the label overlap was continuously a grave problem for the busiest sectors. Even allowing for this, the controllers’ response shows that a prerequisite to be able to handle traffic of this level requires as a minimum:

- implementation of parallel, uni-directional routes as tested in the simulations;
- implementation of the 10 NM separation for the entire area, which was used in the simulation;
- OLDI co-ordination, again to reduce the controller workload;
- decongestion of the MIL point;
- division of the LMO sector into LMO and LMOH sectors with a level split at FL285;
- division of the TSL sector into TSL and TSLH sectors with a level split at FL335;
- division of the KRK sector into KRK and KRKH sectors. The best level split needs investigating - FL285 or FL305;
- division of the SKL sector into SKL and SKLH sectors with a level split at FL285;
- division of the MIL sector into MIL and MILH sectors with a level split at FL285;
- division of the RDS sector into RDS and RDSH sectors with a level split at FL285. The RDS sector (the lower sector) needs to have the workload reduced; and
- division of the KFL sector into KFL and ARA sectors; the best place to have the border between these two sectors needs to be investigated further.

In addition to this, further sector divisions may be needed. A review of the division of workload between planner and tactical controller can also help to optimise the sector capacity before the Olympic Games.

The working method have to be revised as well, so as to be able to cope with 2004 + Olympic Games traffic. In support of this, all probable technical problems have to be solved.

- ATC Clearance should not be repeated at the entry on the first Greek sector. When receiving the flight plan then the route should be verified and a warning generated only for the flights with a wrong route filed.
- Identification should not be made when aircraft are coming from a radar-equipped centre. Radar transfer procedures should be developed between centres in the Letters of Agreement.
- Radar transfer procedures should be developed between Greek sectors. Radar handoff and Acceptance of the Radar handoff is not necessary, and increases the workload very much. Aircraft must be transferred to the next frequency at the same time as the Radar handoff.
When using OLDI, the same procedure of transfer has to be developed. Radar handoff and Acceptance of the Radar handoff is not necessary, and increases the workload very much. Aircraft must be transferred to the next frequency at the same time as the Radar handoff.

- The tasks of the executive and planner controllers have to be very clearly developed and the tasks should not overlap between executive and planner.

- A conflict analysis of the traffic should be made before the STCA appears on the screen.

To be able to implement all the points stated in this chapter, the legal and technical matters have to be posed and solved first.
13. FYROM OBJECTIVE 1

Is not applicable for FYROM.

14. FYROM RESULTS – OBJECTIVE 2

*Identify benefits from the use of new unidirectional routings (Southeast and Northwest bound).*

For comparison reasons the same exercises were tested: with the existing bi-directional routes and with the new proposed and agreed uni-directional routes through Athens and Skopje FIRs.

The participating controllers agreed unanimously that the uni-directional routes reduced workload, reduced the number of conflicts and would be valuable for implementation as soon as possible. There were no negative aspects to the use of uni-directional routes.

![Figure 31: Traditional routes](image)

This is an example of trajectories of one exercise with traditional routes.
Figure 32: Unidirectional routes

This is an example of trajectories of one exercise with uni-directional routes.

Airspace is more efficiently used with uni-directional routes and the risk of conflicts is reduced.
15. FYROM RESULTS – OBJECTIVE 3

*Determine whether a FLAS is appropriate in specific circumstances.*

A FLAS was not considered appropriate under any circumstances in the FYROM airspace, because all the traffic flows converging in Skopje FIR, are not so close to the boundary and controllers have enough time to take action.

In the simulation environment which was without a FLAS, with traffic re-routed via Kosovo and OLDI available, the common conclusion of controllers was that *no* FLAS was needed.

In general, a FLAS was considered by participating controllers as a non-expeditious method of separating aircraft, because traffic is automatically descended to the agreed levels from the FLAS but most of the time the original levels could have been maintained.
16. FYROM RESULTS – OBJECTIVE 4

*Determine the efficiency of the defined vertical sector limits.*

16.1. INTRODUCTION

During the different organisations different vertical sector limits were tested. The upper limit of SKE and SKW was tested first as FL315, then as FL 305 and the upper sector was tested both as a single upper sector and with vertical split again at FL335 and FL 345.

When testing the organisations with three superimposed sectors it was felt that these agreed scenarios did not satisfy the needs, and so a new plan was developed.

In Org 1C with cross-border sectorisation, two different sector splits were tried, with NH sector starting at FL325 above the SKW and SKE sectors, and with three superimposed sectors, maintaining the FL325 sector splits between SKW/SKE and NH, but with an additional NTU sector starting at FL355.

16.2. RESULTS

16.2.1. ORG 1A2

SKE/SKW - GND – FL305  
SKH - FL305 - FL335  
SKTU - FL335 – FL460

A level split of 335 created a high workload for the SKL sector for climbing and descending traffic. Workload in the SKW sector was high too.

![Figure 33: Workload Org 1A2](image)

The participating controllers considered that the lower flight level of SKTU should be an odd flight level because of arrivals to and departures from LGTS.

There was not enough time for co-ordination between the FYROM sectors for traffic with a destination LGTS; this type of traffic is crossing three of the four existing sectors. Because of the amount of co-ordination it was not possible to provide a continuous descent. Therefore the organisation was not considered as viable.
16.2.2. ORG 1B1

SKE/SKW - GND – FL305  
SKH        - FL305 - FL345  
SKTU       - FL345 – FL460

In the SKTU sector there was not too much traffic but there was a lot of traffic in the SKH sector (see the next two figures).

![Number of Aircraft by Time for Sector SKH](image)

**Figure 34: Number of aircraft by time for sector SKH**

![Number of Aircraft by Time for Sector SKTU](image)

**Figure 35: Number of aircraft by time for sector SKTU**
The participating controllers felt that co-ordination was much easier between the three sectors (for arrivals to and departures from LGTS) because of the level division of FL345 between SKH and SKTU.

This sectorisation was preferred to the sectorisation used in ORG 1A2. The division at FL345 between SKH and SKTU was correct. Sector SKW was heavily loaded because of the significant amount of climbing and descending traffic. The planning controller was affected because of the significant amount of co-ordination allocated within the climbing and descending traffic.

16.2.3. ORG 1B2

SKE/SKW - GND – FL315
SKH - FL315 - FL345
SKTU - FL345 – FL460

The participating controllers considered that the lower flight level of SKH should be an odd flight level because of arrivals to and departures from LGTS.

