ICAO STATE ACTION PLAN

On reducing CO2 emissions in aviation of the Republic of Serbia
Imprint

Civil Aviation Directorate of the Republic of Serbia
Skadarska 23
11000 Beograd

Principal Contact:
Maja Bjelobrk
Advisor for Environmental Protection and GHG emissions
Tel: +38 112927123
E-mail: maja.bjelobrk@cad.gov.rs

Authors:
Maja Bjelobrk - Advisor for Environmental Protection and GHG emissions
Sanja Marković - Advisor for Environmental Protection

Approved by:
Director of Civil Aviation Directorate of the Republic of Serbia
Mirjana Ćizmarov

July 2019
CONTENTS

Contents.............................................................................................................................................. 3

1. Introduction......................................................................................................................................... 7

1.1. COMMON SECTION......................................................................................................................... 7

2. CIVIL AVIATION IN SERBIA................................................................................................................ 9

2.1. HISTORICAL BACKGROUND.......................................................................................................... 9

2.2. NATIONAL STAKEHOLDERS IN AVIATION IN SERBIA.............................................................. 10

2.2.1. CIVIL AVIATION DIRECTORATE OF THE REPUBLIC OF SERBIA - CAD ........... 12

2.2.2. SMATSA LLC ............................................................................................................................ 13

2.2.3. MILITARY AUTHORITIES .......................................................................................................... 14

3. STRUCTURE OF THE AVIATION SECTOR....................................................................................... 14

3.1. AIR CARRIERS WITH A SERBIAN AOC ...................................................................................... 14

3.2. SERBIAN AIRWORTHINESS AIRCRAFT ..................................................................................... 15

3.3. Airports in the Republic of Serbia .................................................................................................. 19

3.3.1. LIST OF AERODROME OPERATORS WITH AERODROME CERTIFICATE: ........ 19

3.3.2. LIST OF AERODROME OPERATORS WITH APPROVAL TO OPERATE AN AERODROME ......................................................................................................................... 19

3.3.3. LIST OF AERODROME OPERATORS WITH AGREEMENT TO OPERATE AN ...... 20

3.3.4. LIST OF HELIPORT OPERATORS WITH AGREEMENT TO OPERATE A HELIPORT ................................................................................................................................. 21

4. TRAFFIC PERFORMANCE at the Airports Belgrade and Niš from 2014 to 2018 ...................... 22

4.1. TRAFFIC PERFORMANCE AT AIRPORT BELGRADE FROM 2014 – 2018 ...................... 22

4.2. TRAFFIC PERFORMANCE AT AIRPORT NIS FROM 2014 TO 2018 ................................. 22

5. MEMBERSHIP IN INTERNATIONAL.............................................................................................. 23

6.1. EXECUTIVE SUMMARY .............................................................................................................. 23

6.2. AIRCRAFT RELATED TECHNOLOGY ......................................................................................... 24

6.3. ALTERNATIVE FUELS .................................................................................................................. 25

6.4. IMPROVED AIR TRAFFIC MANAGEMENT ................................................................................. 26

6.5. ECONOMIC/MARKET BASED MEASURES (MBMS) ............................................................. 26

6.6. ECAC SCENARIOS FOR TRAFFIC AND CO2 EMISSIONS .................................................. 27
7. REGIONAL COORDINATION AND PROJECTS ................................................................. 28

8. ACTIONS TAKEN AT THE SUPRANATIONAL LEVEL .................................................... 31

8.1. TRAFFIC SCENARIO “REGULATION AND GROWTH” .............................................. 32
8.2. ECAC BASELINE SCENARIO .................................................................................. 33
8.3. FURTHER ASSUMPTIONS AND RESULTS FOR THE BASELINE SCENARIO .......... 36
8.4. ECAC SCENARIO WITH IMPLEMENTED MEASURES, ESTIMATED BENEFITS OF MEASURES .............................................................................................................. 39

9. ACTIONS TAKEN COLLECTIVELY THROUGHOUT EUROPE ....................................... 43

9.1. aircraft related technology development .................................................................. 43
  9.1.2 RESEARCH AND DEVELOPMENT ........................................................................ 43
9.2. alternative fuels ......................................................................................................... 45
  9.2.1. EUROPEAN ADVANCED BIOFUELS FLIGHTPATH ......................................... 45
  9.2.2. RESEARCH AND DEVELOPMENT PROJECTS ON ALTERNATIVE FUELS IN AVIATION ......................................................................................................................... 48
9.3. IMPROVED AIR TRAFFIC MANAGEMENT AND INFRASTRUCTURE USE ................. 50
  9.3.1. SESAR PROJECT ................................................................................................. 50
  9.3.2. SESAR RESEARCH PROJECTS (ENVIRONMENTAL FOCUS) ............................ 51
  9.3.3. SESAR DEMONSTRATION PROJECTS: ............................................................... 53
  9.3.4. SESAR2020 ENVIRONMENTAL PERFORMANCE ASSESSMENT .................. 59
9.4. economic / market – based measures ........................................................................ 65
  9.4.1 THE EU EMISSION TRADING SYSTEM ............................................................... 65
  9.4.2. THE CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION ......................................................................................................................... 70
9.5. EU INITIATIVES IN THIRD COUNTRIES ................................................................. 72
  9.5.1 MULTILATERAL PROJECTS ................................................................................... 72
9.6. SUPPORT TO VOLUNTARY ACTIONS .................................................................... 73
  9.6.1. ACI AIRPORT CARBON ACCREDITATION ....................................................... 73

10. National actions in SERBIA ....................................................................................... 77

10.1 OVERVIEW (OBJECTIVES) ...................................................................................... 77
10.2. TYPE OF ACTIONS TO BE TAKEN ......................................................................... 77
10.3. RESPONSIBLE NATIONAL INSTITUTIONS ............................................................. 78
10.4. RESOURCES NEEDED TO IMPLEMENT THE PROPOSED ACTIONS ..................... 78
10.5. REPORTING ............................................................................................................. 78
10.6. UPDATE OF THE ACTION PLAN .......................................................................... 79

11. DESCRIPTION OF ACTIONS AT NATIONAL LEVEL IN serbia .................................. 79
11.1. CONTINUOUS PROMOTION OF PRACTICES AND PROCEDURES AT OPERATIONAL LEVEL WITH AN IMPACT ON FUEL CONSUMPTION REDUCTION

11.1.1. Description

11.1.2. CATEGORY

11.1.3. START DATE

11.1.4. DATE OF FULL IMPLEMENTATION

11.1.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION

11.1.6. REFERENCE TO EXISTING LEGISLATION

11.1.7. IF A NEW LEGISLATION IS PROPOSED

11.1.8. RESOURCES NEEDED FOR IMPLEMENTATION

11.1.9. LIST OF STAKEHOLDERS INVOLVED

11.2. ESTABLISHMENT OF REPORTING SYSTEM FOR THE EU DIRECTIVE 2009/29/EC (EU ETS)

11.2.1. DESCRIPTION

11.2.2. CATEGORY

11.2.3. START DATE

11.2.4. DATE OF FULL IMPLEMENTATION

11.2.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION

11.2.6. REFERENCE TO EXISTING LEGISLATION

11.2.7. IF A NEW LEGISLATION IS PROPOSED

11.2.8. RESOURCES NEEDED FOR IMPLEMENTATION

11.2.9. LIST OF STAKEHOLDERS INVOLVED

11.3. CREATION OF A MONITORING, REPORTING AND VERIFYING SYSTEM FOR THE SUCCESSFUL IMPLEMENTATION OF THE EU EMISSIONS TRADING SCHEME

11.3.1. DESCRIPTION

11.3.2. CATEGORY

11.3.3. START DATE

11.3.4. DATE OF FULL IMPLEMENTATION

11.3.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION

11.3.6. REFERENCE TO EXISTING LEGISLATION

11.3.7. IF A NEW LEGISLATION IS PROPOSED

11.3.8. RESOURCES NEEDED FOR IMPLEMENTATION

11.3.9. LIST OF STAKEHOLDERS INVOLVED

11.4. IMPLEMENTATION OF CDO LANDING PROCEDURES AND DEVELOPMENT OF PBN PROCEDURES

11.4.1. DESCRIPTION

11.4.2. CATEGORY
1. INTRODUCTION

1.1. COMMON SECTION

a) The Republic of Serbia is a candidate country for European Union membership. Through the ECAA Agreement\(^1\), Serbia has accepted to align its national aviation legislation to the complete aviation acquis of the Community. To this end, Serbia signed the ECAA Agreement in May 2006 which was ratified in May 2009. Serbia is also member of the European Civil Aviation Conference (ECAC). ECAC is an intergovernmental organization covering the widest grouping of Member States\(^2\) of any European organization dealing with civil aviation. It is currently composed of 44 Member States, and was created in 1955.

b) ECAC States share the view that environmental concerns represent a potential constraint on the future development of the international aviation sector, and together they fully support ICAO’s ongoing efforts to address the full range of these concerns, including the key strategic challenge posed by climate change, for the sustainable development of international air transport.

c) Serbia, like all of ECAC’s forty-four States, is fully committed to and involved in the fight against climate change, and works towards a resource-efficient, competitive and sustainable multimodal transport system.

d) Serbia recognizes the value of each State preparing and submitting to ICAO a State Action Plan on emissions reductions, as an important step towards the achievement of the global collective goals agreed at the 37\(^{th}\) Session of the ICAO Assembly in 2010.

e) In that context, it is the intention that all ECAC States submit to ICAO an Action Plan\(^3\), regardless of whether or not the 1% de Minimis threshold is met, thus going beyond the agreement of ICAO Assembly Resolution A37-19. This is the Action Plan of the Republic of Serbia.

---

\(^1\) ECAA (European Common Aviation Area) is a project initiated and managed by the European Commission, aiming at the establishment of equal conditions of competition and common rules in aviation, including ATM and environment.

\(^2\) Albania, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and the United Kingdom

\(^3\) ICAO Assembly Resolution A37-19 also encourages States to submit an annual reporting on international aviation CO\(_2\) emissions. This is considered by Europe an important task, but one which is different in nature and purpose to the Action Plans, which are strategic in their nature. For that reason, the reporting to ICAO on international aviation CO\(_2\) emissions referred to a paragraph 9 of ICAO Resolution A37-19 is not part of this Action Plan. This information will be provided to ICAO separately.
f) Serbia shares the view of all ECAC States that a comprehensive approach to reducing aviation emissions is necessary, and that this should include:

   i. Emission reductions at source, including European support to CAEP work.

   ii. Research and development on emission reductions technologies, including public-private partnerships.

   iii. The development and deployment of low-carbon sustainable alternative fuels, including research and operational initiatives undertaken jointly with stakeholders.

   iv. The optimization and improvement of Air Traffic Management, and infrastructure use within Europe, in particular through the Single European Sky ATM Research (SESAR), and also beyond European borders, through the Atlantic Initiative for the Reduction of Emissions (AIRE) in cooperation with the US FAA.

   v. Market-based measures, such as open emission trading schemes (ETS), which allow the sector to continue to grow in a sustainable and efficient manner, recognizing that the measures at (i) to (iv) above cannot, even in aggregate, deliver in time the emissions reductions necessary to meet the global goals. This growth becomes possible through the purchase under an ETS of CO$_2$ allowances from other sectors of the economy, where abatement costs are lower than within the aviation sector.

g) In Europe, many of the actions which are undertaken within the framework of this comprehensive approach are in practice taken at a supra-national level, most of them led by the EU. They are reported in Section 1 of this Action Plan, where Serbia’s involvement in them is described, as well as that of stakeholders.

h) In the Republic of Serbia a number of actions are undertaken at the national level, including by stakeholders, in addition to those of a supra-national nature. These national actions are reported in Section 2 of this Plan.

i) In relation to actions which are taken at a supra-national level, it is important to note that:

   i. The extent of participation will vary from one State and another, reflecting the priorities and circumstances of each State (economic situation, size of its aviation market, historical and institutional context, such as EU/non EU). The ECAC States are thus involved to different degrees and on different timelines in the delivery of these common actions. When an additional State joins a collective action, including at a later stage, this broadens the effect of the measure, thus increasing the European contribution to meeting the global goals.
ii. Nonetheless, acting together, the ECAC States have undertaken to reduce the region’s emissions through a comprehensive approach which uses each of the pillars of that approach. Some of the component measures, although implemented by some but not all of ECAC’s 44 States, nonetheless yield emission reduction benefits across the whole of the region (thus for example research, ETS).

2. CIVIL AVIATION IN SERBIA

2.1. HISTORICAL BACKGROUND

The Kingdom of Serbia was one of the first countries to establish a legal framework in the field of civil aviation by adopting the “Regulation on Transport Devices Navigating by Air” on 21 February 1913, few months before the adoption of a similar regulation in the United States of America. The Kingdom of Serbs, Croats and Slovenes was one of ten signatories to the “International Convention for Regulating Aeronautics”, adopted in Paris, in October 1919. In the course of the period between the two World Wars, the civil aviation authority in the Republic of Serbia operated as within the framework of a separate department under the Military Aviation Headquarters.

Following the Second World War, in 1946, the Office for Civil Aeronautics was established thus becoming a part of the Ministry of Transport in January 1947. Under a different name – the Federal Office for Civil Aviation – the aviation authority functioned independently until 1978, when it was incorporated into the Federal Ministry of Transport and divided into three departments:

- Air Transport Department,
- Federal Aviation Inspectorate,
- Federal Air Traffic Control Administration.

Following the establishment of the State Union of Serbia and Montenegro in 2003, a reorganization of the aviation authority took place in view of its harmonization with the international aviation standards and recommended practices and the European aviation requirements. The emphasis was on creating a competent and effective aviation authority which would regulate the area of civil aviation and preserve the safety and security of air services.
Basic characteristics of a modern aviation authority are the integration of state regulatory and supervisory functions into one specialized and financially independent authority as well as the disassociation of the air traffic service provider from the regulatory and supervisory authority.

The Governments of Serbia and Montenegro established the Civil Aviation Directorate of the State of Serbia and the State of Montenegro on 1 January 2004. Simultaneously, the Serbia and Montenegro Air Traffic Services Agency Ltd (SMATSA) was founded for providing air navigation services.

Following the dissolution of the State Union of Serbia and Montenegro, the Parliament of the Republic of Serbia adopted on 5 June 2006 the Resolution on the Legal Succession to the International Legal Subjectivity of Serbia and Montenegro. Based on this Resolution, the Republic of Serbia became legal successor of the founding rights of the Directorate.

### 2.2. NATIONAL STAKEHOLDERS IN AVIATION IN SERBIA

Civil aviation in the Republic of Serbia falls under the responsibility of the ministry in charge of transport and Civil Aviation Directorate of the Republic of Serbia (CAD). The different national entities having regulatory responsibilities in ATM are summarized in the table below. The CAD is further detailed in the following sections.