In conclusion this was not considered a good organisation because the division FL between the SKH and SKE/SKW sectors is not an odd flight level and the SKE sector is not loaded while the SKW sector is highly loaded.
16.2.4. New ORG Developed

SKE  - GND - FL305
SKW  - GND - FL345
SKH  - FL305 - FL345 only over SKE
SKTU  - FL345 - FL460

The sector boundary between SKE and SKW was moved to the west as shown on the Figure 38 and SKH was only on top of the newly created SKE sector.

Figure 38: Org1D Skopje new sectors

This organisation was only partially tested during the simulation. The modified sector boundary between SKE and SKW was tested in most of ORG 1D.
The new configuration of the SKH sector was not tested because it was proposed only just before the end of the simulation, but unanimously, the participating controllers considered this sectorisation as the single sectorisation which can properly work in Skopje FIR. Participating controllers believed this because the workload of the SKW sector should have been decreased because no co-ordination is needed for descent and traffic could stay all the time in the same sector (SKW).

Flight level 345 was an odd level as it was the conclusion from previous organisations and the workload between the new design sectors was equally shared.

This airspace organisation was considered by all participating controllers as the best organisation, because of the considerations above.

17. FYROM RESULTS – OBJECTIVE 5

Harmonisation of the separation procedures in Greece, FYROM and Albania to achieve:

   a) 10NM common radar separation procedures, between ACCs,
   b) an understanding of the feasibility of the implementation of proposed separation criteria with adjacent FIRs.

This objective was interpreted as a testing of 10NM common radar separation and find out where problems might occur.

A 10NM common radar separation minimum is feasible, and from an operational viewpoint implementation is possible. However it has to be noted that the requirements on reliable telephone lines and proper radar-coverage in the border areas are essential to maintaining ten miles separation minima.

Participating controllers found that the reduced separation translated into increased capacity and reduction of their workload due to the single separation criteria between Albania, FYROM and Greece. Not needing to apply different separation minima for crossing of the borders reduced the overall workload. Especially for a small FIR like Skopje the reduced separation minima was found to be beneficial.

No losses of separation were found during the measured simulated time.
18. FYROM RESULTS – OBJECTIVE 6

Identify benefits of changed workload characteristics resulting from introduction of OLDI, including the effects on controller interaction with the HMI.

18.1. INTRODUCTION

The participating controllers from FYROM worked with a HMI similar to that of the new Skopje system specification and changes to the colour specifications were made during the simulation to further improve the HMI. This was an added value to the simulation. The system offered OLDI functionality for co-ordination with Athens and Tirana FIRs.

18.2. RESULTS OF INTERFACE WITH HMI

The responses from the participating Skopje controllers indicate no particular problems with the HMI. It was seen as very close to the HMI of the new Alenia system delivered to Skopje. Minor differences were found in the colours used, but did not cause any problems. The use of a three-button mouse operation and window management caused no problems. In dense traffic situations there were concerns over label overlapping which caused extra work and monitoring tasks for the controllers.

The OLDI co-ordination, which is dependent on quick recognition of posted messages, was seen as a mandatory feature which has to be implemented as soon as technically possible. All FYROM controllers expressed satisfaction with the OLDI messages and did not see any forthcoming or potential problem. There were some problems with individual flights where the handover function did not work properly. This was due to system problems with the simulator and not the general function of OLDI.

The sector Inbound List contained the correct information and was found very useful. For a future system the RVSM status of the aircraft should be included in the Sector Inbound List information so that a better planning can be made, knowing the RVSM status in advance (before the aircraft is assumed).

The Short Term Conflict Alert (STCA) was found useful and the various alerts attracted the controller’s attention without unacceptable delays.

The Dynamic Flight Leg (DFL) was found useful.

The Conflict Risk Display (CRD) was found useful, and its presence reduced the workload of the planning controller. Moreover, the CRD allowed controllers to better prioritise the tasks required.
19. FYROM RESULTS – OBJECTIVE 7

Compare Upper airspace (above FL 290) sectorisation:
- Respecting country boundaries,
- Using the airspace from contiguous ATCCs as a continuum.

19.1. INTRODUCTION

In Organisation 1C1/1C2 an upper airspace consisting of the upper airspace of Skopje FIR and a part of the upper TSL area of Athens FIR were made into a common upper airspace. This was simulated both as one upper sector (FL325 upward) and as two upper sectors with an extra split at FL355. The other three organisations tested different sectorisations while respecting the national boundaries.

19.2. RESULTS

19.2.1. ORG 1C2

Organisation 1C2 was not considered as a good idea because the descending traffic through the NH common sector to LGTS (Thessaloniki) were creating high workload and it was considered as a problem while the NTU common sector was not very loaded.

![Estimated Workload (ISA)](image)

*Figure 39: FYROM Org 1C2 ISA workload*
19.2.2. ORG 1C1

In the final analysis 80% of the participating controllers from FYROM said that the “common airspace” was the most efficient sectorisation.

Among the advantages quoted were:

- “Bigger area, more time to organise traffic and improve safety and capacity.”
- “Flexible use of airspace. Less co-ordination. Less workload.”
- “Aircraft stay on frequency longer. Conflicts can be solved with ease with less co-ordination.”
- “Controlling more airspace gives benefits for more direct routings, noticing conflicts earlier, etc.”

The participating controllers’ answers in the questionnaires indicated a problem with en-route sectors where the flight time in a sector was too short. Any actions taken by the controllers required large deviations. Using a bigger sector like NH solved the problem stated before. The efficient planning tasks would also be helped if the aircraft stays longer with the same sector. This is especially true in Skopje FIR where a number of separate routes entering from south merge over the same boundary point in the north.

From an economic viewpoint, the common sector NH (FL325-FL460) was beneficial since it reduced the total number of sectors in operation in the area.
Above is presented the average workload from all the tested exercises of all organisations of the both upper sectors of Skopje.
Figure 42 is presented the average workload of the common sector.

The one common sector was favoured especially by FYROM who think that the main benefit is for northbound traffic converging on XAXAN. This traffic benefits from a longer period for planning and resolution of conflicting levels. Lower limit for FYROM suggested 335 or even the untested 345.

Participating controllers from FYROM thought the real benefits could be greater once the controllers have gained full knowledge of the geography in the new sector.