<table>
<thead>
<tr>
<th>Activity in ATM:</th>
<th>Organization responsible</th>
<th>Legal Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule-making</td>
<td>Parliament, Government, Ministry of Infrastructure and Energy and CAD</td>
<td>1. <a href="https://example.com">Air Transport Law (&quot;Official Gazette of the Republic of Serbia&quot;, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version</a>; 2. bylaws on transposed EU Regulations</td>
</tr>
<tr>
<td>Safety Oversight</td>
<td>CAD (inspection and audit)</td>
<td>1. <a href="https://example.com">Air Transport Law (&quot;Official Gazette of the Republic of Serbia&quot;, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version</a>; and relevant European regulations transposed</td>
</tr>
<tr>
<td>Activity in ATM:</td>
<td>Organization responsible</td>
<td>Legal Basis</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Establishment of Tolerable Safety Levels</td>
<td>Government, Ministry of Infrastructure and Energy, CAD</td>
<td>1. <a href="http://example.com">Air Transport Law</a> („Official Gazette of the Republic of Serbia”, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version;</td>
</tr>
<tr>
<td>Safety Performance Monitoring</td>
<td>Ministry of Infrastructure and Energy, CAD</td>
<td>1. <a href="http://example.com">Air Transport Law</a> („Official Gazette of the Republic of Serbia”, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version;</td>
</tr>
<tr>
<td>Enforcement actions in case of non-compliance with safety regulatory requirements</td>
<td>Ministry of Infrastructure and Energy, CAD</td>
<td>1. <a href="http://example.com">Air Transport Law</a> („Official Gazette of the Republic of Serbia”, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version; Regulation on requirements, issuing and validity period of the certificate for providing air navigation services (“Official Gazette of the Republic of Serbia, No 32/11)</td>
</tr>
<tr>
<td>Economic</td>
<td>Ministry of Infrastructure and Energy, CAD</td>
<td>1. <a href="http://example.com">Air Transport Law</a> („Official Gazette of the Republic of Serbia”, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version;</td>
</tr>
<tr>
<td>Activity in ATM:</td>
<td>Organization responsible</td>
<td>Legal Basis</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Environment</td>
<td>Ministry of Environment and Spatial Planning, Ministry of Infrastructure and Energy, CAD</td>
<td>1. <a href="#">Air Transport Law („Official Gazette of the Republic of Serbia“, No 73/10, 57/11, 93/12, 45/15, 66/15 - other law and 83/18) – unofficial consolidated version</a>;</td>
</tr>
</tbody>
</table>

Regulation establishing the common rules in the field of civil aviation security (“Official Gazette of the Republic of Serbia, No 2/11), Regulation supplementing common basic standards in civil aviation security, Regulation on derogation from common basic standards in civil aviation security, Regulation on Commission inspections in the field of civil aviation security (“Official Gazette of the Republic of Serbia, No 19/11), Decision establishing the national aviation security committee (“Official Gazette of the Republic of Serbia, No 20/11),

### 2.2.1. CIVIL AVIATION DIRECTORATE OF THE REPUBLIC OF SERBIA - CAD

The Civil Aviation Directorate of the Republic of Serbia (CAD) was founded by the Government as a public agency (Article 233 of Air Transport Law, “Official Gazette of the Republic of Serbia” No 73/10 Corrigendum No 57/11) and entrusted with the tasks of regulation, oversight, auditing and inspection, certification, licensing and record keeping in the civil aviation in the Republic of Serbia, as well as cooperating with the international aviation organizations.

The bodies of the Directorate are the Management Board and the Director.
CAD is the National Supervisory Authority for the area of air navigation compliant with relevant EU provisions, and as such issues certificates and performs continued oversight over ANSPs (Article 234 of Air Transport Law).

Military authority is contributing to the ATM safety by taking part in safety regulations development process. Furthermore, military authorities are taking part in the incident/accident investigations when military aircraft are involved.

For further information on CAD, please visit [www.cad.gov.rs](http://www.cad.gov.rs).

### 2.2.2 SMATSA LLC

**Table 2 – SMATSA LLC**

<table>
<thead>
<tr>
<th>Name of the ANSP:</th>
<th>Serbia and Montenegro Air Traffic Services SMATSA llc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance:</td>
<td>Two State enterprise</td>
</tr>
<tr>
<td>Ownership:</td>
<td>Gov. of Serbia = 92%</td>
</tr>
<tr>
<td></td>
<td>Gov. of Montenegro = 8%</td>
</tr>
<tr>
<td>Service provided</td>
<td>Y/N</td>
</tr>
<tr>
<td>ATC en – route</td>
<td>Y</td>
</tr>
<tr>
<td>ATC approach</td>
<td>Y</td>
</tr>
<tr>
<td>ATC Airport(s)</td>
<td>Y</td>
</tr>
<tr>
<td>AIS</td>
<td>Y</td>
</tr>
<tr>
<td>CNS</td>
<td>Y</td>
</tr>
<tr>
<td>MET</td>
<td>Y</td>
</tr>
<tr>
<td>ATCO training</td>
<td>Y</td>
</tr>
<tr>
<td>Others</td>
<td>Y</td>
</tr>
<tr>
<td>Provision of services in other State(s)</td>
<td>Y</td>
</tr>
</tbody>
</table>
Serbia and Montenegro Air Traffic Services SMATSA llc can be visited at www.smatsa.rs

2.2.3. MILITARY AUTHORITIES

The Military Aviation Authority in the Republic of Serbia is composed of:

- Serbian Air Force Command;
- Military Aviation Inspectorate.

The main role of the Military Aviation Authority in ANS provision is in the domain of ATM by contributing in ASM planning processes and in coordinating, organizing and controlling special activities in TSAs. The MAA does not have any particular role in the provision of ATS.

The Military Aviation Authority is the main source of the information and data promulgated in the Military Aeronautical Information Package, which is published by SMATSA llc.

The MAA is also responsible for military aircraft registry, certification of military aircraft and equipment. The MAA reports to the Serbian Ministry of Defense.

### 3. STRUCTURE OF THE AVIATION SECTOR

#### 3.1. AIR CARRIERS WITH A SERBIAN AOC

*Table 3 Air carriers*

<table>
<thead>
<tr>
<th>AIR CARRIERS</th>
<th>AOC</th>
<th>AUTHORIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR SERBIA AD BEOGRAD RS-001</td>
<td>Continued validity</td>
<td>Passenger and cargo transport</td>
</tr>
<tr>
<td>PRINCE AVIATION DOO BEOGRAD RS-004</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>AIR PINK DOO BEOGRAD RS-005</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>AIR CARRIERS</td>
<td>AOC</td>
<td>AUTHORIZATION</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>EAGLE EXPRESS DOO</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>BEOGRAD RS-007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFINITY AVIATION DOO</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>BEOGRAD RS-008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BALKAN HELICOPTERS DOO</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>BEOGRAD RS-010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPC AIR DOO RS-011</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FERRO AVIATION DOO</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>BEOGRAD RS-012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKYBRIDGE INTERNATIONAL</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>BALKAN DOO RS-014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR SWISSLION RD</td>
<td>Continued validity</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>RS-015</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2. SERBIAN AIRWORTHINESS AIRCRAFT

*Table 4 Airworthiness aircraft*

<table>
<thead>
<tr>
<th>Nb. In register</th>
<th>Registraton mark</th>
<th>Type of aircraft</th>
<th>Serial number</th>
<th>Manufacture</th>
<th>Year of manufacture</th>
<th>Engine type</th>
<th>Noise certificate basis (ICAO Annex 16 Volume I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1607</td>
<td>YU-ALN</td>
<td>ATR 72-202</td>
<td>180</td>
<td>ATR-GIE</td>
<td>1990</td>
<td>turboprop</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1608</td>
<td>YU-ALO</td>
<td>ATR 72-202</td>
<td>186</td>
<td>ATR-GIE</td>
<td>1990</td>
<td>turboprop</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1609</td>
<td>YU-ALP</td>
<td>ATR 72-202</td>
<td>189</td>
<td>ATR-GIE</td>
<td>1990</td>
<td>turboprop</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Nb. In register</td>
<td>Registraton mark</td>
<td>Type of aircraft</td>
<td>Serial number</td>
<td>Manufacture</td>
<td>Year of manufacture</td>
<td>Engine type</td>
<td>Noise certificate basis (ICAO Annex 16 Volume I)</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------</td>
<td>------------------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------------</td>
<td>------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>1916</td>
<td>YU-ALT</td>
<td>ATR 72-212</td>
<td>555</td>
<td>ATR- GIE</td>
<td>1998</td>
<td>turboprop</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1607</td>
<td>YU-ALU</td>
<td>ATR 72-202</td>
<td>180</td>
<td>ATR- GIE</td>
<td>1990</td>
<td>turboprop</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1951</td>
<td>YU-ALV</td>
<td>ATR 72-212</td>
<td>727</td>
<td>ATR- GIE</td>
<td>2006</td>
<td>turboprop</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1462</td>
<td>YU-AND</td>
<td>Boeing 737-300</td>
<td>23329</td>
<td>The Boeing Company</td>
<td>1985</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1485</td>
<td>YU-ANI</td>
<td>Boeing 737-300</td>
<td>23416</td>
<td>The Boeing Company</td>
<td>1985</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1503</td>
<td>YU-ANJ</td>
<td>Boeing 737-300</td>
<td>23714</td>
<td>The Boeing Company</td>
<td>1986</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1504</td>
<td>YU-ANK</td>
<td>Boeing 737-300</td>
<td>23715</td>
<td>The Boeing Company</td>
<td>1986</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1923</td>
<td>YU-APC</td>
<td>A319-132</td>
<td>2621</td>
<td>Airbus</td>
<td>2005</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1924</td>
<td>YU-APE</td>
<td>A319-132</td>
<td>3252</td>
<td>Airbus</td>
<td>2007</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1926</td>
<td>YU-APF</td>
<td>A319-132</td>
<td>3317</td>
<td>Airbus</td>
<td>2007</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1929</td>
<td>YU-APA</td>
<td>A319-132</td>
<td>2277</td>
<td>Airbus</td>
<td>2004</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1935</td>
<td>YU-APB</td>
<td>A319-132</td>
<td>2296</td>
<td>Airbus</td>
<td>2004</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1936</td>
<td>YU-API</td>
<td>A319-132</td>
<td>1140</td>
<td>Airbus</td>
<td>1999</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1937</td>
<td>YU-APJ</td>
<td>A319-132</td>
<td>1159</td>
<td>Airbus</td>
<td>2000</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1940</td>
<td>YU-APD</td>
<td>A319-132</td>
<td>2335</td>
<td>Airbus</td>
<td>2004</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1931</td>
<td>YU-APG</td>
<td>A320-232</td>
<td>2587</td>
<td>Airbus</td>
<td>2005</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1930</td>
<td>YU-APH</td>
<td>A320-232</td>
<td>2645</td>
<td>Airbus</td>
<td>2005</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1968</td>
<td>YU-ARA</td>
<td>A330-202</td>
<td>885</td>
<td>Airbus</td>
<td>2007</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1915</td>
<td>YU-SVL</td>
<td>C-560 XL</td>
<td>560-5772</td>
<td>Cessna Aircraft Company</td>
<td>2008</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Nb. In register</td>
<td>Registratio n mark</td>
<td>Type of aircraft</td>
<td>Serial number</td>
<td>Manufactur e</td>
<td>Year of manuf acture</td>
<td>Engine type</td>
<td>Noise certificate basis (ICAO Annex 16 Volume I)</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------</td>
<td>------------------</td>
<td>---------------</td>
<td>--------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1916</td>
<td>YU-SPC</td>
<td>Cessna 560 XL</td>
<td>560-6136</td>
<td>Cessna Aircraft Company</td>
<td>2013</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1967</td>
<td>YU-FSS</td>
<td>Falcon 2000 LXS</td>
<td>320</td>
<td>Dassault Aviation</td>
<td>2016</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1858</td>
<td>YU-BTN</td>
<td>Cessna 525B</td>
<td>0193</td>
<td>Cessna Aircraft Company</td>
<td>2007</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1812</td>
<td>YU-BZZ</td>
<td>Cessna CitationC-550</td>
<td>0924</td>
<td>Cessna Aircraft Company</td>
<td>2000</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1844</td>
<td>YU-BTB</td>
<td>Citation Bravo</td>
<td>550-1037</td>
<td>Cessna Aircraft Company</td>
<td>2002</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1959</td>
<td>YU-RDA</td>
<td>Cessna 560 XL</td>
<td>560-6199</td>
<td>Cessna Aircraft Company</td>
<td>2015</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1973</td>
<td>YU-PNK</td>
<td>Cessna 560 XL</td>
<td>560-6209</td>
<td>Cessna Aircraft Company</td>
<td>2016</td>
<td>turbofan</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>1877</td>
<td>YU-BSR</td>
<td>PA-31-350</td>
<td>31-8152195</td>
<td>Piper Aircraft Inc</td>
<td>1981</td>
<td>piston</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>1908</td>
<td>YU-BST</td>
<td>Cessna 525</td>
<td>525-0022</td>
<td>Cessna Aircraft Company</td>
<td>1993</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1852</td>
<td>YU-MTU</td>
<td>C-525 CJ</td>
<td>525-0295</td>
<td>Cessna Aircraft Company</td>
<td>1998</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>Nb. In register</td>
<td>Registratio mark</td>
<td>Type of aircraft</td>
<td>Serial number</td>
<td>Manufacturer</td>
<td>Year of manufacture</td>
<td>Engine type</td>
<td>Noise certificate basis (ICAO Annex 16 Volume I)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>--------------</td>
<td>--------------------</td>
<td>-------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1965</td>
<td>YU-MPC</td>
<td>C-525 CJ</td>
<td>525-0911</td>
<td>Cessna Aircraft Company</td>
<td>2016</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1970</td>
<td>YU-TPC</td>
<td>500 Citation I</td>
<td>500-0392</td>
<td>Cessna Aircraft Company</td>
<td>1979</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1990</td>
<td>YU-SCJ</td>
<td>C-525</td>
<td>525-0143</td>
<td>Cessna Aircraft Company</td>
<td>1996</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>2007</td>
<td>YU-PBB</td>
<td>Cessna 560 XL</td>
<td>560-6051</td>
<td>Cessna Aircraft Company</td>
<td>2010</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1980</td>
<td>YU-PMK</td>
<td>Cessna 560 XL</td>
<td>560-6220</td>
<td>Cessna Aircraft Company</td>
<td>2016</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1983</td>
<td>YU-PZM</td>
<td>Cessna 560 XL</td>
<td>560-6226</td>
<td>Cessna Aircraft Company</td>
<td>2016</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>1876</td>
<td>YU-SPB</td>
<td>Cessna 560 XL</td>
<td>560-5807</td>
<td>Cessna Aircraft Company</td>
<td>2008</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>2004</td>
<td>YU-TBA</td>
<td>Cessna 560 XL</td>
<td>560-6249</td>
<td>Cessna Aircraft Company</td>
<td>2018</td>
<td>turbofan</td>
<td>Chapter 3</td>
</tr>
</tbody>
</table>
3.3. AIRPORTS IN THE REPUBLIC OF SERBIA

Three international airports in the Republic of Serbia, namely LYBE (BEG) Airport Belgrade “Nikola Tesla”, LYNI (INI) Airport Nis “Konstantin Veliki”, and LYPR (PRN) Airport Priština are organised as State Enterprises, owned by the Government of Serbia. The Priština Airport is temporarily operated by UNMIK (United Nations Mission in Kosovo).

Two airports, Batajnica and Kraljevo are operated by military authority, owned by the State and are available for the civilian air traffic.

3.3.1. LIST OF AERODROME OPERATORS WITH AERODROME CERTIFICATE:

1. Beograd – Nikola Tesla LYBE

   ![Belgrade Airport](image)

2. Niš Konstantin Veliki LYNI

   ![Niš Airport](image)

3.3.2. LIST OF AERODROME OPERATORS WITH APPROVAL TO OPERATE AN AERODROME

1. Beograd - Lisičiji Jarak LYBJ

2. Bor LYBO

3. Kikinda LYKI

4. Kostolac LYKT
5. Kraljevo - Brege LYKA
6. Kruševac - Koširsko Polje LYKS
7. Novi Sad - Čenej LYNS
8. Pančevo LYPA
9. Paraćin - Davidovac LYPN
10. Smederevo LYSD
11. Smederevska Palanka - Rudine LYSP
12. Sremska Mitrovica - Veliki Radinci LYSM
13. Subotica LYSU
14. Trstenik LYTR
15. Valjevo - Divci LYVA
16. Vršac LYVR
17. Zrenjanin - Ečka LYZR
19. Vojka - Vojka

3.3.3. LIST OF AERODROME OPERATORS WITH AGREEMENT TO OPERATE AN AERODROME

1. Bogatić
2. Ivanje Prijepolje
3. Kora Sombor Bogdan Nikola
4. 7. juli Surčin
5. Verušić Subotica
6. Pek Češljeva Bara Veliko Gradište
7. Blace
8. Ravan Čačak
9. Kragujevac Ravni Gaj Knić
10. Ćuprija
11. Hrelja Bočar
12. Ponikve Užice

3.3.4. LIST OF HELIPORT OPERATORS WITH AGREEMENT TO OPERATE A HELIPORT

1. BD Agro
2. Ciklonizacija-Novi Sad
3. Mokra Gora
4. Požega
5. Sobovica
6. Takovo Gornji Milanovac
4. TRAFFIC PERFORMANCE AT THE AIRPORTS BELGRADE AND NIŠ FROM 2014 TO 2018

4.1. TRAFFIC PERFORMANCE AT AIRPORT BELGRADE FROM 2014 – 2018

Table 5 Traffic performance Belgrade

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Nb of landings</th>
<th>Total Nb of Take Offs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>2015</td>
<td>63931</td>
<td>63931</td>
</tr>
<tr>
<td>2016</td>
<td>32295</td>
<td>32300</td>
</tr>
<tr>
<td>2017</td>
<td>32505</td>
<td>32499</td>
</tr>
<tr>
<td>2018</td>
<td>33741</td>
<td>33721</td>
</tr>
</tbody>
</table>

4.2. TRAFFIC PERFORMANCE AT AIRPORT NIS FROM 2014 TO 2018

Table 6 Traffic performance Nis

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Nb of landings</th>
<th>Total Nb of Take Offs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>271</td>
<td>271</td>
</tr>
<tr>
<td>2015</td>
<td>526</td>
<td>526</td>
</tr>
<tr>
<td>2016</td>
<td>722</td>
<td>722</td>
</tr>
<tr>
<td>2017</td>
<td>1477</td>
<td>1477</td>
</tr>
<tr>
<td>2018</td>
<td>1417</td>
<td>1417</td>
</tr>
</tbody>
</table>
5. MEMBERSHIP IN INTERNATIONAL ORGANIZATIONS

Serbia is a member of the following international organizations:

Table 7 International membership

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Member since</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECAC</td>
<td>2002</td>
</tr>
<tr>
<td>Eurocontrol</td>
<td>2005</td>
</tr>
<tr>
<td>European Union</td>
<td></td>
</tr>
<tr>
<td>European Common Aviation Area</td>
<td>2006</td>
</tr>
<tr>
<td>EASA</td>
<td></td>
</tr>
<tr>
<td>ICAO</td>
<td>2001</td>
</tr>
<tr>
<td>JAA</td>
<td>2006</td>
</tr>
<tr>
<td>NATO</td>
<td></td>
</tr>
</tbody>
</table>

6. EUROPEAN STATES’ ACTION PLANS ECAC/EU COMMON SECTION

6.1. EXECUTIVE SUMMARY

The European Section of this action plan, which is common to all European State action plans, presents a summary of the actions taken collectively in the 44 States of the European Civil Aviation Conference (ECAC) to reduce CO2 emissions from the aviation system against a background of increased travel and transport.