Specific problems in the sector were encountered with the crossing traffic (east-west and v.v.), which can produce several conflicts due to the high number of almost parallel routes north/south. This could be solved with a system of FLAS.
20. FYROM RESULTS – OBJECTIVE 8

Identify impact of Olympic Games in 2004 on handling of traffic in Greece, FYROM and Albania Airspace.

For all the organisations with national FYROM airspace only, the controllers all felt that the Olympic games did not have an important impact on the workload. The reasons given were:

- Added capacity through RVSM and new sectorisation with up to four sectors in Skopje ACC.
- Parallel route system.
- Flights with destination LGAV do not add specific workload to Skopje ACC.

For the common airspace simulated in Organisation C the traffic for the Olympic games added significantly to the controller workload. Despite this, the common sector NH (FL325-FL460) was seen as the most efficient.
21. ALBANIA  OBJECTIVES 1 & 2

Are not applicable for Albania.

22. ALBANIA  RESULTS – OBJECTIVE 3

Determine whether a FLAS is appropriate in specific circumstances.

The participating controllers considered that a FLAS is not appropriate in any circumstances, because all the traffic flows converging in Tirana FIR, are not so close to the boundary and controllers have enough time to take action. In general a FLAS was considered by the Albanian participating controllers as a non-expeditious method in separating aircraft because traffic is automatically descended to agreed levels from the FLAS but most of the time the original levels could have been maintained.
23. ALBANIA RESULTS – OBJECTIVE 4

Determine the efficiency of the defined vertical sector limits.

23.1. INTRODUCTION

During the first organisation 1A2/1B1, especially with the morning sample, the amount of traffic in the Tirana FIR was found to be very low. This was not felt to be realistic, as the traffic levels were lower than the existing traffic today. The reason was the agreed re-routing of traffic through Kosovo. There is no clear view of what traffic will fly through Tirana FIR in this scenario, and in organisation 1B2/1D, some traffic originally transferring from Italian to Greek airspace and vice versa was re-routed through Tirana FIR. This routing is realistic when Kosovo opens since it offers the shortest route to Central Europe.
23.2. RESULTS

The best organisation quoted by the controllers was ORG 1A2/1B1 where the vertical split between TIRL and TIRH was FL295. For this Organisation controllers felt their workload as EXE and PLC in TIRL and TIRH sectors was distributed uniformly.

In organisation 1B2/1D where the two Albanian sectors were split at FL325, TIRL sector was busier than TIRH.

![Comparison of pilot orders between ORG 1A2/1B1 and 1B2/1D](image)

**Figure 44: Comparison of pilot orders between ORG 1A2/1B1 and 1B2/1D**

It is unwise to make a comparison between the two organisations because of the two traffic levels created by re-routing of the traffic from the Greek KRK sector, in organisation 1B2/1D.
Figure 45: Workload org 1A2/1B1

Figure 46: Workload org 1B2/1D
24. ALBANIA  RESULTS – OBJECTIVE 5

Harmonisation of the separation procedures in Greece, FYROM and Albania to achieve:

a)  10NM common radar separation procedures, between ACCs,

b) an understanding of the feasibility of the implementation of proposed separation criteria with adjacent FIRs.

A 10NM common radar separation minima is feasible, and from an operational viewpoint implementation is possible.

Participating controllers found a reduction of their workload due to the single separation criteria between Albania, FYROM and Greece. Not needing to apply different separation minima for crossing of the borders reduced the overall workload.

In a small FIR like Tirana, reduced separation minima can be seen as equivalent to more available airspace.

No significant losses of separation (less than 3NM) were encountered during the simulation because of 10NM separation.

Attention should be given to flights on route from VJOSA to PAPIZ that intersect the route from TR to GOKEL sometimes at the same FL. The following example was not happening several times but such a situation can become very dangerous especially when aircraft are flying on a direct route.
25. ALBANIA RESULTS – OBJECTIVE 6

Identify benefits of changed workload characteristics resulting from introduction of OLDI, including the effects on controller interaction with the HMI.

25.1. INTRODUCTION

The controllers worked with an EATMP based HMI specific to Tirana. The system offered OLDI functionality for co-ordination with Athens and Skopje FIRs.

25.2. RESULTS OF THE CONTROLLER INTERFACE WITH THE HMI

The participating controllers quickly got used to the three-button mouse operation, found it easy to place the cursor accurately on the desired field for data input or information request and rarely experienced difficulties with the window management.

The radar toolbox was found to be easy to understand and rapid to use.

The colours used in the label information assisted controllers in the execution of their ATC tasks and colour confusion occurred rarely.

Participants felt generally happy with the use of pop-up menus as a means of input to the system.

Controllers rarely missed the initial posting of a message in their Co-ordination In Window.

There were rarely problems in interpreting or understanding messages.

The electronic co-ordination assisted controllers in their ATC tasks very well compared with their existing equipment and procedures. 80% of the controllers did not want any modifications to the simulated electronic co-ordination.

The simulated Extended Radar Label, Standard Label and Selected Label were found complete and the layout was good.

The use of colour for identifying the aircraft status (assumed, concerned, pending, etc) often assisted the controllers in prioritising actions to be taken.

The Sector Inbound List contained the correct information and was found very useful. For a future system the RVSM status of the aircraft should be included in the Sector Inbound List information.

The Short Term Conflict Alert (STCA) was found useful and the various alerts attracted the controller’s attention without unacceptable delays.

The Dynamic Flight Leg (DFL) was found useful.

The Conflict Risk Display (CRD) was found useful, and its presence reduced workload of the planning controller. Moreover, the CRD allowed controllers to better prioritise the tasks required.
26. ALBANIA RESULTS – OBJECTIVE 7

Compare Upper airspace (above FL 290) sectorisation:
- Respecting country boundaries,
- Using the airspace from contiguous ATCCs as a continuum.

The participating controllers shared their appraisal for organisation 1C1/1C2. The common sector NWH was found better than TIRH because there was more space for conflict solving, and more time for traffic analysis.

Figure 47: Comparison of pilot orders between NWH and TIRL
Figure 48: Comparison of pilot orders for TIRL

Figure 49: Workload analysis
The data recorded and compared above doesn’t show a big difference between the organisations. The traffic level was totally different from one organisation to another (see chapter 22.1 Introduction). The result is mainly based on participating controllers feeling and their experience.

27. ALBANIA  RESULTS – OBJECTIVE 8

Identify impact of Olympic Games in 2004 on handling of traffic in Greece, FYROM and Albania Airspace.