For over a century, Europe has led the development of new technology, monitoring its impacts and developing new innovations to better meet societies developing needs and concerns. From the dawn of aviation, governments and industry across the region have invested heavily to
understand and mitigate the environmental impacts of aviation, initially focusing on noise, then adding air quality and more recently the emissions affecting the global climate and CO2 from fuel burn in particular. This is all taking place in a sector ever striving to improve safety and security whilst also reducing operating costs and improving fuel efficiency.

Some of these mitigating actions have domestic beginnings that stretch to international aviation whilst others are part of centralized cross-cutting funding such as through the EU Research Framework programmes. The aviation sector has also benefitted from large bespoke programmes such as the EU’s Single European Sky ATM Research Initiative (SESAR). This has a vision stretching to 2050, which may turn utopian dreams of flight with seamless end-to-end co-ordination, optimised for efficiency, with minimal environmental impacts and complete safety into reality.

The European common section also includes new innovations being tried and tested in a range of demonstration trials to reduce fuel burn and CO2 emissions at different stages of different flights, airports or routes. These might not be contributing to measured benefits in day-to-day operations yet, but Europe can anticipate a stream of future implementation actions and additional CO2 savings.

6.2. AIRCRAFT RELATED TECHNOLOGY

European members have worked together to best support progress in the ICAO Committee on Aviation Environmental Protection (CAEP). This contribution of resources, analytical capability and leadership has undoubtedly facilitated leaps in global certification standards that has helped drive the markets demand for technology improvements. Developing what became the 2016 ICAO CO2 standards for newly built aircraft relied on contributions from many across the ECAC States. Airlines now have confidence that fuel efficient aircraft are future proof which may even have generated orders for manufacturers and demonstrates a virtuous circle that efficiency sells. Solutions and technology improvements have already started to go into service and are helping to support demand for ever more ambitious research.

Environmental improvements across the ECAC States is knowledge lead and at the forefront of this is the Clean Sky EU Joint Technology Initiative (JTI) that aims to develop and mature breakthrough “clean technologies”. This activity recognizes and exploits the interaction between environmental, social and competitiveness aspects with sustainable economic growth. Funding and its motivation is critical to research and the public private partnership model of
the EU Framework Programmes underpins much that will contribute to this and future CO2 action plans across the ECAC region. Evaluations of the work so far under the JTI alone estimate aircraft CO2 reductions of 32% which, aggregated over the future life of those products, amount to 6bn tonnes of CO2.

The main efforts under Clean Sky 2 include demonstrating technologies: for both large and regional passenger aircraft, improved performance and versatility of new rotorcraft concepts, innovative airframe structures and materials, radical engine architectures, systems and controls and consideration of how we manage aircraft at the end of their useful life. This represents a rich stream of ideas and concepts that, with continued support, will mature and contribute to achieving the goals on limiting global climate change.

6.3. ALTERNATIVE FUELS

ECAC States are embracing the introduction of sustainable alternative aviation fuels but recognize the many challenges between the current situation and their widespread availability or use. It has been proven fit for purpose and the distribution system has demonstrated its capacity to handle sustainable alternative fuels. Recent actions have focused on preparing the legal base for recognizing a minimum reduction in greenhouse gas emissions and market share targets for such fuels in the transport sector. The greatest challenge to overcome is economic scalability of the production of sustainable fuel and the future actions of the ECAC states are preparing the building blocks towards that goal. The European Commission has proposed specific measures and sub-quotas to promote innovation and the deployment of more advanced sustainable fuels as well as additional incentives to use such fuels in aviation. Public private partnership in the European Advanced Biofuels Flight-path is also continuing to bring down the commercial barriers. In that framework, Europe is progressing towards a 2 million tonne goal for the consumption of sustainably produced paraffinic biofuels by 2020. Europe has progressed from demonstration flights to sustainable biofuel being made available through the hydrant fuelling infrastructure, but recognises that continued action will be required to enable a more large-scale introduction.
6.4. IMPROVED AIR TRAFFIC MANAGEMENT

The European Union’s Single European Sky (SES) policy aims to transform Air Traffic Management in Europe, tripling capacity, halving ATM costs with 10 times the safety and 10% less environmental impact. Progress is well underway on the road map to achieve these ambitious goals through commitment and investment in the research and technology. Validated ATM solutions alone are capable of 21% more airspace capacity, 14% more airport capacity, a 40% reduction in accident risk, 2.8% less greenhouse emissions and a 6% reduction in flight cost. Steps 2 and 3 of the overall SES plan for the future will deploy ‘Trajectory-based Operation’ and ‘Performance-based Operations’ respectively. Much of the research to develop these solutions is underway and published results of the many earlier demonstration actions confirm the challenge but give us confidence that the goals will be achieved in the ECAC region with widespread potential to be replicated in other regions.

6.5. ECONOMIC/MARKET BASED MEASURES (MBMS)

ECAC members have always been strong supporters of a market-based measure scheme for international aviation to incentivise and reward good investment and operational choices, and so welcomed the agreement on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The 31 EEA states in Europe have already implemented the EU Emissions Trading System (ETS), including the aviation sector with around 500 aircraft operators participating in the cap and trade approach to limit CO2 emissions. It was the first and is the biggest international system capping greenhouse gas emissions. In the period 2012 to 2018 EU ETS has saved an estimated 100 million tonnes of intra-European aviation CO2 emissions.

ECAC States, through the Bratislava declaration, have expressed their intention to voluntarily participate in CORSIA from its pilot phase and encourage other States to do likewise and join CORSIA. Subject to preserving the environmental integrity and effectiveness it is expected that the EU ETS legislation will be adapted to implement the CORSIA. A future world with a globally implemented CORSIA aimed at carbon neutral growth of international aviation would significantly reduce emissions.
6.6. ECAC SCENARIOS FOR TRAFFIC AND CO2 EMISSIONS

Aviation traffic continues to grow, develop and diversify in many ways across the ECAC states. Whilst the focus of available data relates to passenger traffic, similar issues and comparable outcomes might be anticipated for cargo traffic both as belly hold freight and in dedicated freighters. Analysis by EUROCONTROL and EASA has identified the most likely scenario of influences on future traffic and modelled these assumptions out to future years. On the basis of this traffic forecast, fuel consumption and CO2 emissions of aviation have been estimated for both a theoretical baseline scenario (without any mitigation action) and a scenario with implemented mitigation measures that are presented in this action plan. Results are visualized in the figure below.

*Figure 1 Equivalent CO2 emissions forecast for the baseline and implemented measures scenarios*

![Graph showing CO2 emissions forecast](image)

Modelling the impact of improved aircraft technology for the scenario with implemented measures indicates an overall 8.5% reduction of fuel consumption and CO2 emissions in 2040 compared to the baseline. Whilst the data to model the benefits of ATM improvements and
sustainable alternative fuels may be less robust, they are nevertheless valuable contributions to reduce emissions further. Overall fuel efficiency, including the effects of new aircraft types and ATM-related measures, is projected to improve by 24% between 2010 and 2040. The potential of sustainable aviation fuels to reduce CO2 emissions on a lifecycle basis is reflected in Figure 1. Market-based measures and their effects have not been simulated in detail, but will help reach the goal of carbon-neutral growth. As further developments in policy and technology are made, further analysis will improve the modelling of future emissions.

7. REGIONAL COORDINATION AND PROJECTS

ECAA (European Common Aviation Area) is a project initiated and managed by the European Commission, aiming at the establishment of equal conditions of competition and common rules in aviation, including ATM and environment. As for ATM, the project will seek the highest degree of cooperation with the view to extending SES among the States concerned. Multilateral agreement on the Establishment of a European Common Aviation Area (ECAA Agreement) was signed between the European Community and its Member States, the Republic of Albania, Bosnia and Herzegovina, the Republic of Bulgaria, the Republic of Croatia, North Macedonia, the Republic of Iceland, the Republic of Montenegro, the Kingdom of Norway, Romania, the Republic of Serbia and the United Nations Interim Administration Mission in Kosovo (pursuant to UN Security Council Resolution 1244 of June 10th 1999).

Serbia has accepted to align its national aviation legislation to the complete aviation acquis of the Community. To this end, Serbia signed the ECAA Agreement in June 2006 which was ratified in May 2009 (“Official Gazette of the Republic of Serbia – International Treaties” No 38/09).

This Regulation provides the scope for monitoring initial certification and performing continued oversight of the ANSPs.

In light of the SES implementation and predefined safety and performance objectives, SMATSA llc, neighboring ANSPs and other interested ANSPs have achieved significant steps in mutual cooperation that resulted in signing the agreements on operational-technical cooperation.

Agreements have been signed with NATA (Albania) and Slovenia Control (Slovenia) in 2010 and with HungaroControl (Hungary), BULATSA (Bulgaria) and MK CAA (North Macedonia) in 2011.

Application of the agreements will bring many benefits and improvements in ANS provision, especially in the areas of safety, flight efficiency, predictability, environment, cost effectiveness and interoperability.

The Republic of Serbia has an active role in ISIS programme (Implementation of the Single European Sky in the South East Europe) which will facilitate ISIS Beneficiaries in transposing the European regulations and developing institutional capacity to implement those regulations.

The implementation pillar of the ISIS Programme has been endorsed on the ISIS Governing Body meeting held on September 7th 2011 in Solin (Croatia), consisting of the assessment of the actual implementation of the SES legislation, and the development of associated technical assistance and recommendations for follow-up activities, as appropriate.

Within the ISIS programme CAD has a leading role in the projects of Transposition and Capacity Building of NSAs.

Furthermore, Joint Service Provision Area Initiative (JSPAI) has been initiated by the Civil Aviation Agency of Montenegro which represents regional initiative aiming to further promote Single European Sky (SES) in the SEE region and representing a step towards the more active and successful involvement of the Western Balkan States into the SES Initiative. The JSPA Initiative stands for inter-organizational partnership for cooperation and coordination among the signatory civil aviation authorities and air navigation service providers, established by signed “Letter of Intent for stepwise development of a Joint Service Area (JSPA) in the South East Europe” on April 23 2013 in Sarajevo. In accordance with the high level objectives stemming from South East Europe 2020 Strategy – Jobs and Prosperity in a European
Perspective, adopted at ministerial level on November 21 2013 in Sarajevo, and reflecting the determination of all the governments in South East Europe to embrace the bold policy approaches required to attain the levels of socioeconomic growth necessary to improve the prosperity of all citizens and to facilitate eventual integration with the European Union, SEETO – as a Dimension Coordinator, and JSPA Initiative – as a Responsible Structure, in February 2015 elaborated and adopted Regional Programme “HARMONIZED AND OPTIMIZED USE OF REGIONAL AIRSPACE WITH ENHANCED AIR TRANSPORT CONNECTIVITY IN THE SEE”. The regional programme focuses on the increase of air traffic safety and ATM capacity, decrease of CO2 and noise emissions by shortening route length and fuel burn leading to the regional economic growth and increased mobility. It directly elaborates possibilities and provides guidelines for the enhancement of overall air transport connectivity in the region.
The baseline scenario of ECAC States presents the following sets of data (in 2010) and forecast (in 2020 and 2035), which were provided by EUROCONTROL:

- European air traffic (includes all international and national passenger flight departures from ECAC airports, in number of flights, and RPK calculated purely from passenger numbers, which are based on EUROSTAT figures. Belly freight and dedicated cargo flights are not included),

- its associated aggregated fuel consumption (in million tonnes)

- its associated emissions (in million tonnes of CO2), and

- Average fuel efficiency (in kg/10RPK).

The sets of forecasts correspond to projected traffic volumes and emissions, in a scenario of “regulated growth”, while corresponding fuel consumption and CO2 emissions assume the technology level of the year 2010 (i.e. without considering reductions of emissions by further aircraft related technology improvements, improved ATM and operations, alternative fuels or market based measures).
8.1. TRAFFIC SCENARIO “REGULATION AND GROWTH”

As in all 20-year forecasts produced by EUROCONTROL, various scenarios are built with a specific storyline and a mix of characteristics. The aim is to improve the understanding of factors that will influence future traffic growth and the risks that lie ahead. In the 20-year forecast published in 2013 by EUROCONTROL, the scenario called ‘Regulated Growth’ was constructed as the ‘most-likely’ or ‘baseline’ scenario, most closely following the current trends. It considers a moderate economic growth, with regulation reconciling the environmental, social and economic demands.

Amongst the models applied by EUROCONTROL for the forecast the passenger traffic sub-model is the most developed and is structured around five main group of factors that are taken into account:

- Global economy factors represent the key economic developments driving the demand for air transport.

- Factors characterizing the passengers and their travel preferences change patterns in travel demand and travel destinations.

- Price of tickets set by the airlines to cover their operating costs influences passengers’ travel decisions and their choice of transport.

- More hub-and-spoke or point-to-point networks may alter the number of connections and flights needed to travel from origin to destination.

- Market structure describes size of aircraft used to satisfy the passenger demand (modelled via the Aircraft Assignment Tool).

Table below presents a summary of the social, economic and air traffic related characteristics of three different scenarios developed by EUROCONTROL. The year 2016 serves as the baseline year of the 20-year forecast results updated in 2018 by EUROCONTROL and presented here. Historical data for the year 2010 are also shown later for reference.

---

4 Challenges of Growth 2018: Flight forecast, EUROCONTROL 2018
The ECAC baseline scenario presented in the following tables was generated by EUROCONTROL for all ECAC States including the Canary Islands. Over-flights of the ECAC area have not been included.

The baseline scenario, which is presented in the following tables, does not include business and dedicated cargo traffic. It covers only commercial passenger flight movements for the area

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Growth</td>
<td>Regulation and Growth</td>
<td>Fragmenting World</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Base</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aging</td>
<td>Aging</td>
<td>Aging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN Medium-fertility variant</td>
<td>UN Medium-fertility variant</td>
<td>UN Zero-migration variant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-haul</td>
<td>No Change</td>
<td>Long-haul</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU enlargement later</td>
<td>EU enlargement Earliest</td>
<td>EU enlargement Latest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 city-pairs faster implementation</td>
<td>20 city-pairs</td>
<td>20 city-pairs later implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stronger</td>
<td>Moderate</td>
<td>Weaker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5 States, Later</td>
<td>+5 States, Earliest</td>
<td>+5 States, Latest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global, faster</td>
<td>Limited, later</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreasing</td>
<td>Decreasing</td>
<td>No change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Lowest</td>
<td>Highest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Lowest</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise:</td>
<td>Noise:</td>
<td>Noise:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security:</td>
<td>Security:</td>
<td>Security:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubs: Mid-East</td>
<td>Hubs: Mid-East</td>
<td>No change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>Turkey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry fleet forecast</td>
<td>Industry fleet forecast</td>
<td>Industry fleet forecast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ STATFOR assumptions</td>
<td>+ STATFOR assumptions</td>
<td>+ STATFOR assumptions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.2. ECAC BASELINE SCENARIO

The ECAC baseline scenario presented in the following tables was generated by EUROCONTROL for all ECAC States including the Canary Islands. Over-flights of the ECAC area have not been included.