No significant impact for Albania was identified for the Olympic Games in 2004 using the prepared traffic samples.

![Average Number of Aircraft in the measured sectors](image)

**Figure 50: Average number of aircraft in the measured sectors**

The Participating Controllers’ impression was that traffic was sometimes lower than currently experienced, because of the assumptions made for re-routing the traffic via Kosovo. For the same reason, probably, traffic was missing on UH77 (VJOSA-PAPIZ) and MAVAR-TR-GOKEL had no traffic in the upper airspace.
28. CONCLUSIONS AND RECOMMENDATIONS

28.1. GREECE

28.1.1. Conclusions

The RVSM transition area was found safe; no particular problem was identified.

The unidirectional routings were very much liked by all participating controllers; they reduced the number of conflicts and would be valuable for implementation as soon as possible.

The need for a FLAS was identified in the border area with Bulgaria and FYROM but for the simulated traffic sample, a FLAS was not needed because of the re-routing of traffic via Kosovo and traffic flying via TIMUR was already in accordance with the FLAS in all traffic samples.

Different vertical and horizontal sector splits were tested during both scenarios. Here are the conclusions from the simulation about the best way to split sectors:

- LMO vertical split at FL285,
- TSL vertical split at FL335,
- KRK vertical split at FL305,
- SKL vertical split at FL285,
- MIL vertical split at FL285, only together with a new route network structure in this sector,
- RDS vertical split at FL285, RDSH was appropriate, RDS (low) still loaded,
- KFL lateral split into KFL and ARA. As it was simulated, the workload was still too high.

A 10NM common radar separation minimum was found feasible and possible to implement.

The simulated OLDI HMI was accepted without any requirement for modification. Participating controllers found it mandatory for the traffic level of the Olympic Games.

The common sector organisation was found to be unsuitable by the majority of the Greek controllers, unlike the controllers from Tirana and Skopje, which were generally in favour of the common sectors.

The participating controllers found the level of the simulated traffic level for the Olympic Games in 2004 to be significant.

28.1.2. Recommendations

The unidirectional routings, as they were simulated, should be implemented before the Olympic Games. Unidirectional routings should be developed in other overloaded sectors together with a redesign of sectorisation (as simulated in GFA RT). This applies especially to the MIL sector.
Use of a FLAS should be limited; it is only to be considered when no other procedure can be applied. The main recommended place to use a FLAS is TIMUR - RUGAS/DISOR so as to have separation over LAMBI and FSK.

The route network structure in MIL has to be re-designed so that several routes don’t all cross each other over the MIL point.

The working methods have to be revised as well so as to be able to cope with 2004 + Olympic Games traffic. In support of this, all probable technical problems have to be solved.

- ATC Clearance should not be repeated on entering the first Greek sector. When receiving the flight plan, the route shall be verified and a warning generated only for the flights with a wrong route filled.
- Identification should not be made when an aircraft is coming from a radar-equipped centre. Radar transfer procedures should be developed between centres (in the Letters of Agreement).
- Radar transfer procedures should be developed between Greek sectors. Radar handoff and Acceptance of the Radar handoff is not necessary, and increases the workload very much. Aircraft must be transferred to the next frequency at the same time as the Radar handoff.
- When using OLDI the same procedures of transfer have to be developed. Radar handoff and Acceptance of the Radar handoff is not necessary, and increases the workload very much. Aircraft must be transferred to the next frequency at the same time as the Radar handoff.
- The controller's tasks of the executive and planner have to be very clearly developed and the tasks should not overlap between executive and planner.
- Controllers should not rely on STCA as a tool for conflict analysis. Planning is necessary to ensure STCA warnings are avoided.

28.2. FYROM

28.2.1. Conclusions

The uni-directional routes reduced the number of conflicts and would be valuable for implementation as soon as possible.

A FLAS was not considered appropriate under any circumstances in the FYROM airspace.

From the prepared organisations the best quoted was 1B1; however, during the simulation, another airspace organisation was developed and quoted to be the best one. Details about this organisation can be found in chapter 16.2.4 "New ORG Developed" of this document.

The simulated 10NM common radar separation minimum was found feasible.

The OLDI co-ordination, which is dependent on quick recognition of posted messages, was not seen as a problem. All FYROM controllers expressed satisfaction with the OLDI messages.

In the final analysis 80% of the participating controllers from FYROM quoted the “common airspace” as the most efficient sectorisation.

The simulated traffic level of 2004 + Olympic Games did not have an important impact on the controllers' workload.
28.2.2. Recommendations

The unidirectional routings as they were simulated, should be implemented as soon as possible, before the Olympic Games.

OLDI co-ordination should be implemented as soon as possible with at least Greece and Bulgaria, before the Olympic Games in 2004.

28.3. ALBANIA

28.3.1. Conclusions

A FLAS is not appropriate in any circumstances.

The traditional organisation (i.e. with no common sectors) that was considered to be the best by the controllers was ORG 1A2/1B1 where the vertical split between TIRL TIRH was FL295.

A 10NM common radar separation minimum can be implemented.

The electronic co-ordination assisted controllers in their ATC tasks very well compared with their existing equipment and procedures.

The organisation that was considered by the controllers to be the best of all was 1C1/1C2. The common sector NWH was found to be better than TIRH.

No big impact for Albania was identified for the Olympic Games in 2004 using the prepared traffic samples.

28.3.2. Recommendations

Attention should be given to flights from VJOSA to PAPIZ that intersect the route of the flights from TR to GOKEL sometimes at the same FL.

Refresher courses for controllers shall be effectuated before implementing the new radar separation minimum so as to avoid losses of separation.

For a future system the RVSM status of the aircraft should be included in the Sector Inbound List information.

During the simulation it was clear that there are several alternative possibilities for traffic overflying this region. Before the Olympic Games in 2004 it must be identified by Albanian representatives, in collaboration with neighbouring states and EUROCONTROL (both CFMU, IFPS and the AMN unit), which routing will be requested and to assess the available capacity to ensure a safe and expeditious handling of all traffic.
La présent session de simulation en temps réel pour la Grèce, l’ancienne République yougoslave de Macédoine (FYROM) et l’Albanie est le troisième volet du Projet de simulation commune pour les Balkans (COSIBA).

En février 1999, l’Administration grecque de l’aviation civile a mis en œuvre un nouveau système ATC baptisé PALLAS, qui requiert une nouvelle méthodologie opérationnelle, avec des modifications importantes.