The baseline scenario, which is presented in the following tables, does not include business and dedicated cargo traffic. It covers only commercial passenger flight movements for the area
of scope outlined in the previous paragraph, using data for airport pairs, which allows for the
generation of fuel efficiency data (in kg/RPK). Historical fuel burn (2010) and emission
calculations are based on the actual flight plans from the PRISME data warehouse, including
the actual flight distance and the cruise altitude by airport pair. Future year fuel burn and
emissions (2020, 2035) are modelled based on actual flight distances and cruise altitudes by
airport pair in 2014. Taxi times are not included. The baseline is presented along a scenario of
engine-technology freeze, as of 2014, so aircraft not in service at that date are modelled with
the fuel efficiency of comparable-role in-service aircraft (but with their own seating capacities).

The future fleet has been generated using the Aircraft Assignment Tool (AAT) developed
collaboratively by EUROCONTROL, the European Aviation Safety Agency and the European
Commission. The retirement process of the Aircraft Assignment Tool is performed year by
year, allowing the determination of the amount of new aircraft required each year. This way,
the entry into service year (EISY) can be derived for the replacement aircraft. The Growth and
Replacement (G&R) Database used is largely based on the Flightglobal Fleet Forecast
Deliveries by Region 2014 to 2033. This forecast provides the number of deliveries for each
type in each of the future years, which are re-scaled to match the EUROCONTROL forecast.

The data and forecasts for Europe show two distinct phases, of rapid improvement followed by
continuing, but much slower improvement after 2020. The optimism behind the forecast for
the first decade is partly driven by statistics: in the 4 years 2010-2014, the average annual
improvement in fuel efficiency for domestic and international flights was around 2%. [Source:
EUROCONTROL] so this is already achieved. Underlying reasons for this include gains
through improvements in load factors (e.g. more than 3% in total between 2010 and 2014), and
use of slimmer seats allowing more seats on the same aircraft. However, neither of these can
be projected indefinitely into the future as a continuing benefit, since they will hit diminishing
returns. In their place we have technology transitions to A320neo, B737max, C-series, B787
and A350 for example, especially over the next 5 years or so. Here this affects seat capacity,
but in addition, as we exit from the long economic downturn, we see an acceleration of
retirement of old, fuel-inefficient aircraft, as airline finances improve, and new models become
available. After that, Europe believes that the rate of improvement would be much slower, and
this is reflected in the ‘technology freeze’ scenario, which is presented here.
Table 8 Total fuel burn for passenger domestic and international flights (ECAC)

<table>
<thead>
<tr>
<th>Year</th>
<th>Traffic (millions of departing flights)</th>
<th>Total Fuel burn (in million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>7,12</td>
<td>40,34</td>
</tr>
<tr>
<td>2020</td>
<td>8,48</td>
<td>48,33</td>
</tr>
<tr>
<td>2035</td>
<td>11,51</td>
<td>73,10</td>
</tr>
</tbody>
</table>

Table 9 CO2 emissions forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>CO2 emissions (in million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>127,48</td>
</tr>
<tr>
<td>2020</td>
<td>152,72</td>
</tr>
<tr>
<td>2035</td>
<td>231,00</td>
</tr>
</tbody>
</table>

Table 10 Traffic in RPK (domestic and international departing flights from ECAC airports, PAX only, no freight and dedicated cargo flights)

<table>
<thead>
<tr>
<th>Year</th>
<th>Traffic (in billion RPK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1 329,6</td>
</tr>
<tr>
<td>2020</td>
<td>1 958,7</td>
</tr>
<tr>
<td>2035</td>
<td>3 128,2</td>
</tr>
</tbody>
</table>

Table 11 Fuel efficiency (kg/10RPK)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel efficiency (in kg/10 RPK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0,3034</td>
</tr>
<tr>
<td>2020</td>
<td>0,2468</td>
</tr>
<tr>
<td>2035</td>
<td>0,2337</td>
</tr>
</tbody>
</table>
Table 12 Average annual fuel efficiency improvement

<table>
<thead>
<tr>
<th>Period</th>
<th>Fuel efficiency improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020-2010</td>
<td>-2.05%</td>
</tr>
<tr>
<td>2035-2020</td>
<td>-0.36%</td>
</tr>
<tr>
<td>2035-2010</td>
<td>-1.04%</td>
</tr>
</tbody>
</table>

In order to further improve fuel efficiency and to reduce future air traffic emissions beyond the projections in the baseline scenario, ECAC States have taken further action. Supranational measures in order to achieve such additional improvement will be described in the following sections. It should be noted, however, that a quantification of the effects of many measures is difficult. As a consequence, no aggregated quantification of potential effects of the supranational measures can be presented in this action plan.

8.3. FURTHER ASSUMPTIONS AND RESULTS FOR THE BASELINE SCENARIO

The ECAC baseline scenario was generated by EUROCONTROL for all ECAC States. It covers all commercial international passenger flights departing from ECAC airports, as forecasted in the aforementioned traffic scenario. The number of passengers per flight is derived from Eurostat data.

EUROCONTROL also generates a number of all-cargo flights in its baseline scenario. However, no information about the freight tonnes carried is available. Hence, historical and forecasted cargo traffic have been extracted from another source (ICAO⁵). This data, which is presented below, includes both belly cargo transported on passenger flights and freight transported on dedicated all-cargo flights.

Historical fuel burn and emission calculations are based on the actual flight plans from the PRISME data warehouse used by EUROCONTROL, including the actual flight distance and the cruise altitude by airport pair. These calculations were made for 98% of the passenger

---

⁵ ICAO Long-Term Traffic Forecasts, Passenger and Cargo, July 2016.
flights; the remaining flights in the flight plans had information missing. Determination of the fuel burn and CO2 emissions for historical years is built up as the aggregation of fuel burn and emissions for each aircraft of the associated traffic sample. Fuel burn and CO2 emission results consider each aircraft’s fuel burn in its ground and airborne phases of flight and are obtained by use of the EUROCONTROL IMPACT environmental model. While historical traffic data is used for the year 2016, the baseline fuel burn and emissions in 2016 and the forecast years (until 2040) are modelled in a simplified approach on the basis of the historical/forecasted traffic and assume the technology level of the year 2010.

The following tables and figures show the results for this baseline scenario, which is intended to serve as a reference case by approximating fuel consumption and CO2 emissions of European aviation in the absence of mitigation actions.

**Table 13 Baseline forecast for international traffic departing from ECAC airports**

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger Traffic (IFR movements) (million)</th>
<th>Revenue Passenger Kilometres(^6) (billion)</th>
<th>All-Cargo Traffic (IFR movements) (million)</th>
<th>Freight Tonne Kilometres transported(^7) (billion)</th>
<th>Total Revenue Tonne Kilometres(^6) (billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>4.6</td>
<td>1,218</td>
<td>0.20</td>
<td>45.4</td>
<td>167.2</td>
</tr>
<tr>
<td>2016</td>
<td>5.2</td>
<td>1,601</td>
<td>0.21</td>
<td>45.3</td>
<td>205.4</td>
</tr>
<tr>
<td>2020</td>
<td>5.6</td>
<td>1,825</td>
<td>0.25</td>
<td>49.4</td>
<td>231.9</td>
</tr>
<tr>
<td>2030</td>
<td>7.0</td>
<td>2,406</td>
<td>0.35</td>
<td>63.8</td>
<td>304.4</td>
</tr>
<tr>
<td>2040</td>
<td>8.4</td>
<td>2,919</td>
<td>0.45</td>
<td>79.4</td>
<td>371.2</td>
</tr>
</tbody>
</table>

**Table 14 Fuel burn and CO\(_2\) emissions forecast for the baseline scenario**

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel Consumption (10(^8) kg)</th>
<th>CO(_2) emissions (10(^9) kg)</th>
<th>Fuel efficiency (kg/RPK)</th>
<th>Fuel efficiency (kg/RTK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>37.98</td>
<td>120.00</td>
<td>0.0310</td>
<td>0.310</td>
</tr>
<tr>
<td>2016</td>
<td>46.28</td>
<td>146.26</td>
<td>0.0287</td>
<td>0.287</td>
</tr>
<tr>
<td>2020</td>
<td>49.95</td>
<td>157.85</td>
<td>0.0274</td>
<td>0.274</td>
</tr>
<tr>
<td>2030</td>
<td>61.75</td>
<td>195.13</td>
<td>0.0256</td>
<td>0.256</td>
</tr>
<tr>
<td>2040</td>
<td>75.44</td>
<td>238.38</td>
<td>0.0259</td>
<td>0.259</td>
</tr>
</tbody>
</table>

*For reasons of data availability, results shown in this table do not include cargo/freight traffic.*

\(^6\) Calculated based on 98% of the passenger traffic

\(^7\) Includes passenger and freight transport (on all-cargo and passenger flights).

\(^8\) A value of 100 kg has been used as the average mass of a passenger incl. baggage (ref: ICAO).
Figure 2 - Forecasted traffic until 2040 (assumed both for the baseline and implemented measures scenarios)

Figure 3 - Fuel consumption forecast for the baseline and implemented measures scenarios (international passenger flights departing from ECAC airports)
8.4. ECAC SCENARIO WITH IMPLEMENTED MEASURES, ESTIMATED BENEFITS OF MEASURES

In order to improve fuel efficiency and to reduce future air traffic emissions beyond the projections in the baseline scenario, ECAC States have taken further action. Assumptions for a top-down assessment of effects of mitigation actions are presented here, based on modelling results by EUROCONTROL and EASA. Measures to reduce aviation’s fuel consumption and emissions will be described in the following chapters.

For reasons of simplicity, the scenario with implemented measures is based on the same traffic volumes as the baseline case, i.e. EUROCONTROL’s ‘Regulation and Growth’ scenario described earlier. Unlike in the baseline scenario, the effects of aircraft related technology development, improvements in ATM/operations and alternative fuels are considered here for a projection of fuel consumption and CO2 emissions up to the year 2040.

Effects of improved aircraft technology are captured by simulating fleet rollover and considering the fuel efficiency improvements of new aircraft types of the latest generation (e.g. Airbus A320NEO, Boeing 737MAX, Airbus A350XWB etc.). The simulated future fleet of aircraft has been generated using the Aircraft Assignment Tool (AAT) developed collaboratively by EUROCONTROL, EASA and the European Commission. The retirement process of the Aircraft Assignment Tool is performed year by year, allowing the determination of the amount of new aircraft required each year. In addition to the fleet rollover, a constant annual improvement of fuel efficiency of 0.96% per annum is assumed to aircraft deliveries during the last 10 years of the forecast (2030-2040). This rate of improvement corresponds to the ‘medium’ fuel technology scenario used by CAEP to generate the fuel trends for the Assembly. The effects of improved ATM efficiency are captured in the Implemented Measures Scenario on the basis of efficiency analyses from the SESAR project. Regarding SESAR effects, baseline deployment improvements of 0.2% in terms of fuel efficiency are assumed to be included in the base year fuel consumption for 2010. This improvement is assumed to rise to 0.3% in 2016 while additional improvements of 2.06% are targeted for the time period from
2025 onwards. Further non-SESAR related fuel savings have been estimated to amount to 1.2% until the year 2010, and are already included in the baseline calculations.

Regarding the introduction of sustainable alternative fuels, the European ACARE roadmap targets described in chapter 9.2.1 of this document are assumed for the implemented measures case. These targets include an increase of alternative fuel quantities to 2% of aviation’s total fuel consumption in the year 2020, rising linearly to 25% in 2035 and 40% in 2050. An average 60% reduction of lifecycle CO2 emissions compared to crude-oil based JET fuel was assumed for sustainable aviation fuels, which is in line with requirements from Article 17 of the EU’s Renewable Energy Directive (Directive 2009/28/EC). The resulting emission savings are shown in Table 6 and Figure 4 in units of equivalent CO2 emissions on a well-to-wake basis. Well-to-wake emissions include all GHG emissions throughout the fuel lifecycle, including emissions from feedstock extraction or cultivation (including land-use change), feedstock processing and transportation, fuel production at conversion facilities as well as distribution and combustion.

For simplicity, effects of market-based measures including the EU Emissions Trading Scheme (ETS) and ICAO’s Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) on aviation’s CO2 emissions have not been modelled explicitly in the top-down assessment of the implemented measures scenario presented here. CORSIA aims for carbon-neutral growth (CNG) of aviation, and this target is therefore shown in Figure 4.

Tables 15-17 and Figures 2-3 summarize the results for the scenario with implemented measures. It should be noted that Table 15 shows direct combustion emissions of CO2

---

9 See SESAR1 D72 “Updated Performance Assessment in 2016” document, November 2016, project B05, project manager: ENAIRE.

10 See SESAR1 D107 “Updated Step 1 validation targets – aligned with dataset 13”, project B.04.01, December 2014, project manager: NATS.

11 According to article 17 of the EU RED (Directive 2009/28/EC), GHG emission savings of at least 60% are required for biofuels produced in new installations in which production started on or after 1 January 2017.

12 Well-to-wake CO2e emissions of fossil-based JET fuel are calculated by assuming an emission index of 3.88 kg CO2e per kg fuel (see DIN e.V., "Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)", German version EN 16258:2012), which is in accordance with 89 g CO2e per MJ suggested by ICAO CAEP AFTF.

13 Note that in a strict sense the CORSIA target of CNG is aimed to be achieved globally (and hence not necessarily in each world region).
(assuming 3.16 kg CO2 per kg fuel), whereas Table 17 and Figure 4 present equivalent CO2 emissions on a well-to-wake basis.

**Table 15 Fuel burn and CO2 emissions forecast for the Implemented Measures Scenario (new aircraft technology and ATM improvements only)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel Consumption ($10^9$ kg)</th>
<th>CO$_2$ emissions ($10^9$ kg)</th>
<th>Fuel efficiency (kg/RTK)</th>
<th>Fuel efficiency (kg/RTK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>37.98</td>
<td>120.00</td>
<td>0.0310</td>
<td>0.310</td>
</tr>
<tr>
<td>2016</td>
<td>46.24</td>
<td>146.11</td>
<td>0.0286</td>
<td>0.286</td>
</tr>
<tr>
<td>2020</td>
<td>49.03</td>
<td>154.93</td>
<td>0.0245</td>
<td>0.245</td>
</tr>
<tr>
<td>2030</td>
<td>57.38</td>
<td>181.33</td>
<td>0.0242</td>
<td>0.242</td>
</tr>
<tr>
<td>2040</td>
<td>67.50</td>
<td>213.30</td>
<td>0.0237</td>
<td>0.237</td>
</tr>
</tbody>
</table>

*For reasons of data availability, results shown in this table do not include cargo/freight traffic.*

**Table 16. Average annual fuel efficiency improvement for the Implemented Measures Scenario (new aircraft technology and ATM improvements only)**

<table>
<thead>
<tr>
<th>Period</th>
<th>Average annual fuel efficiency improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2016</td>
<td>-1.36%</td>
</tr>
<tr>
<td>2016-2020</td>
<td>-1.40%</td>
</tr>
<tr>
<td>2020-2030</td>
<td>-1.11%</td>
</tr>
<tr>
<td>2030-2040</td>
<td>-0.21%</td>
</tr>
</tbody>
</table>

**Table 17. Equivalent (well-to-wake) CO2e emissions forecasts for the scenarios described in this chapter**

<table>
<thead>
<tr>
<th>Year</th>
<th>Well-to-wake CO2e emissions ($10^9$ kg)</th>
<th>% improvement by Implemented Measures (full scope)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline Scenario</td>
<td>Implemented Measures Scenario</td>
</tr>
<tr>
<td></td>
<td>Aircraft techn. improvements only</td>
<td>Aircraft techn. and ATM improvements</td>
</tr>
<tr>
<td>2010</td>
<td>147.3</td>
<td>NA</td>
</tr>
<tr>
<td>2016</td>
<td>179.6</td>
<td>179.4</td>
</tr>
<tr>
<td>2020</td>
<td>193.8</td>
<td>190.4</td>
</tr>
<tr>
<td>2030</td>
<td>239.6</td>
<td>227.6</td>
</tr>
<tr>
<td>2040</td>
<td>292.7</td>
<td>267.7</td>
</tr>
</tbody>
</table>

*For reasons of data availability, results shown in this table do not include cargo/freight traffic. Note that fuel consumption is assumed to be unaffected by the use of alternative fuels.*
As shown in Figures 3-4, the impact of improved aircraft technology indicates an overall 8.5% reduction of fuel consumption and CO2 emissions in 2040 compared to the baseline scenario. Whilst the data to model the benefits of ATM improvements and sustainable alternative fuels shown in Figure 4 may be less robust, they are nevertheless valuable contributions to reduce emissions further. Overall fuel efficiency, including the effects of new aircraft types and ATM-related measures, is projected to improve by 24% between 2010 and 2040.

Under the currently assumed aircraft and ATM improvement scenarios, the rate of fuel efficiency improvement is expected to slow down progressively until 2040. Aircraft technology and ATM improvements alone will not be sufficient to meet the post-2020 carbon neutral growth objective of aviation, nor will the use of alternative fuels even if Europe’s ambitious targets for alternative fuels are met. This confirms that additional action, particularly market-based measures, are required to fill the gap.
9. ACTIONS TAKEN COLLECTIVELY THROUGHOUT EUROPE

9.1. AIRCRAFT RELATED TECHNOLOGY DEVELOPMENT

9.1.1 AIRCRAFT EMISSIONS STANDARDS (EUROPE’S CONTRIBUTION TO THE DEVELOPMENT OF THE AEROPLANE CO2 STANDARD IN CAEP)

European Member States fully supported the work achieved in ICAO’s Committee on Aviation Environmental Protection (CAEP), which resulted in an agreement on the new airplane CO\textsubscript{2} Standard at CAEP/10 meeting in February 2016, applicable to new airplane type designs from 2020 and to airplane type designs that are already in-production in 2023. Europe significantly contributed to this task, notably through the European Aviation Safety Agency (EASA) which co-led the CO\textsubscript{2} Task Group within CAEP’s Working Group 3, and which provided extensive technical and analytical support.

The assessment of the benefits provided by this measure in terms of reduction in European emissions is not provided in this action plan. Nonetheless, elements of assessment of the overall contribution of the CO\textsubscript{2} standard towards the global aspirational goals are available in CAEP.

9.1.2 RESEARCH AND DEVELOPMENT

Clean Sky is an EU joint technology initiative (JTI) that aims to develop and mature breakthrough “clean technologies” for air transport globally. By accelerating their deployment, the JTI will contribute to Europe’s strategic environmental and social priorities, and simultaneously promote competitiveness and sustainable economic growth.

Joint technology initiatives are specific large-scale EU research projects created by the European commission within the 7th framework programme (FP7) and continued within the horizon 2020 framework programme. Set up as a public private partnership between the European commission and the European aeronautical industry, clean sky pulls together the research and technology resources of the European union in a coherent programme that contributes significantly to the ‘greening’ of global aviation.
The first Clean Sky programme (Clean sky 1 - 2011-2017) had a budget of €1.6 billion, equally shared between the European commission and the aeronautics industry. It aimed to develop environmental friendly technologies impacting all flying-segments of commercial aviation. The objectives are to reduce aircraft CO2 emissions by 20-40%, NOx by around 60% and noise by up to 10db compared to year 2000 aircraft.

This was followed up with a second programme (Clean sky 2 – 2014-2024) with the objective to reduce aircraft emissions and noise by 20 to 30% with respect to the latest technologies entering into service in 2014. The current budget for the programme is approximately €4 billion.

The two interim evaluations of clean sky in 2011 and 2013 acknowledged that the programme is successfully stimulating developments towards environmental targets. These preliminary assessments confirm the capability of achieving the overall targets at completion of the programme.

Main remaining areas for RTD efforts under clean sky 2 are:

- Large passenger aircraft: demonstration of best technologies to achieve the environmental goals whilst fulfilling future market needs and improving the competitiveness of future products.
- Regional aircraft: demonstrating and validating key technologies that will enable a 90-seat class turboprop aircraft to deliver breakthrough economic and environmental performance and a superior passenger experience.
- Fast rotorcraft: demonstrating new rotorcraft concepts (tilt-rotor and compound helicopters) technologies to deliver superior vehicle versatility and performance.
- Airframe: demonstrating the benefits of advanced and innovative airframe structures (like a more efficient wing with natural laminar flow, optimized control surfaces, control systems and embedded systems, highly integrated in metallic and advanced composites structures). In addition, novel engine integration strategies and innovative fuselage structures will be investigated and tested.
• Engines: validating advanced and more radical engine architectures.
• Systems: demonstrating the advantages of applying new technologies in major areas such as power management, cockpit, wing, landing gear, to address the needs of a future generation of aircraft in terms of maturation, demonstration and innovation.
• Small air transport: demonstrating the advantages of applying key technologies on small aircraft demonstrators to revitalize an important segment of the aeronautics sector that can bring key new mobility solutions.
• Eco-design: coordinating research geared towards high eco-compliance in air vehicles over their product life and heightening the stewardship with intelligent re-use, recycling and advanced services.

In addition, the technology evaluator will continue to be upgraded to assess technological progress routinely and evaluate the performance potential of clean sky 2 technologies at both vehicle and aggregate levels (airports and air traffic systems). More details on clean sky can be found at the following link: http://www.cleansky.eu/

9.2. ALTERNATIVE FUELS

9.2.1. EUROPEAN ADVANCED BIOFUELS FLIGHTPATH

Within the European union, Directive 2009/28/EC on the promotion of the use of energy from renewable sources (“the Renewable Energy Directive” – RED) established mandatory targets to be achieved by 2020 for a 20% overall share of renewable energy in the EU and a 10% share for renewable energy in the transport sector. Furthermore, sustainability criteria for biofuels to be counted towards that target were established14. Directive 2009/28/EC of the European Parliament and of the Council of 23/04/2009 on the promotion of the use of energy from renewable sources, details in its article 17 that ‘with effect from 1 January 2017, the greenhouse gas emission saving from the use of biofuels and bioliquids taken into account for the purposes referred to in points (a), (b) and (c) of paragraph 1 shall be at least 50 %. From 1 January 2018

that greenhouse gas emission saving shall be at least 60 % for biofuels and bioliquids produced in installations in which production started on or after 1 January 2017’.

In November 30, 2016, the European commission (EC) presented a proposal to the EU Council and the European parliament for a recast of the renewable energy directive for 2030.

To promote the deployment and development of low carbon fuels, such as advanced biofuels, it is proposed to introduce after 2020 an obligation requiring fuel suppliers to sell a gradually increasing share of renewable and low-emission fuels, including advanced biofuels and renewable electricity (at least 1.5% in 2021 increasing to at least 6.8% by 2030).

To promote innovation the obligation includes a specific sub-quota for advanced biofuels, increasing from 0.5% in 2021 to at least 3.6% in 2030. Advanced biofuels are defined as biofuels that are based on a list of feedstocks; mostly lignocellulosic material, wastes and residues.

Aviation and marine sectors are explicitly covered in the proposal. In fact, it is proposed that advanced alternative fuels used for aviation and maritime sectors can be counted 1.2 times towards the 6.8% renewable energy mandate. This would provide an additional incentive to develop and deploy alternative fuels in the aviation sector.

In February 2009, the European Commission's Directorate General for Energy and Transport initiated the SWAFEA (Sustainable Ways for Alternative Fuels and Energy for Aviation) study to investigate the feasibility and the impact of the use of alternative fuels in aviation.

The SWAFEA final report was published in July 2011\(^\text{15}\). It provides a comprehensive analysis on the prospects for alternative fuels in aviation, including an integrated analysis of the technical feasibility, environmental sustainability (based on the sustainability criteria of the EU Directive on renewable energy\(^\text{16}\) and economic aspects. It includes a number of recommendations on the steps that should be taken to promote the take-up of sustainable biofuels for aviation in Europe.

In March 2011, the European Commission published a White Paper on transport\(^\text{17}\). In the context of an overall goal of achieving a reduction of at least 60% in greenhouse gas emissions


\(^{17}\) Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM (2011) 144 final
from transport by 2050 with respect to 1990, the White Paper established a goal of low-carbon sustainable fuels in aviation reaching 40% by 2050.

<table>
<thead>
<tr>
<th>ACARE Roadmap targets regarding share alternative sustainable fuels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation to use:</td>
</tr>
<tr>
<td>- at minimum 2% sustainable alternative fuels in 2020;</td>
</tr>
<tr>
<td>- at minimum 25% sustainable alternative fuels in 2035;</td>
</tr>
<tr>
<td>- at minimum 40% sustainable alternative fuels in 2050</td>
</tr>
</tbody>
</table>

As a first step towards delivering this goal, in June 2011 the European commission, in close coordination with Airbus, leading European airlines (Lufthansa, Air France/KLM, & British airways) and key European biofuel producers (Choren industries, Neste oil, Biomass technology group and UOP), launched the

**European Advanced Biofuels Flight-path.** This industry-wide initiative aims to speed up the commercialization of aviation biofuels in Europe, with the objective of achieving the commercialization of sustainably produced paraffinic biofuels in the aviation sector by reaching an aggregated 2 million tonnes consumption by 2020. This initiative is a shared and voluntary commitment by its members to support and promote the production, storage and distribution of sustainably produced drop- in biofuels for use in aviation. It also targets establishing appropriate financial mechanisms to support the construction of industrial "first of a kind" advanced biofuel production plants. The Biofuels Flight path is explained in a technical paper, which sets out in more detail the challenges and required actions

More specifically, the initiative focuses on the following:

1. Facilitating the development of standards for drop-in biofuels and their certification for use in commercial aircraft,
2. Working together across the full supply chain to further develop worldwide accepted sustainability certification frameworks,

3. Agree biofuel take-off arrangements over a defined period of time and at a reasonable cost,

4. Promote appropriate public and private actions to ensure the market uptake of paraffinic biofuels by the aviation sector,

5. Establish financing structures to facilitate the realisation of 2nd Generation biofuel projects,

6. Accelerate targeted research and innovation for advanced biofuel technologies, and especially algae, and

7. Take concrete actions to inform the European citizen of the benefits of replacing kerosene with certified sustainable biofuels.

When the Flightpath 2020 initiative began in 2010, only one production pathway was approved for aviation use; renewable kerosene had only been produced at very small scale and only a handful of test and demonstration flights had been conducted using it. Since then, worldwide technical and operational progress in the industry has been remarkable. Four different pathways for the production of renewable kerosene are now approved and several more are expected to be certified soon. A significant number of flights using renewable kerosene have been conducted, most of them revenue flights carrying passengers. Production has been demonstrated at up to industrial scale for some of the pathways. Distribution of renewable kerosene through an airport hydrant system was also demonstrated in Oslo in 2015.

In 2016 the European commission tendered support and secretariat functions for the Flightpath 2020, which had so far depended on the initiative of the individual members. This €1.5m tender was won by a consortium run by SENASA, which started the work supporting the Flightpath at the end of 2016.

9.2.2. RESEARCH AND DEVELOPMENT PROJECTS ON ALTERNATIVE FUELS IN AVIATION

In the time frame 2011-2016, 3 projects have been funded by the FP7 research and innovation program of the EU.

**ITAKA:** €10m EU funding (2012-2015) with the aim of assessing the potential of a specific crop (camelina) for providing jet fuel. The project aims entailed testing the whole chain from field to fly and assessing the potential beyond the data gathered in lab experiments, gathering
experiences on related certification, distribution and economic aspects. For a feedstock, ITAKA targeted European camelina oil and used cooking oil in order to meet a minimum of 60% GHG emissions savings compared to the fossil fuel jet A1.

**SOLAR - JET:** This project has demonstrated the possibility of producing jet-fuel from CO2 and water. This was done by coupling a two-step solar thermochemical cycle based on non-stoichiometric ceria redox reactions with the Fischer-Tropsch process. This successful demonstration is further complemented by assessments of the chemical suitability of the solar kerosene, identification of technological gaps, and determination of the technological and economical potentials.

**Core-JetFuel:** €1.2m EU funding (2013-2017) this action evaluated the research and innovation “landscape” in order to develop and implement a strategy for sharing information, for coordinating initiatives, projects and results and to identify needs in research, standardisation, innovation/deployment and policy measures at European level. Bottlenecks of research and innovation will be identified and, where appropriate, recommendations for the European commission will be made with respect to the priorities in the funding strategy. The consortium covers the entire alternative fuel production chain in four domains: feedstock and sustainability; conversion technologies and radical concepts; technical compatibility, certification and deployment; policies, incentives and regulation. Core-jet fuel ensures cooperation with other European, international and national initiatives and with the key stakeholders. The expected benefits are enhanced knowledge amongst decision makers, support for maintaining coherent research policies and the promotion of a better understanding of future investments in aviation fuel research and innovation.

In 2015, the European commission launched projects under the horizon 2020 research programme with production capacities of the order of several thousand tonnes per year.

In addition, in 2013 the commission tendered the HBBA study (high biofuel blends in aviation). This study analysed in detail the blending behavior of fossil kerosene with bio kerosene produced by the various pathways either already approved or undergoing the technical approval process. It also analysed the impact of bio kerosene on various types of aircraft fuel seals, plus the effect of different bio-kerosenes on aircraft emissions. The final report on this research was published in early 2017 and is available at: [https://ec.europa.eu/energy/sites/ener/files/documents/final_report_for_publication.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/final_report_for_publication.pdf).
9.3. IMPROVED AIR TRAFFIC MANAGEMENT AND INFRASTRUCTURE USE

9.3.1. SESAR PROJECT

The European Union’s Single European Sky (SES) policy aims to reform Air Traffic Management (ATM) in Europe in order to enhance its performance in terms of its capacity to manage larger volume of flights in a safer, more cost-efficient and environmental friendly manner.

The SES aims at achieving 4 high level performance objectives (referred to 2005 context):

- Triple capacity of ATM systems
- Reduce ATM costs by 50%
- Increase safety by a factor of 10
- Reduce the environmental impact by 10% per flight

SESAR, the technological pillar of the Single European Sky, contributes to the Single Sky's performance targets by defining, developing, validating and deploying innovative technological and operational solutions for managing air traffic in a more efficient manner.

Guided by the European ATM Master Plan, the SESAR Joint Undertaking (JU) is responsible for defining, developing, validating and delivering technical and operation solutions to modernise Europe’s air traffic management system and deliver benefits to Europe and its citizens. The SESAR JU research programme has been split into 2 phases, SESAR 1 (from 2008 to 2016) and SESAR 2020 (started in 2016). It is delivering solutions in four key areas, namely airport operations, network operations, air traffic services and technology enablers. SESAR contribution to the SES high-level goals set by the Commission are continuously reviewed by the SESAR JU and kept up to date in the ATM Master Plan.

The estimated potential fuel emission savings per flight segment is depicted below:

*Figure 5 Estimated fuel savings*
By the end of SESAR 1, the validation exercises conducted showed that the solutions identified could provide by 2024 (as compared to the 2005 baseline) 2.36% reduction per flight in gate-to-gate greenhouse gas emissions.

9.3.2. SESAR RESEARCH PROJECTS (ENVIRONMENTAL FOCUS)

Within the SESAR R&D activities, environmental aspects have mainly been addressed under two types of projects: Environmental research projects which are considered as a transversal activity and therefore primarily contribute to the validation of the SESAR solutions and SESAR demonstration projects, which are pre-implementation activities. Environment aspects, in particular fuel efficiency, are also a core objective of approximately 80% of SESAR’s primary projects.

Four Environmental research projects are now completed:

- Project 16.03.01 dealt with Development of the Environment validation framework (Models and Tools);
- Project 16.03.02 dealt with the Development of environmental metrics;
- Project 16.03.03 dealt with the Development of a framework to establish interdependencies and trade-off with other performance areas;
- Project 16.03.07 dealt with Future regulatory scenarios and risks.