A court et moyen termes, la mise en œuvre attendue de la Version 4 du réseau de routes ATS ainsi que la révision des Lettres d’accord régionales vont avoir de fortes répercussions sur les opérations ATC de la FYROM. Pour être à même d’absorber la demande de trafic future, la FYROM va mettre en œuvre une nouvelle salle de contrôle équipée d’un système ATC ALENIA. Cette mise en œuvre nécessitera une adaptation importante des méthodes de travail des contrôleurs.


Ce sont les besoins des trois pays susvisés qui ont commandé les caractéristiques de la présente simulation.


Pour chacun des trois pays, l’objectif est d’évaluer la meilleure organisation possible de l’espace aérien (routes, sectorisation, RVSM …) et la méthode d’exploitation (coordinations entre centres/secteurs, partage des tâches entre contrôleurs…) la plus efficace pour absorber la demande de trafic attendue dans les 5/6 années à venir (y compris les Jeux olympiques de 2004).

Dans ce contexte, la Simulation GFA en temps réel s’est déroulée au Centre expérimental d’EUROCONTROL entre le 12 novembre et le 7 décembre 2001. Pour simuler l’ensemble de l’espace aérien des trois pays, l’activité a été scindée en deux scénarios : le Scénario 1, entre le 12 novembre et le 23 novembre, a consisté en la simulation du Nord de la Grèce, de la FYROM et de l’Albanie, et le Scénario 2, entre le 26 novembre et le 7 décembre, en la simulation de l’ensemble de l’espace aérien de la Grèce. Pendant la simulation, les contrôleurs ont participé à 7 exercices d’entraînement à la simulation et à 42 exercices mesurés de simulation, pour un total de 84 heures de simulation.
COOPÉRATION RÉGIONALE

L'un des objectifs de la simulation était de tester une sectorisation transfrontalière pour évaluer l'utilité potentielle d'une coopération régionale au-delà des frontières nationales. A cette fin, un scénario qui comportait des secteurs en route supérieurs combinant de l'espace aérien Albanie/Grèce et FYROM/Grèce dans les mêmes volumes a été testé. Dans ce scénario, l'espace aérien a été traité comme une seule entité, avec application des mêmes minima d'espacement (10 NM) dans l'ensemble de l'espace aérien et compte non tenu de la contrainte actuelle qui impose un accroissement des minima d'espacement lors du franchissement des frontières nationales.

Le scénario a été évalué en fonction des économies globales (élimination de secteurs ATC), de l'amélioration de la planification grâce à l'accroissement de la taille des secteurs et du renforcement de la capacité grâce à la réduction des espacements lors du franchissement des frontières.

CETTE SIMULATION A ÉVALUÉ LES ÉLÉMENTS SUIVANTS :

- Transition vers des niveaux non–RVSM et à partir de ces niveaux, dans la partie sud de la FIR de la Grèce, selon les procédures établies dans le cadre du sous-projet de modélisation.
- Avantages procurés par l'utilisation de nouveaux itinéraires unidirectionnels (vers le sud-est et le nord-ouest).
- Opportunité d'un schéma d'allocation des niveaux de vol (FLAS) dans certaines circonstances particulières.
- Efficacité des limites verticales définies pour les secteurs.
- Harmonisation des procédures d'espacement en Grèce, dans la FYROM et en Albanie, afin d'obtenir un espacement radar commun de 10NM grâce à l'application de procédures communes entre CCR.
- La simulation a permis de déterminer les avantages d'une modification des caractéristiques de la charge de travail résultant de l'utilisation de l'OLDI, notamment ses effets sur l'interaction des contrôleurs avec la HMI.
- Une sectorisation de l'espace aérien supérieur (au-dessus du FL 290), avec respect des frontières nationales et espace aérien considéré comme un continuum, a fait l'objet d'une comparaison.
- Les pertes d'espacement et les incidents ont été suivis pendant la simulation au moyen de l'Instrument de contrôle de la sécurité de l'ATM (ASMT).
- Les résultats ont été les suivants :

Zone de Transition RVSM

Aucune constatation particulière n'a été faite en ce qui concerne la zone de transition RVSM, si ce n'est que l'utilité des routes unidirectionnelles s'est trouvée confirmée.
Utilisation de routes unidirectionnelles

Pour ce qui est des cinq objectifs principaux de la simulation, il a été constaté, en général, que l'utilisation de routes unidirectionnelles pour traverser l'espace aérien de la Grèce et celui de la FYROM donnait des résultats très positifs, voire essentiels pour la prise en charge du trafic dans de bonnes conditions de sécurité et d'organisation. La capacité de l'espace aérien et la capacité de prise en charge du trafic par les contrôleurs s'en sont trouvées grandement renforcées. Cette conclusion donne à penser que les routes unidirectionnelles sont indispensables tant pour le fonctionnement efficace du RVSM que pour la prise en charge des niveaux de trafic simulés dans la perspective des Jeux olympiques de 2004.

Harmonisation des minima d'espacement/connexion OLDI

L'harmonisation des minima d'espacement et la coordination automatisée grâce aux liaisons OLDI entre les pays participants sont étroitement liées. Les minima d'espacement appliqués (10 NM dans l'ensemble de la région) ont aidé les contrôleurs à prendre en charge les niveaux de trafic simulés, et la coordination automatisée, dans une telle situation, a été perçue comme un élément favorisant cette prise en charge. L'expérience de la coordination OLDI n'a été acquise que dans le cadre du premier scénario, le second n'ayant pas fait appel à l'OLDI. Dans les deux scénarios, les contrôleurs participants ont souligné l'utilité de l'harmonisation des minima d'espacement (réduit).

Utilisation partagée de l'espace aérien supérieur

Dans le premier scénario, un espace aérien composé de l'espace aérien supérieur de l'Albanie et de la partie septentrionale du secteur KRK a été simulé comme un seul secteur commun, desservi alternativement par des contrôleurs grecs ou albanais. Lors de l'analyse, les contrôleurs albanais ont exprimé un avis général positif et marqué leur préférence pour cette sectorisation par rapport à la sectorisation en vigueur. En revanche, les contrôleurs grecs ont jugé la sectorisation actuelle préférable, le scénario commun entraînant une surcharge des contrôleurs de secteur.