In the context of Project 16.03.01 the IMPACT tool was developed providing SESAR primary projects with the means to conduct fuel efficiency, aircraft emissions and noise assessments at the same time, from a web based platform, using the same aircraft performance assumptions. IMPACT successfully passed the CAEP MDG V&V process (Modelling and Database Group Verification and Validation process). Project 16.06.03 has also ensured the continuous development/maintenance of other tools covering aircraft GHG assessment (AEM), and local air quality issues (Open-ALAQS). It should be noted that these tools have been developed for covering the research and the future deployment phase of SESAR.

In the context of Project 16.03.02 a set of metrics for assessing GHG emissions, noise and airport local air quality has been documented. The metrics identified by Project 16.03.02 and not subject of specific IPRs will be gradually implemented into IMPACT.

Project 16.03.03 has produced a comprehensive analysis on the issues related to environmental interdependencies and trade-offs.

Project 16.03.07 has conducted a review of current environmental regulatory measures as applicable to ATM and SESAR deployment, and another report presenting an analysis of environmental regulatory and physical risk scenarios in the form of user guidance. It identifies both those Operation Focus Areas (OFA) and Key Performance Areas which are most affected by these risks and those OFAs which can contribute to mitigating them. It also provides a gap analysis identifying knowledge gaps or uncertainties which require further monitoring, research or analysis.

Project 16.06.03, was the SESAR Environment support and coordination project which ensured the coordination and facilitation of all the Environmental research project activities whilst supporting the SESAR/AIRE/DEMO projects in the application of the material produced by the research projects. In particular, this project delivered an Environment Impact Assessment methodology providing guidance on how to conduct an assessment, which metrics to use, and dos and don’ts for each type of validation exercise with a specific emphasis on flight trials.
The above-mentioned SESAR 1 environmental project deliverables constitute the reference material that SESAR2020 should be using.

9.3.3. SESAR DEMONSTRATION PROJECTS:

In addition to its core activities, the SESAR JU co-finances projects where ATM stakeholders worked collaboratively to perform integrated flight trials and demonstrations validating solutions for the reduction of CO2 emissions for surface, terminal and oceanic operations to substantially accelerate the pace of change. Between 2009 and 2012, the SESAR JU co-financed a total of 33 “green” projects in collaboration with global partners, under the Atlantic Interoperability Initiative to Reduce Emissions (AIRE).

A total of 15767 flight trials were conducted under the AIRE initiative involving more than 100 stakeholders, demonstrating savings ranging from 20 to 1000kg fuel per flight (or 63 to 3150 kg of CO2), and improvements to day-to-day operations. Other 9 demonstration projects took place from 2012 to 2014 focusing also on environment and during 2015 and 2016 the SESAR JU co-financed 15 additional large-scale demonstrations projects more ambitious in geographic scale and technology. More information can be found at http://www.sesarju.eu

A key feature leading to the success of AIRE is that it focused strongly on operational and procedural techniques rather than new technologies. AIRE trials used technology that was already in place, but until the relevant AIRE project came along, air traffic controllers and other users hadn’t necessarily thought deeply about how to make the best operationally use of that technology. For example, because of the AIRE initiative and the good cooperation between NAV Portugal and FAA, in New York and St Maria oceanic airspace lateral separation optimisation is given for any flight that requests it.

Specific trials were carried for the following improvement areas/solutions as part of the AIRE initiative:

a. Use of GDL/DMAN systems (pre-departure sequencing system / Departure Manager) in Amsterdam, Paris and Zurich,

b. Issue of Target-Off Block time (TOBT), calculation of variable taxiout time and issue of Target-Start-up Arrival Time (TSAT) in Vienna,
c. Continuous Descent Operations (CDOs or CDAs) in Amsterdam, Brussels, Cologne, Madrid, New York, Paris, Prague, Pointe-à-Pitre, Toulouse, and Zurich,
d. CDOs in Stockholm, Gothenburg, Riga, La Palma; Budapest and Palma de Majorca airports using RNP-AR procedures
e. Lateral and vertical flight profile changes in the NAT taking benefit of the implementation of Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance in the North Atlantic,
f. Calculation of Estimated Times of Arrival (ETA) allowing time based operations in Amsterdam,
g. Precision Area Navigation - Global Navigation Satellite System (PRNAV GNSS) Approaches in Sweden,
h. Free route in Lisbon and Casablanca, over Germany, Belgium, Luxembourg, Netherlands in the EURO-SAM corridor, France, and Italy,
i. Global information sharing and exchange of actual position and updated meteorological data between the ATM system and Airline AOCs for the vertical and lateral optimisation of oceanic flights using a new interface.

The AIRE 1 campaign (2008-2009) demonstrated, with 1152 trials performed, that significant savings can already be achieved using existing technology. CO2 savings per flight ranged from 90kg to 1250kg and the accumulated savings during trials were equivalent to 400 tonnes of CO2. This first set of trials represented not only substantial improvements for the greening of air transport, but high motivation and commitment of the teams involved creating momentum to continue to make progress on reducing aviation emissions.
The AIRE 2 campaign (2010-2011) showed a doubling in demand for projects and a high transition rate from R&D to day-to-day operations. 18 projects involving 40 airlines, airports, ANSPs and industry partners were conducted in which surface, terminal, oceanic and gate-to-gate operations were tackled. 9416 flight trials took place. Table 19 summarises AIRE 2 projects operational aims and results.

---

**Table 18: Summary of AIRE 1 projects**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Location</th>
<th>Trials performed</th>
<th>CO$_2$ benefit/flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>Paris, France</td>
<td>353</td>
<td>190-1200 kg</td>
</tr>
<tr>
<td></td>
<td>Paris, France</td>
<td>82</td>
<td>100-1250 kg</td>
</tr>
<tr>
<td></td>
<td>Stockholm, Sweden</td>
<td>11</td>
<td>450-950 kg</td>
</tr>
<tr>
<td></td>
<td>Madrid, Spain</td>
<td>620</td>
<td>250-800 kg</td>
</tr>
<tr>
<td>Terminal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceanic</td>
<td>Santa Maria, Portugal</td>
<td>48</td>
<td>90-650 kg</td>
</tr>
<tr>
<td></td>
<td>Reykjavik, Iceland</td>
<td>48</td>
<td>250-1050 kg</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1152</td>
<td></td>
</tr>
</tbody>
</table>

---

**Table 19: Summary of AIRE 2 projects**

<table>
<thead>
<tr>
<th>Project name</th>
<th>Location</th>
<th>Operation</th>
<th>Objective</th>
<th>CO$_2$ and Noise benefits per flight (kg)</th>
<th>Nb of flights</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDM at Vienna Airport</td>
<td>Austria</td>
<td>CDM notably pre-departure sequence</td>
<td>CO$_2$ &amp; Ground Operational efficiency</td>
<td>54</td>
<td>208</td>
</tr>
<tr>
<td>Greener airport operations under adverse conditions</td>
<td>France</td>
<td>CDM notably pre-departure sequence</td>
<td>CO$_2$ &amp; Ground Operational efficiency</td>
<td>79</td>
<td>1800</td>
</tr>
<tr>
<td>Project Code</td>
<td>Country</td>
<td>Description</td>
<td>CO2 Emissions</td>
<td>CO2 Range (10 to 25 Nm from touchdown)</td>
<td>Percentage</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>B3</td>
<td>Belgium</td>
<td>CDO in a complex radar vectoring environment</td>
<td></td>
<td>160-315; -2dB</td>
<td>3094</td>
</tr>
<tr>
<td>DoWo - Down Wind Optimisation</td>
<td>France</td>
<td>Green STAR &amp; Green IA in busy TMA</td>
<td>CO2</td>
<td>158-315</td>
<td>219</td>
</tr>
<tr>
<td>REACT-CR</td>
<td>Czech Republic</td>
<td>CDO</td>
<td>CO2</td>
<td>205-302</td>
<td>204</td>
</tr>
<tr>
<td>Flight Trials for less CO2 emission during transition from en-route to final approach</td>
<td>Germany</td>
<td>Arrival vertical profile optimisation in high density traffic</td>
<td>CO2</td>
<td>110-650</td>
<td>362</td>
</tr>
<tr>
<td>RETA-CDA2</td>
<td>Spain</td>
<td>CDO from ToD</td>
<td>CO2</td>
<td>250-800</td>
<td>210</td>
</tr>
<tr>
<td>DORIS</td>
<td>Spain</td>
<td>Oceanic: Flight optimisation with ATC coordination &amp; Data link (ACARS, FANS CPDLC)</td>
<td>CO2</td>
<td>3134</td>
<td>110</td>
</tr>
<tr>
<td>ONATAP</td>
<td>Portugal</td>
<td>Free and Direct Routes</td>
<td>CO2</td>
<td>526</td>
<td>999</td>
</tr>
<tr>
<td>ENGAGE</td>
<td>UK</td>
<td>Optimisation of cruise altitude and/or Mach number</td>
<td>CO2</td>
<td>1310</td>
<td>23</td>
</tr>
<tr>
<td>RlongSM (Reduced longitudinal)</td>
<td>UK</td>
<td>Optimisation of cruise altitude profiles</td>
<td>CO2</td>
<td>441</td>
<td>533</td>
</tr>
<tr>
<td>Separation Minima)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate to gate Green Shuttle</td>
<td>France</td>
<td>Optimisation of cruise altitude profile &amp; CDO from ToD</td>
<td>CO₂</td>
<td>788</td>
<td>221</td>
</tr>
<tr>
<td>Transatlantic green flight PPTP</td>
<td>France</td>
<td>Optimisation of oceanic trajectory (vertical and lateral) &amp; approach</td>
<td>CO₂</td>
<td>2090+1050</td>
<td>93</td>
</tr>
<tr>
<td>Greener Wave</td>
<td>Switzerland</td>
<td>Optimisation of holding time through 4D slot allocation</td>
<td>CO₂</td>
<td>504</td>
<td>1700</td>
</tr>
<tr>
<td>VINGA</td>
<td>Sweden</td>
<td>CDO from ToD with RNP STAR and RNP AR.</td>
<td>CO₂ &amp; noise</td>
<td>70-285; negligible change to noise contours</td>
<td>189</td>
</tr>
<tr>
<td>AIRE Green Connections</td>
<td>Sweden</td>
<td>Optimised arrivals and approaches based on RNP AR &amp; Data link. 4D trajectory exercise</td>
<td>CO₂ &amp; noise</td>
<td>220</td>
<td>25</td>
</tr>
<tr>
<td>Trajectory based night time</td>
<td>The Netherlands</td>
<td>CDO with pre-planning</td>
<td>CO₂ + noise</td>
<td>TBC</td>
<td>124</td>
</tr>
<tr>
<td>A380 Transatlantic Green Flights</td>
<td>France</td>
<td>Optimisation of taxiing and cruise altitude profile</td>
<td>CO₂</td>
<td>1200+1900</td>
<td>19</td>
</tr>
</tbody>
</table>
The AIRE 3 campaign comprised 9 projects (2012-2014) and 5199 trials summarized in table 20.

*Table 20 Summary of AIRE 3 campaign*

<table>
<thead>
<tr>
<th>Project name</th>
<th>Location</th>
<th>Operation</th>
<th>Number of trials</th>
<th>Benefits per flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMBER</td>
<td>Riga International airport</td>
<td>Turboprop aircraft to fly tailored Required Navigation Performance – Authorisation Require (RNP-AR) approaches together with Continuous Descent Operations (CDO),</td>
<td>124</td>
<td>230kg reduction in CO2 emissions per approach; a reduction in noise impact of 0.6 decibels (dBA)</td>
</tr>
<tr>
<td>CANARIAS</td>
<td>La Palma and Lanzarote airports</td>
<td>CCDs and CDOs</td>
<td>8</td>
<td>Area Navigation-Standard Terminal Arrival Route (RNAV STAR) and RNP-AR approaches 34-38 NM and 292-313 kg of fuel for La Palma and 14 NM and 100 kg of fuel for Lanzarote saved.</td>
</tr>
<tr>
<td>OPTA-IN</td>
<td>Palma de Mallorca airport</td>
<td>CDOs</td>
<td>101</td>
<td>Potential reduction of 7-12% in fuel burn and related</td>
</tr>
<tr>
<td>Project</td>
<td>Description</td>
<td>CO2 emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REACT plus</td>
<td>Budapest airport</td>
<td>CDOs and CCOs</td>
<td>4113</td>
<td>102 kg of fuel conserved during each CDO</td>
</tr>
<tr>
<td>ENGAGE Phase II</td>
<td>North Atlantic – between Canada &amp; Europe</td>
<td>Optimisation of cruise altitude and/or Mach number</td>
<td>210</td>
<td>200-400 litres of fuel savings; An average of 1-2% of fuel burn</td>
</tr>
<tr>
<td>SATISFIED</td>
<td>EUR-SAM Oceanic corridor</td>
<td>Free routing</td>
<td>165</td>
<td>1.58 t CO2 emissions</td>
</tr>
<tr>
<td>SMART</td>
<td>Lisbon flight information region (FIR), New York Oceanic and Santa Maria FIR</td>
<td>Oceanic: Flight optimisation</td>
<td>250</td>
<td>3.13 t CO2 per flight</td>
</tr>
<tr>
<td>WE-FREE</td>
<td>Paris CDG, Venice, Verona, Milano Linate, Pisa, Bologna, Torino, Genoa airports</td>
<td>Free routing</td>
<td>128</td>
<td>693 kg CO2 for CDG-Roma Fiumicino; 504 kg CO2 for CDG Milano Linate</td>
</tr>
<tr>
<td>MAGGO</td>
<td>Santa Maria FIR and TMA</td>
<td>Several enablers</td>
<td>100</td>
<td>The MAGGO project couldn’t be concluded</td>
</tr>
</tbody>
</table>

9.3.4. SESAR2020 ENVIRONMENTAL PERFORMANCE ASSESSMENT

SESAR2020 builds upon the expectations of SESAR1 and of the deployment baseline.

It is estimated that around 50.0m MT of fuel per year will be burned by 2025, ECAC wide, by around 10m flights. The SESAR2020 Fuel Saving Ambition (10%) equate to 500kg per flight or around 1.6 t CO2 per flight, including:

- SESAR2020 Fuel Saving target for Solutions (6.8%) = 340kg/flight or 1 t CO2/flight,
• SESAR 1 Fuel Saving performance (1.8%) = 90kg/flight or 283kg of CO2/flight,
• SESAR Deployment Baseline Fuel Saving performance (0.2%) = 10kg/flight or 31kg of CO2/flight,
• Non-SESAR ATM improvements (1.2%) = 60kg/flight or 189Kg of CO2/flight.

It has to be noted that, while the SESAR 1 baseline was 2005, the SESAR2020 baseline was 2012.

*Figure 6 SESAR Fuel saving ambition repartition*

SESAR2020 has put in place a methodology that should allow a close monitoring of the expected fuel saving performance of each Solution, and of the overall programme. But, at this point of the SESAR2020 programme, it is too early to assess with a good level of confidence the gap between the expected fuel-saving benefit of each SESAR Solution and its demonstrated potential from the results of the validation exercises.

However, 30 out of the 85 SESAR2020 Solutions have the potential to generate fuel savings. Table 21 provides the Top 10 Solutions with the biggest expected fuel saving potential:
<table>
<thead>
<tr>
<th>Solution</th>
<th>Short description + Fuel saving rational</th>
<th>Operational environment (OE/ Sub-OEs) benefiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>PJ.07-01 Airspace User Processes for Trajectory Definition</td>
<td>This Solution refers to the development of processes related to the Flight Operation Centre (FOC) aimed at managing and updating the shared business trajectory, and fully integrating FOCs in the ATM Network processes. These processes respond to the need to accommodate individual airspace users’ business needs and priorities without compromising the performance of the overall ATM system or the performance of other stakeholders. This will also ensure continuity in the Collaborative Decision Making process throughout the trajectory lifecycle. The benefits will come through anticipation and choice of the optimal route and reduction of vertical inefficiencies, which will reduce costs and fuel burn. No real impact on airport is expected.</td>
<td>Mainly for: Terminal Very High Complexity&lt;br&gt;En-route Very High Complexity&lt;br&gt;Some benefit but much lower for: Terminal High, Medium, Low Complexity En-route High, Medium Complexity</td>
</tr>
<tr>
<td>PJ.10-01C Collaborative Control</td>
<td>This Solution refers to coordination by exception rather than coordination by procedure and is facilitated by advanced controller tools, reducing the need for coordination agreements, fewer boundary constraints and the ability to combine sectors into multisector planner teams. The existence of clear procedures for collaborative control reduces the need for coordination and results in a more streamlined method of operation close to a sector boundary. This may bring a reduction in the number of level-offs and, thus, bring a partial improvement in fuel efficiency.</td>
<td>Mainly for: Terminal Very High Complexity&lt;br&gt;En-route Very High Complexity&lt;br&gt;Some benefit but much lower for: Terminal High, Medium, Low Complexity En-route High, Medium Complexity</td>
</tr>
<tr>
<td>PJ.10-02b</td>
<td>This Solution aims to further improve the quality of services of separation management in the en-</td>
<td>Mainly for: Terminal Very High Complexity</td>
</tr>
</tbody>
</table>
| Advanced Separation Management | route and TMA operational environments by introducing automation mechanisms and integrating additional information (ATC intent, aircraft intent). Controller tools will enable earlier and more precise detection and resolution of conflicts. This will reduce the need for vectoring and enable de-confliction actions to be taken earlier and through the usage of closed clearances. Those will be managed more proactively on-board, and benefit fuel efficiency. Clearances issued by the ATCOs may, in some situations, take into account aircraft derived data related to airline preferences, bringing an improvement in fuel efficiency. | En-route Very High Complexity
Some benefit but much lower:
Terminal High, Medium, Low Complexity
En-route High, Medium Complexity |
| PJ.09-03 Collaborative Network Management Functions | This Solution allows for network management based on transparency, performance targets and agreed control mechanisms. The work enables a real-time visualisation of the evolving Airport Operation Plan (AOP) and Network Operating Plan (NOP) planning environment (such as demand pattern and capacity bottlenecks) to support airspace user and local planning activities. Thanks to this Solution, the increased efficiency of the performance of the system due to more optimised trajectory with airlines preference will result in fuel burn reductions. | Mainly for:
En-route Very High Complexity
Some benefit but much lower for:
Terminal very High, High, Medium Complexity
En-route High, Medium Complexity
Airport very large, large, medium |
| PJ.01-02 Use of Arrival and Departure Management Information for Traffic Optimization within the TMA | This Solution brings near real time traffic management to the TMA, taking advantage of predicted demand information provided by arrival and departure management systems from one or multiple airports. This will allow the identification and resolution of complex interacting traffic flows in the TMA and on the runway, through the use of AMAN and DMAN flow adjustments and ground holdings. Traffic optimisation obtained thanks to this Solution will reduce the need for tactical interventions and will result in more efficient flights, and increased flight efficiency will save fuel. | Mainly for:
Terminal Very High Complexity
En-route Very High Complexity
Some benefit but much lower for:
Terminal very High, High, Medium Complexity
En-route High, Medium Complexity |
<p>| PJ2-01 | Wake turbulence separation optimization | This Solution refers to the use of downlinked information from aircraft to predict wake vortex and determine appropriate wake- vortex minima dynamically, thereby optimising runway delivery. Wake turbulence separation optimization should reduce airborne delays due to arrival capacity limitations linked to wake separations. For major airports that are today constrained in peak hours, the use of: - optimised wake category scheme or pairwise separations can either be translated into added capacity (as described above) or additional resilience in case of perturbation. - time based separation will reduce the effect of a headwind on the arrival flow rate and thus increase the predictability of the scheduling process. On less constrained airports, significant improvement can also be observed by employing reduced separation applied on a time based separation basis in the specific runway configuration or wind conditions responsible for a large part of the airport delay. This increases the flexibility for Controllers to manage the arrival traffic due to the separation minima reduction. The weather dependant reduction of wake separation, considering the allowable increase of throughput, is expected to be a major mitigation of delay and to provide for an increase in the flexibility for Controllers to manage the arrival traffic due to the reduction in the required wake separations. The reduction of delay will generate fuel saving. | Mainly for: Airports and TMAs with High and Medium complexity. <strong>•</strong> Any runway configuration. <strong>•</strong> Airports with mainly strong headwinds. Capacity constrained airports or airports with observed delay. |
| PJ.09-02 | Integrated local DCB processes | This Solution sees the seamless integration of local network management with extended air traffic control planning and arrival management activities in short-term and execution phases. The work will improve the efficiency of ATM resource management, as well as the effectiveness of complexity resolutions by closing the gap between local network management and extended ATC planning. The increased efficiency of the performance of the system due to more optimised trajectory with airlines preference will result in fuel burn reductions. | Mainly for: Airport Very large. Some benefit but much lower for: Terminal very High, High, Medium Complexity. En-route very High, High, Medium Complexity. Airport large, medium. |
| PJ.01-03 | This Solution brings together vertical and lateral | | Mainly for: |</p>
<table>
<thead>
<tr>
<th><strong>Dynamic and Enhanced Routes and Airspace</strong></th>
<th><strong>Terminal Very High Complexity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>profile issues in both the en-route and TMA phases of flight, with a view to creating an end-to-end optimised profile and ensuring transition between free route and fixed route airspace. The Solution will be supported by new controller tools and enhanced airborne functionalities. Significant fuel efficiency benefits are expected from Continuous Descent (CDO) / Continuous Climb Operations (CCO) in high density operations. CDO / CCO permit closer correlation of the actual with optimal vertical profile, to take into account the preference of the Airspace User for the most efficient climb / descent profile for the flight. Implementation of enhanced conformance monitoring / alerting by both ground and airborne systems reduce the likelihood of ATCO intervention in the climb / descent, so reducing the potential for tactical level offs.</td>
<td>Some benefit but much lower for: Terminal High, Medium Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PJ.02-08 Traffic optimisation on single and multiple runway airports</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to a system that enables tower and approach controllers to optimise runway operations arrival and/or departure spacing and make the best use of minimum separations, runway occupancy, runway capacity and airport capacity. Imbalances known more than 3 hours ahead allow to re-planning inbound traffic from the originating airport or reconsider Airport Transit View (ATV) on behalf of airlines reducing delays due to airport constraints up to 20%. Planning runway closures or runway changes in the optimum periods of the day will minimize the time spent re-routing air and ground traffic during the execution phase. Sharing this information with the different actors will provide the NOP with more accurate forecasts for arrival and departure time in order to coordinate the subsequent target times. There should be some fuel gains as a direct consequence of improved predictability, both for departures and arrivals (less variability $$\Rightarrow$$ less patch stretching, holdings ...).</td>
<td>Terminal Very High Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PJ.08-01 Management of Dynamic Airspace configurations</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to the development of the process, procedures and tools related to Dynamic Airspace Configuration (DAC), supporting Dynamic Mobile Areas of Type 1 and Type 2. It consists of the activation of Airspace configurations through an integrated collaborative decision making process, at national, sub-regional and regional levels; a seamless and coordinated approach to airspace configuration, from planning to execution phases, allowing the Network to continuously adapt to demand pattern changes in a free route environment)</td>
<td>En-route Very High Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PJ.02-08 Traffic optimisation on single and multiple runway airports</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to a system that enables tower and approach controllers to optimise runway operations arrival and/or departure spacing and make the best use of minimum separations, runway occupancy, runway capacity and airport capacity. Imbalances known more than 3 hours ahead allow to re-planning inbound traffic from the originating airport or reconsider Airport Transit View (ATV) on behalf of airlines reducing delays due to airport constraints up to 20%. Planning runway closures or runway changes in the optimum periods of the day will minimize the time spent re-routing air and ground traffic during the execution phase. Sharing this information with the different actors will provide the NOP with more accurate forecasts for arrival and departure time in order to coordinate the subsequent target times. There should be some fuel gains as a direct consequence of improved predictability, both for departures and arrivals (less variability $$\Rightarrow$$ less patch stretching, holdings ...).</td>
<td>Terminal Very High Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PJ.08-01 Management of Dynamic Airspace configurations</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to the development of the process, procedures and tools related to Dynamic Airspace Configuration (DAC), supporting Dynamic Mobile Areas of Type 1 and Type 2. It consists of the activation of Airspace configurations through an integrated collaborative decision making process, at national, sub-regional and regional levels; a seamless and coordinated approach to airspace configuration, from planning to execution phases, allowing the Network to continuously adapt to demand pattern changes in a free route environment)</td>
<td>En-route Very High Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>pj.02-08 Traffic optimisation on single and multiple runway airports</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to a system that enables tower and approach controllers to optimise runway operations arrival and/or departure spacing and make the best use of minimum separations, runway occupancy, runway capacity and airport capacity. Imbalances known more than 3 hours ahead allow to re-planning inbound traffic from the originating airport or reconsider Airport Transit View (ATV) on behalf of airlines reducing delays due to airport constraints up to 20%. Planning runway closures or runway changes in the optimum periods of the day will minimize the time spent re-routing air and ground traffic during the execution phase. Sharing this information with the different actors will provide the NOP with more accurate forecasts for arrival and departure time in order to coordinate the subsequent target times. There should be some fuel gains as a direct consequence of improved predictability, both for departures and arrivals (less variability $$\Rightarrow$$ less patch stretching, holdings ...).</td>
<td>Terminal Very High Complexity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>pj.08-01 Management of Dynamic Airspace configurations</strong></th>
<th><strong>Mainly for:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This Solution refers to the development of the process, procedures and tools related to Dynamic Airspace Configuration (DAC), supporting Dynamic Mobile Areas of Type 1 and Type 2. It consists of the activation of Airspace configurations through an integrated collaborative decision making process, at national, sub-regional and regional levels; a seamless and coordinated approach to airspace configuration, from planning to execution phases, allowing the Network to continuously adapt to demand pattern changes in a free route environment)</td>
<td>En-route Very High Complexity</td>
</tr>
</tbody>
</table>
and ATC sector configurations adapted to dynamic TMA boundaries and both fixed and dynamic elements.

This solution increased efficiency enabling optimised flight trajectories and profiles with the end result being reduced fuel burn, noise and CO2 emissions. Advanced Airspace Management should decrease Airspace Users fuel consumption and reduce flight time. Optimised trajectory and a more direct route as a result of enhanced situation awareness through real airspace status update and seamless civil-military coordination by AFUA application.

9.4. ECONOMIC / MARKET – BASED MEASURES

ECAC members have always been strong supporters of a market-based measure scheme for international aviation to incentivise and reward good investment and operational choices, and so welcomed the agreement on the carbon offsetting and reduction scheme for international aviation (CORSIA). The 31 EEA states in Europe have already implemented the EU emissions trading system (ETS), including the aviation sector with around 500 aircraft operators participating in the cap and trade approach to limit CO2 emissions. It was the first and is the biggest international system capping greenhouse gas emissions. In the period 2012 to 2018 EU ETS has saved an estimated 100 million tonnes of intra-European aviation CO2 emissions.

9.4.1 THE EU EMISSION TRADING SYSTEM

The EU Emissions Trading System (EU ETS) is the cornerstone of the European Union's policy to tackle climate change, and a key tool for reducing greenhouse gas emissions cost-effectively, including from the aviation sector. It operates in 31 countries: the 28 EU Member States, Iceland, Liechtenstein and Norway. The EU ETS is the first and so far the biggest international system capping greenhouse gas emissions; it currently covers half of the EU's CO2 emissions, encompassing those from around 12 000 power stations and industrial plants in 31 countries, and, under its current scope, around 640 commercial and non-commercial aircraft operators that have flown between airports in the European Economic Area (EEA). The EU ETS
Directive has recently been revised in line with the European Council Conclusions of October 2014\(^\text{19}\) that confirmed that the EU ETS will be the main European instrument to achieve the EU’s binding 2030 target of an at least 40% domestic reduction of greenhouse gases compared to 1990\(^\text{20}\).

The EU ETS began operation in 2005; a series of important changes to the way it works took effect in 2013, strengthening the system. The EU ETS works on the "cap and trade" principle. This means there is a "cap", or limit, on the total amount of certain greenhouse gases that can be emitted by the factories, power plants, other installations and aircraft operators in the system. Within this cap, companies can sell to or buy emission allowances from one another. The limit on allowances available provides certainty that the environmental objective is achieved and gives allowances a market value. For aviation, the cap is calculated based on the average emissions from the years 2004-2006. Aircraft Operators are entitled to free allocation based on an efficiency benchmark, but this might not cover the totality of emissions. The remaining allowances need to be purchased from auctions or from the secondary market. The system allows aircraft operators to use aviation allowances or general (stationary installations) allowances to cover their emissions.

By the 30th April each year, companies, including aircraft operators, have to surrender allowances to cover their emissions from the previous calendar year. If a company reduces its emissions, it can keep the spare allowances to cover its future needs or sell them to another company that is short of allowances. The flexibility that trading brings ensures that emissions are cut where it costs least to do so. The number of allowances reduces over time so that total emissions fall.

As regards aviation, legislation to include aviation in the EU ETS was adopted in 2008 by the European Parliament and the Council\(^\text{21}\). The 2006 proposal to include aviation in the EU ETS was accompanied by detailed impact assessment\(^\text{22}\). After careful analysis of the different


\[^{22}\] http://ec.europa.eu/clima/policies/transport/aviation/documentation_en.htm
options, it was concluded that this was the most cost-efficient and environmentally effective option for addressing aviation emissions.

In October 2013, the Assembly of the International Civil Aviation Organization (ICAO) decided to develop a global market-based mechanism (MBM) for international aviation emissions. Following this agreement the EU decided to limit the scope of the EU ETS to flights between airports located in the European Economic Area (EEA) for the period 2013-2016 (Regulation 421/2014), and to carry out a new revision in the light of the outcome of the 2016 ICAO Assembly. The temporary limitation follows on from the April 2013 'stop the clock' decision\(^23\) adopted to promote progress on global action at the 2013 ICAO Assembly.

The European Commission assessed the outcome of the 39th ICAO Assembly and, in that light, made a new legislative proposal on the scope of the EU ETS. Following the EU legislative process, this Regulation was adopted in December 2017\(^24\).

The legislation maintains the scope of the EU ETS for aviation limited to intra-EEA flights. It foresees that once there is clarity on the nature and content of the legal instruments adopted by ICAO for the implementation of CORSIA, as well as about the intentions of other states regarding its implementation, a further assessment should take place and a report be presented to the European Parliament and to the Council considering how to implement CORSIA in Union law through a revision of the EU ETS Directive. This should be accompanied, where appropriate, by a proposal to the European Parliament and to the Council to revise the EU ETS Directive that is consistent with the Union economy-wide greenhouse gas emission reduction commitment for 2030 with the aim of preserving the environmental integrity and effectiveness of Union climate action.

The Regulation also sets out the basis for the implementation of CORSIA. It provides for European legislation on the monitoring, reporting and verification rules that avoid any


distortion of competition for the purpose of implementing CORSIA in European Union law. This will be undertaken through a delegated act under the EU ETS Directive.

The EU ETS has been effectively implemented over recent years on intra-EEA flights, and has ensured a level playing field with a very high level of compliance. It will continue to be a central element of the EU policy to address aviation CO2 emissions in the coming years. The complete, consistent, transparent and accurate monitoring, reporting and verification of greenhouse gas emissions remain fundamental for the effective operation of the EU ETS. Aviation operators, verifiers and competent authorities have already gained experience with monitoring and reporting during the first aviation trading period; detailed rules are prescribed by Regulations (EU) N°600/2012 and 601/2012.

The EU legislation establishes exemptions and simplifications to avoid excessive administrative burden for the smallest aircraft operators. Since the EU ETS for aviation took effect in 2012 a de minimis exemption for commercial operators – with either fewer than 243 flights per period for three consecutive four-month periods or flights with total annual emissions lower than 10 000 tonnes CO2 per year – applies, which means that many aircraft operators from developing countries are exempted from the EU ETS. Indeed, over 90 States have no commercial aircraft operators included in the scope of the EU ETS. From 2013 also flights by non-commercial aircraft operators with total annual emissions lower than 1 000 tonnes CO2 per year are excluded from the EU ETS up to 2020. A further administrative simplification applies to small aircraft operators emitting less than 25 000 tonnes of CO2 per year, who can choose to use the small emitter’s tool rather than independent verification of their emissions. In addition, small emitter aircraft operators can use the simplified reporting procedures under the existing legislation.

The EU legislation foresees that, where a third country takes measures to reduce the climate change impact of flights departing from its airports, the EU will consider options available in order to provide for optimal interaction between the EU scheme and that country’s measures. In such a case, flights arriving from the third country could be excluded from the scope of the EU ETS. The EU therefore encourages other countries to adopt measures of their own and is


ready to engage in bilateral discussions with any country that has done so. The legislation also makes it clear that if there is agreement on global measures, the EU shall consider whether amendments to the EU legislation regarding aviation under the EU ETS are necessary.