L'autre secteur commun simulé était composé de l'espace aérien supérieur de la FYROM et de la partie septentrionale du secteur TSL. Cette sectorisation a été bien reçue par les contrôleurs de la FYROM, qui ont apprécié l'élargissement de la région, favorable à une amélioration de la planification de secteur, tandis que les contrôleurs grecs ont marqué leur préférence pour la sectorisation nationale actuelle.

Indépendamment du caractère subjectif de l'appréciation des secteurs testés, les avantages qu'offre le fait de considérer l'espace aérien comme un continuum et de rechercher une sectorisation optimale sont évidents.
Les avantages sont notamment les suivants :

- La possibilité d'éliminer un ou plusieurs secteurs se traduit par une baisse des coûts d'exploitation, grâce à une diminution des coûts de personnel.
- L'élimination de LoA pour l'espacement au franchissement des limites de FIR rend possible l'application d'un espacement de 10 NM au lieu des 20 NM actuellement appliqués lors du franchissement des frontières nationales.
- Davantage de souplesse pour la re-sectorisation future.
- Amélioration de la redondance en cas de panne de système.
- Réduction du nombre de transferts de fréquence pour les aéronefs.

CONCLUSIONS NATIONALES

Grèce

Les incidences des Jeux olympiques évaluées pendant la simulation ont été importantes dans l'espace aérien grec, et les contrôleurs ont estimé qu'il fallait envisager les mesures suivantes pour le système grec :

- La mise en œuvre de la coordination OLDI avec les États voisins est une priorité.
- Des routes unidirectionnelles sont indispensables pour permettre la prise en charge du niveau de trafic simulé.
- L'établissement d'une région de contrôle au lieu de routes ATS routes renforcera la capacité en permettant un degré plus élevé de guidage radar.
- Les niveaux privilégiés de démarcation de l'espace aérien grec dans le plan vertical ont été déterminés.

FYROM

- Il est apparu que les Jeux olympiques n'ont pas d'incidence grave sur l'espace aérien de la FYROM.
- Les routes unidirectionnelles à destination/en provenance de la FIR de la Grèce se sont révélées très favorables à une augmentation de la capacité.
- Plusieurs délimitations des secteurs dans les plans horizontal et vertical ont été testées, ce qui a permis de déterminer le choix privilégié.
- Le schéma d'allocation des niveaux de vol (FLAS) s'est révélé inutile et sans intérêt pour la FYROM.

Albanie

- Il est apparu que les Jeux olympiques n'ont pas d'incidence grave sur l'espace aérien de l'Albanie.
- Le schéma d'allocation des niveaux de vol (FLAS) s'est révélé inutile et sans intérêt pour l'Albanie.
- Plusieurs délimitations des secteurs dans les plans horizontal et vertical ont été testées, ce qui a permis de déterminer le choix privilégié.
- Une expérience de l'exploitation d'un système moderne a pu être acquise et un certain nombre de modifications ont été apportées à la HMI. Il sera tiré parti de cette expérience dans les spécifications du nouveau système ATM de l'Albanie.
1. INTRODUCTION

La Simulation GFA en temps réel s'est déroulée au Centre expérimental d'EUROCONTROL entre le 12 novembre et le 7 décembre 2001. Elle visait à répondre aux besoins de l'Administration grecque de l'aviation civile (HCAA), de l'Administration de l'aviation civile de la FYROM (DGCA) de Skopje, et de l'Administration de l'aviation civile d'Albanie (NATA).

Le présent rapport expose les résultats de la simulation GFA en temps réel.

La HCAA, la DGCA et la NATA ont décidé, avec l'assistance d'EUROCONTROL :

- d'évaluer la transition à partir des niveaux non–RVSM et vers ces niveaux, dans le sud de la FIR de la Grèce,
- d'évaluer les nouveaux itinéraires unidirectionnels,
- d'évaluer l'opportunité d'un FLAS dans certaines circonstances particulières,
- d'évaluer l'efficacité des limites verticales définies pour les secteurs,
- d'évaluer les procédures d'espacement en Grèce, FYROM et Albanie pour obtenir un espacement radar commun de 10 NM entre CCR,
- de répertorier les avantages de l'introduction de l'OLDI,
- de comparer une sectorisation de l'espace aérien supérieur (au-dessus du FL 290) qui tienne compte des frontières nationales et utilise l'espace aérien de centres de contrôle adjacents comme un continuum,
- de déterminer les incidences des Jeux olympiques de 2004 sur la prise en charge du trafic dans les espaces aériens de la Grèce, de la FYROM et de l'Albanie.

Pour atteindre l'ensemble de ces objectifs et simuler tous les secteurs des trois États, la simulation a été divisée en deux parties. La première partie, appelée Scénario 1, s'est déroulée entre le 12 et le 23 novembre 2001 et a porté sur la totalité de l'espace aérien de la FYROM et de l'Albanie ainsi que sur la partie septentrionale de l'espace aérien grec. La seconde partie, appelée Scénario 2, s'est déroulée entre le 26 novembre et le 7 décembre et a porté sur la totalité de l'espace aérien de la Grèce.

La sécurité a été évaluée à l'aide de l'Instrument de contrôle de la sécurité de l'ATM (ASMT).
2. OBJECTIFS

2.1. OBJECTIFS GÉNÉRAUX

- Examiner l'application du RVSM, compte tenu notamment du fait qu'une partie de l'espace aérien simulé est également une zone de transition entre l'espace aérien RVSM et l'espace aérien non-RVSM.
- Étudier l'harmonisation des minima d'espacement dans la région.
- Étudier les avantages de l'application et de l'exploitation de l'OLDI.
- Explorer les possibilités d'utilisation partagée de l'espace aérien supérieur pour obtenir une sectorisation optimisée.
- Analyser les incidences de la pointe de trafic temporaire attendue pour l'été 2004 (Jeux olympiques d'Athènes) en association avec les objectifs ci-dessus.

2.2. OBJECTIFS PARTICULIERS

1) Évaluer la transition vers les niveaux non-RVSM et à partir de ces niveaux dans le sud de la FIR de la Grèce, en utilisant les procédures établies dans le cadre du sous-projet GFR.
2) Répertorier les avantages à escompter de l'utilisation de nouveaux itinéraires unidirectionnels (vers le sud-est et le nord-ouest).
3) Déterminer l'opportunité d'un FLAS dans des circonstances particulières.
4) Déterminer l'efficacité des limites de secteur définies dans le plan vertical.
5) Harmoniser les procédures d'espacement en Grèce, FYROM et Albanie, pour obtenir :
   a) un espacement radar commun de 10 NM à l'aide de procédures communes entre CCR ;
   b) une compréhension de la faisabilité de la mise en œuvre des critères d'espacement proposés avec les FIR adjacentes.
6) Répertorier les avantages des nouvelles caractéristiques de la charge de travail qui résultent de l'application de l'OLDI, notamment ses effets sur l'interaction des contrôleurs avec la HMI.
7) Comparer une sectorisation de l'espace aérien supérieur (au-dessus du FL 290) :
   - qui respecte les frontières nationales,
   - qui utilise l'espace aérien de centre de contrôle contigus comme un continuum.
3. CONCLUSIONS ET RECOMMANDATIONS

3.1. GRÈCE

3.1.1. Conclusions

La zone de transition RVSM s’est révélée sûre ; aucun problème particulier n’a été relevé.

Les cheminements unidirectionnels ont été très appréciés par tous les contrôleurs participants ; ils ont réduit le nombre de conflits et leur mise en œuvre à bref délai serait précieuse.

Un FLAS est apparu nécessaire dans la zone à la frontière de la Bulgarie et de la FYROM, mais non pour l’échantillon de trafic simulé, parce que le réacheminement du trafic via le Kosovo et le trafic passant par TIMUR sont déjà conformes au FLAS dans tous les échantillons de trafic.

Différentes délimitations des secteurs, dans les plans vertical et horizontal, ont été testées dans le cadre de deux scénarios. Les conclusions de la simulation à ce sujet sont les suivantes :

- LMO démarcation verticale au FL285.
- TSL démarcation verticale au FL335.
- KRK démarcation verticale au FL305.
- SKL démarcation verticale au FL285.
- MIL démarcation verticale au FL285, uniquement en association avec une nouvelle structure de routes dans ce secteur.
- RDS démarcation verticale au FL285, RDSH opportun, RDS (inférieur) encore chargé.
- KFL démarcation latérale dans KFL et ARA. Dans les conditions de simulation, la charge de travail est encore trop élevée.

Un minimum d’espacement radar commun de 10NM s’est révélé faisable et possible à mettre en œuvre.

La HMI OLDI simulée a été acceptée sans exiger de modification. Les contrôleurs participants l’ont jugée obligatoire pour le niveau de trafic des Jeux olympiques.

L’organisation de secteurs communs a été jugée inadaptée par la majorité des contrôleurs grecs, alors que les contrôleurs de Tirana et Skopje se sont généralement déclarés en faveur de tels secteurs.

Les contrôleurs participants ont estimé que le niveau de trafic simulé pour les Jeux olympiques de 2004 était significatif.
3.1.2. Recommandations

Les itinéraires unidirectionnels, tels que simulés, devraient être mis en œuvre avant les Jeux olympiques. Il convient de mettre au point des itinéraires unidirectionnels dans d'autres secteurs surchargés et de revoir la sectorisation (telle que simulée lors de la simulation en temps réel GFA). Cette remarque vaut particulièrement pour le secteur MIL.

Le recours à un FLAS devrait être limité ; il n'est à envisager que lorsque aucune autre procédure ne peut être appliquée. L'espace aérien dans lequel un FLAS est recommandé est celui de TIMUR - RUGAS/DISOR, de manière à avoir une séparation au-dessus de LAMBI et FSK.

La structure du réseau de routes dans le secteur MIL doit être revue pour éviter que plusieurs routes ne se coupent au-dessus du point MIL.

Les méthodes de travail sont elles aussi à revoir, afin que le trafic de 2004 + celui des Jeux olympiques puisse être absorbé. A l'appui de cette révision, il faudra également résoudre tous les problèmes techniques probables.

- La clairance ATC ne devrait pas être renouvelée à l'entrée dans le premier secteur grec. À la réception du plan de vol, la route sera vérifiée et un avertissement émis uniquement pour les vols planifiés sur une route erronée.
- Il convient de ne pas faire d'identification lorsqu'un aéronef arrive d'un centre équipé d'un radar. Des procédures de transfert de contrôle radar devraient être mises au point entre centres (dans les Lettres d'accord).
- Il convient de mettre au point des procédures de transfert de contrôle radar entre centres grecs. Le transfert radar et son acceptation sont inutiles et accroissent fortement la charge de travail. Les aéronefs doivent être transférés vers la fréquence suivante au moment même du transfert radar.
- En cas d'utilisation de l'OLDI, les mêmes procédures de transfert doivent être mises au point. Le transfert radar et son acceptation sont inutiles et accroissent fortement la charge de travail. Les aéronefs doivent être transférés vers la fréquence suivante au moment même du transfert radar.
- Les tâches des contrôleurs radar et de planification doivent être très clairement définies et ne pas se chevaucher.
- Une analyse de conflit devrait être faite avant que le STCA n'apparaisse sur l'écran.
3.2. FYROM

3.2.1. Conclusions

Les itinéraires unidirectionnels réduisent le nombre de conflits et il serait très utile de les mettre en œuvre dans les meilleurs délais.

Il n’est pas opportun d’appliquer un FLAS dans l’espace aérien de la FYROM, quelles que soient les circonstances.

Parmi les organisations proposées, c’est la 1B1 qui a reçu la meilleure cote ; cependant, durant la simulation, une autre organisation de l’espace aérien a été mise au point et considérée comme la meilleure. Des précisions à son sujet peuvent être consultés au chapitre 16.2.4 “New ORG Developed” du présent document.

L’espacement radar minimum simulé, de 10 NM, s’est révélé faisable.

La coordination OLDI, qui est tributaire d’une reconnaissance des messages affichés, n’est pas apparue comme posant problème. Les contrôleurs de la FYROM se sont tous déclarés satisfaits des messages OLDI.

Lors de l’analyse finale, 80% des contrôleurs participants de la FYROM ont déclaré que "l'espace aérien commun" constituait la sectorisation la plus efficace.

Le niveau de trafic simulé pour 2004 + les Jeux olympiques n’a pas eu d’incidences importantes sur la charge de travail des contrôleurs.

3.2.2. Recommandations

Les routes unidirectionnelles, telles que simulées, devraient être mises en œuvre dans les meilleurs délais, avant les Jeux olympiques.

La coordination OLDI devrait être mise en œuvre dès que possible, avec la Grèce et la Bulgarie au moins, avant les Jeux olympiques de 2004.

3.3. ALBANIE

3.3.1. Conclusions

Il n’est pas opportun de mettre en œuvre un FLAS, quelles que soient les circonstances.

L’organisation traditionnelle (c'est-à-dire sans secteurs communs) considérée comme la meilleure par les contrôleurs était la 1A2/1B1, dans laquelle le niveau de démarcation entre TIRL et TIRH se situait au FL295.

La mise en œuvre d’un espacement radar minimum commun de 10NM est possible.

La coordination électronique a bien aidé les contrôleurs dans l’accomplissement de leurs tâches ATC, par rapport à l’équipement et aux procédures actuels.
L’organisation considérée comme la meilleure de toutes par les contrôleurs était la 1C1/1C2. Le secteur commun NWH a été jugé meilleur que TIRH.

Sur la base des échantillons de trafic préparés, les Jeux olympiques de 2004 ne devraient pas avoir de fortes incidences sur l’Albanie.

3.3.2. Recommandations

Il convient de faire attention aux vols de VJOSA vers PAPIZ qui coupent la route que les vols de TR vers GOKEL empruntent parfois au même niveau.

Des stages de recyclage seront organisés à l’intention des contrôleurs avant la mise en œuvre du nouveau minimum d’espacement radar pour éviter les pertes d’espacement.

Pour un système futur, l’homologation ou la non-homologation RVSM des aéronefs devrait être indiquée dans les informations de la Liste d’entrées dans le secteur.

Pendant la simulation, il est apparu clairement qu’il existait plusieurs possibilités de rechange pour le trafic survolant la région. Avant les Jeux olympiques de 2004, les représentants de l’Albanie devront déterminer, en collaboration avec les États voisins et EUROCONTROL (CFMU, IFPS et Unité AMN), quelles routes doivent être suivies, et évaluer la capacité disponible pour que la prise en charge de l’ensemble du trafic puisse se faire dans de bonnes conditions de sécurité et de fluidité.
ANNEXES
ANNEX A: TRAFFIC SAMPLE ANALYSIS SCENARIO 1

Traffic Level 2004 + Olympic Games

The analysis of the traffic samples below shows the load that each sample represented for the simulated measured area.

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ANNEX B: TRAFFIC SAMPLE ANALYSIS SCENARIO 2

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M – Morning Sample
A – Afternoon Sample

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ANNEX C: MAPS FOR SCENARIO 1

Figure C1: Org 1A2
Figure C2: Org 1B1
Figure C5: Org 1C1
Figure C6: Org 1C2
ANNEX D: MAPS FOR SCENARIO 2

Figure D1: Org 2A
Figure D2: Org 2B
Figure D3: Org 2C
ANNEX E: LOSSES OF SEPARATION

1. LOSSES OF SEPARATION

1.1 Organisation 1A2

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Figure E1: Losses of separation ORG 1A2

![Losses of separation ORG 1A2](image-url)
Aircraft are not in the same frequency.
Figure E3

LMO Sector.
SKL Sector.
Example of a minor loss of separation in LMO and SKL. When separation is 10NM these should be respected strictly.
One aircraft climbing through an occupied flight level in SKL sector.
Figure E7a: 1/4
Figure E7b: 2/4
Figure E7c: 3/4
In the previous series of 4 figures a classical example of a climb is shown, where the separation is 0NM. For two aircraft initially separated, when 16NM one in front of the other, a climb order was given by the controller, which reduced the separation to 0NM.
1.2 Organisation 1B1

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Figure E8: Losses of separation ORG 1B1
AIH842 climbed in front of the opposite traffic BER758E.
Order for climb was given when the horizontal distance from the two aircraft was far away below the minimum separation.
1.3 **Organisation 1B2**

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**Figure E11: Losses of separation ORG 1B2**
No proper planning of the conflict was done. Only when STCA displayed on the controller’s screen, avoiding action was taken.
Figure E13

No proper planning of the conflict.
### 1.4 Organisation 1D

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#### Figure E14: Losses of separation ORG 1D
For the two climbing aircraft the conflict solving was not planned, avoiding action taken only when STCA appeared on the screen.
This conflict was not seen by the controller not even when the STCA went on. This was happening because KRK sector was overloaded.
1.5 Organisation 1C1

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Figure E17: Losses of separation ORG 1C1
No planning was done. TRA350X was requested by the controller to climb. When STCA turned on, traffic was descended. LMO sector as it was simulated in ORG 1C was totally overloaded. Controller could not control the traffic in this sector.
Because of the LMO sector overload controller couldn’t see the conflict which ended with a separation of 0NM. Even STCA in these conditions of overload was not helping at all.
Figure E20

Same way traffic, one climbing one descending, in KRK sector.
### 1.6 Organisation 1C2

#### MA/M041C2

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**Figure E21: Losses of separation ORG 1C2**
Opposite traffic, when STCA was on, avoiding action was taken. This happened because the workload in LMO as in ORG 1C was very high and the controller was not able to control the traffic.
### 1.7 Organisation 2A

#### ORG 2A

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**Figure E23: Losses of separation ORG 2A**
Opposite traffic, DAN542X climbing slowly. No action was taken by the controller.
Correct climbing procedure applied but separation was below 10NM.
Opposite traffic. No action taken by the controller.
Same way traffic. No action was taken by the controller. Sector RDS
Figure E28

Descent clearance was given to FCN825X without taking into consideration the other same way traffic. Only when STCA went on, climb was given to the descending flights as an avoiding action.
Both flights cleared to climbing at the same flight level.
Same way traffic, one descending.
Wrong co-ordination for climbing for AEE135 between LMO and FEB.
### 1.8 Organisation 2B

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**Figure E32: Losses of separation ORG 2B**
Opposite flights, one climbing, one descending. Wrong CFL cleared by the controller.
MIL point is one of the most dangerous points in Greece because of numerous crossing airways. Example of two crossing traffic at the same flight level, separation 0NM.
1.9 Organisation 2C

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Figure E35: Losses of separation ORG 2C
Crossing traffic one climbing through the other’s flight level in MIL sector.
Opposite traffic in TSL sector.
Figure E38

One aircraft climbing, one descending in LMO sector.
Same way traffic, one descended through the occupied flight level
1.10 MAP OF OVERALL LOSSES OF SEPARATION

Figure E40: Map of overall losses of separation
ANNEX F: SIMULATED TRAFFIC FLOWS

Figure F1: Simulated traffic flows using traditional routes
Parallel Routes

Figure F2: Simulated traffic flows using parallel routes