**Impact on fuel consumption and/or CO2 emissions**

The environmental outcome of an emissions trading system is determined by the emissions cap. Aircraft operators are able to use allowances from outside the aviation sector to cover their emissions. The absolute level of CO2 emissions from the aviation sector itself can exceed the number of allowances allocated to it, as the increase is offset by CO2 emissions reductions in other sectors of the economy covered by the EU ETS.

With the inclusion of intra-European flights in the EU ETS it has delivered around 100 MT of CO2 reductions/offsets between 2012 and 2018. The total amount of annual allowances to be issued will be around 38 million, whilst verified CO2 emissions from aviation activities carried out between aerodromes located in the EEA has fluctuated between 53.5 MT CO2 in 2013 and 61MT in 2016. This means that the EU ETS is now contributing more than 23 MT CO2 of emission reductions annually, or around 100 MT CO2 over 2012-2018, partly within the sector (airlines reduce their emissions to avoid paying for additional units) or in other sectors (airlines purchase units from other ETS sectors, which would have to reduce their emissions consistently). While some reductions are likely to be within the aviation sector, encouraged by the EU ETS's economic incentive for limiting emissions or use of aviation biofuels, the majority of reductions are expected to occur in other sectors.

Putting a price on greenhouse gas emissions is important to harness market forces and achieve cost-effective emission reductions. In parallel to providing a carbon price which incentivises emission reductions, the EU ETS also supports the reduction of greenhouse gas emissions through €2.1 billion funding for the deployment of innovative renewables and carbon capture and storage. This funding has been raised from the sale of 300 million emission allowances from the New Entrants' Reserve of the third phase of the EU ETS. This includes over €900 million for supporting bioenergy projects, including advanced biofuels.

In addition, through Member States' use of EU ETS auction revenue in 2015, over €3.5bn has been reported by them as being used to address climate change. The purposes for which

---

27 For further information, see [http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm](http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm)
revenues from allowances should be used encompass mitigation of greenhouse gas emissions and adaptation to the inevitable impacts of climate change in the EU and third countries. These will reduce emissions through: low-emission transport; funding research and development, including in particular in the field of aeronautics and air transport; providing contributions to the Global Energy Efficiency and Renewable Energy Fund, and measures to avoid deforestation.

In terms of its contribution towards the ICAO global goals, the states implementing the EU ETS have delivered, in “net” terms, a reduction of around 100 MT of aviation CO\(_2\) emissions over 2012-2018 for the scope that is covered, and this reduction will continue to increase in the future under the new legislation. Other emission reduction measures taken, either collectively throughout Europe or by any of the 31 individual states implementing the EU ETS, will also contribute towards the ICAO global goals. Such measures are likely to moderate the anticipated growth in aviation emissions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Reduction in CO(_2) emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 - 2018</td>
<td>100 million tonnes</td>
</tr>
</tbody>
</table>

The table presents projected benefits of the EU-ETS based on the current scope (intra-European flights).

9.4.2. THE CARBON OFFSETTING AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION

In October 2016, the Assembly of ICAO confirmed the objective of targeting CO\(_2\)-neutral growth as of 2020, and for this purpose to introduce a global market-based measure for compensating CO\(_2\) emissions above that level, namely Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The corresponding resolution is A39-3:
Consolidated statement of continuing ICAO policies and practices related to environmental protection – Global Market-based Measure (MBM) scheme.

According to the Assembly Resolution, the average level of CO2 emissions from international aviation covered by the scheme between 2019 and 2020 represents the basis for carbon neutral growth from 2020, against which emissions in future years are compared. In any year from 2021 when international aviation CO2 emissions covered by the scheme exceed the average baseline emissions of 2019 and 2020, this difference represents the sector's offsetting requirements for that year.

CORSIA is divided into 3 phases: There is a pilot phase (2021-2023), a first phase (2024-2026) and a second phase (2027-2035). During CORSIA’s pilot phase and the first phase, participation from states is voluntary. The second phase applies to all ICAO Member States.

Figure 7 CORSIA Implementation Plan Brochure (© ICAO)

Exempted are States with individual share of international aviation activities in RTKs, in year 2018 below 0.5 per cent of total RTKs and States that are not part of the list of States that account for 90 per cent of total RTKs when sorted from the highest to the lowest amount of individual RTKs. Additionally Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing Countries are exempted as well.

CORSIA operates on a route-based approach. The offsetting obligations of CORSIA shall apply to all aircraft operators on the same route between States, both of which are included in the CORSA. Exempted are a) emissions form aircraft operators emitting less than 10 000 tCO2 emissions from international aviation per year, b) emissions from aircraft whose Maximum Take Off Mass (MTOM) is less than 5 700 kg, and c) emissions from humanitarian, medical and firefighting operations.
According to the “Bratislava Declaration” from September 3rd 2016 the Directors General of Civil Aviation Authorities of the 44 ECAC Member States declared their intention to implement CORSIA from the start of the pilot phase, provided certain conditions were met. This shows the full commitment of the EU, its Member States and the other Member States of ECAC to counter the expected in-sector growth of total CO2 emissions from air transport and to achieving overall carbon neutral growth.

9.5. EU INITIATIVES IN THIRD COUNTRIES

9.5.1 MULTILATERAL PROJECTS

At the end of 2013 the European Commission launched a project with a total budget of €6.5 million under the name “Capacity building for CO2 mitigation from international aviation”. The 42-month project, implemented by the ICAO, boosts less developed countries’ ability to track, manage and reduce their aviation emissions. In line with the call from the 2013 ICAO Assembly, beneficiary countries will submit meaningful State action plans for reducing aviation emissions. They then and received assistance to establish emissions inventories and pilot new ways of reducing fuel consumption. Through the wide range of activities in these countries, the project contributes to international, regional and national efforts to address growing emissions from international aviation. The beneficiary countries are the following:


Caribbean: Dominican Republic and Trinidad and Tobago.

Preceding the ICAO Assembly of October 2016 sealing the decision to create a global MBM scheme, a declaration of intent was signed between Transport Commissioner Violeta Bulc and ICAO Secretary General Dr Fang Liu, announcing their common intention to continue cooperation to address climate change towards the implementation of the ICAO Global Market Based Measures. On adoption of a decision by the ICAO Assembly on a GMBM, the parties intended to jointly examine the most effective mechanisms to upgrade the existing support mechanism and also to continue similar assistance, including cooperation and knowledge sharing with other international organisations, with the aim of starting in 2019.
The "Capacity building for CO2 mitigation from international aviation" has been of enormous value to the beneficiary countries. A second project has been initiated by the European Commission aimed at assisting a new set of countries on their way to implementing the CORSIA. Further details will be published upon signature of the contract with the different parties.

Additionally, initiatives providing ASEAN Member States with technical assistance on implementing CORSIA have been initiated in 2018 and will possibly be extended further in 2019. The ARISE plus project dedicates an activity under result 3 - ‘strengthened national capabilities of individual ASEAN Members States and aligned measures with ICAO SARPs’. To achieve this, the project will support workshops in 2018 on capacity building and technical assistance, especially for the development or enhancement of actions plans. This will provide a genuine opportunity to pave the way for the effective implementation of further potential assistance and foster States readiness for their first national aviation emission report at the end of 2019.

EASA is also implementing Aviation Partnership Projects (APPs) in China, South Asia and Latin America (including the Caribbean) as well as projects funded by DG NEAR and DG DEVCO in other regions. This can enable the EU to form a holistic view of progress on CORSIA implementation worldwide.

In terms of synergies, the South Asia and South East Asia environmental workshops could engage with key regional stakeholders (ICAO Asia Pacific office, regulatory authorities, airline operators, verification bodies), and thereby assess the level of readiness for CORSIA on wider scale in the Asia Pacific region. This preparatory work would help focus the subsequent FPI CORSIA project and create economies of scale in order to maximise the benefits of the project, which needs to be implemented within an ambitious timescale.

9.6. SUPPORT TO VOLUNTARY ACTIONS

9.6.1. ACI AIRPORT CARBON ACCREDITATION

Airport Carbon Accreditation is a certification programme for carbon management at airports, based on carbon mapping and management standard specifically designed for the airport industry. It was launched in 2009 by ACI EUROPE, the trade association for European airports.
The underlying aim of the programme is to encourage and enable airports to implement best practice carbon and energy management processes and to gain public recognition of their achievements. It requires airports to measure their CO2 emissions in accordance with the World Resources Institute and World Business Council for Sustainable Development GHG Protocol and to get their emissions inventory assured by an independent third party.

This industry-driven initiative was officially endorsed by EUROCONTROL and the European Civil Aviation Conference (ECAC). It is also officially supported by the United Nations Environmental Programme (UNEP). The programme is overseen by an independent Advisory Board.

At the beginning of the reporting year 2016 (May 2016) there were 156 airports in the programme. Since then, a further 36 airports have joined and 3 have withdrawn, bringing the total number of airports in May 2017 to 189 covering 38.1% of global air passenger traffic.

In 2017, for the first time, airports outside Europe achieved the highest accreditation status: 1 airport in North America, 5 in Asia-Pacific and 1 in Africa have been recognised as carbon neutral. European airports doubled their pledge and set the bar at 100 European airports becoming carbon neutral by 2030 from the 34 currently assessed to be carbon neutral.

Airport Carbon Accreditation is a four-step programme, from carbon mapping to carbon neutrality. The four steps of certification are: Level 1 “Mapping”, Level 2 “Reduction”, Level 3 “Optimisation”, and Level 3+ “Carbon Neutrality”.

*Figure 8 Airport carbon accreditation levels*
**Levels of certification (ACA Annual Report 2016 - 2017)**

One of its essential requirements is the verification by external and independent auditors of the data provided by airports. Aggregated data are included in the Airport Carbon Accreditation Annual Report thus ensuring transparent and accurate carbon reporting. At level 2 of the programme and above (Reduction, Optimisation and Carbon Neutrality), airport operators are required to demonstrate CO2 reductions associated with the activities they control.

For historical reasons European airports remain at the forefront of airport actions to voluntarily mitigate and reduce their impact on climate change. The strong growth momentum was maintained for the reporting year which ended with 116 airports in the programme. These airports account for 64.8% of European passenger traffic and 61% of all accredited airports in the programme this year.

**Anticipated benefits:**

The Administrator of the programme has been collecting CO2 data from participating airports over the past five years. This has allowed the absolute CO2 reduction from the participation in the programme to be quantified.

*Table 23 Emissions reduction highlights for the European region*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total aggregate scope 1 &amp; 2 reduction (ktCO₂)</td>
<td>51.7</td>
<td>54.6</td>
<td>48.7</td>
<td>140</td>
<td>130</td>
<td>169</td>
<td>156</td>
<td>155</td>
</tr>
<tr>
<td>Total aggregate scope 3 reduction (tCO₂)</td>
<td>360</td>
<td>675</td>
<td>366</td>
<td>30.2</td>
<td>224</td>
<td>551</td>
<td>142</td>
<td>899</td>
</tr>
</tbody>
</table>
Table 24 Emissions offset for the European region

<table>
<thead>
<tr>
<th></th>
<th>2015-2016</th>
<th>2016-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate emissions offset, Level 3+ (tCO2)</td>
<td>222</td>
<td>252</td>
</tr>
</tbody>
</table>

The table above presents the aggregate emissions offset by airports accredited at Level 3+ of the programme. The programme requires airports at Level 3+ to offset their residual Scope 1 & 2 emissions as well as Scope 3 emissions from staff business travel.

Table 25 Summary of emissions under airports direct control

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emissions</td>
<td>Number of airports</td>
</tr>
<tr>
<td>Aggregate carbon footprint for ‘year 0’ for emissions under airports’ direct control (all airports)</td>
<td>2.04 MT CO₂</td>
<td>85</td>
</tr>
<tr>
<td>Carbon footprint per passenger</td>
<td>2.01 kg CO₂</td>
<td>1,89 kg CO₂</td>
</tr>
<tr>
<td>Aggregate reduction in emissions from sources under airports’ direct control (Level 2 and above)</td>
<td>87.4 ktonnes CO₂</td>
<td>56</td>
</tr>
<tr>
<td>Carbon footprint reduction per passenger</td>
<td>0.11 kg CO₂</td>
<td>0.15 kg CO₂</td>
</tr>
<tr>
<td>Total carbon footprint for ‘year 0’ for emissions sources which an airport</td>
<td>12.8 MT CO₂</td>
<td>31</td>
</tr>
</tbody>
</table>

Its main immediate environmental co-benefit is the improvement of local air quality.

28 Year 0’ refers to the 12 month period for which an individual airport’s carbon footprint refers to, which according to the Airport Carbon Accreditation requirements must have been within 12 months of the application date.

29 This figure includes increases in CO2 emissions at airports that have used a relative emissions benchmark in order to demonstrate a reduction.
Costs for design, development and implementation of Airport Carbon Accreditation have been borne by ACI EUROPE. Airport Carbon Accreditation is a non-for-profit initiative, with participation fees set at a level aimed at allowing for the recovery of the aforementioned costs.

The scope of Airport Carbon Accreditation, i.e. emissions that an airport operator can control, guide and influence, implies that aircraft emissions in the LTO cycle are also covered. Thus, airlines can benefit from the gains made by more efficient airport operations to see a decrease in their emissions during the LTO cycle. This is coherent with the objectives pursued with the inclusion of aviation in the EU ETS as of 1 January 2012 (Directive 2008/101/EC) and can support the efforts of airlines to reduce these emissions.

10 NATIONAL ACTIONS IN SERBIA

10.1 OVERVIEW (OBJECTIVES)

National actions in Serbia specified in this Section aim at:

a) limiting CO₂ emission from civil aviation activities starting from 2020;

b) informing the aircraft operators, ANSP and airport operators on new internationally promoted technologies;

c) encouraging involvement of national stakeholders in international and national projects aiming at reducing GHG emission in civil aviation;

d) meeting the objectives of the aircraft operators by participating in the EU ETS scheme and CORSIA

10.2. TYPE OF ACTIONS TO BE TAKEN

National actions in Serbia include:

a) Regulatory actions;

b) Operational actions;

c) Economic/market based actions;

d) ATM/infrastructure actions;

e) Other actions.
10.3. RESPONSIBLE NATIONAL INSTITUTIONS

The institutions responsible for implementing the actions specified in this Section are: CAD, MIE, aircraft operators, SMATSA llc, MEMSP, SEPA, airport operators.

10.4. RESOURCES NEEDED TO IMPLEMENT THE PROPOSED ACTIONS

Depending on the actions laid down in this Section, the following open issues were identified:

a) Human resources – insufficient number of experts in the area in institutions responsible for implementation of the Action Plan;

b) Financial resources – financial resources necessary to implement the Action Plan.

c) Technical resources – lack of equipment.

10.5. REPORTING

- According to EU ETS, all air operators in the Republic of Serbia should present annual reports to CAD, containing the description of the actions implemented in accordance with the Action Plan. The above-mentioned reports should be submitted by 31 March of each year for the previous year. As for the CORSIA, Reporting Plan should be submitted by national air operators until 31 July of each year.

- The report shall contain a description of actions implemented/under implementation and an evaluation of their effects in terms of fuel efficiency and emission reduction. The reports shall also contain the following global statistics related to air transport activity in the monitored calendar year.

- CAD may request from appropriate institutions data on total CO2 emissions and aggregated data on different types of fuel used by Serbian air carriers. Submission and confidentiality of these data shall be the subject of the protocol between appropriate institutions.
• Based on data received in accordance with 2.1. – 2.3, CAD shall develop the Annual report on actions for emissions reduction in civil aviation. The first report shall be prepared in 2014 for the actions taken in 2013.

10.6. UPDATE OF THE ACTION PLAN

The Action Plan is a dynamic instrument that will be updated regularly in order to facilitate decisions on policies and measures in civil aviation, so it can adapt to economic development of Serbia and set objectives for reducing emission of greenhouse gases.

11. DESCRIPTION OF ACTIONS AT NATIONAL LEVEL IN SERBIA

In order to maximize efficiency and to ensure that all relevant stakeholders are involved, CAD initiated a stakeholder consultation process, and took the initiative of collecting information about emission reduction activities between different stakeholders. As a result, the stakeholders described the actions which they are already taking or will take, and those actions are presented in this Section.

11.1. CONTINUOUS PROMOTION OF PRACTICES AND PROCEDURES AT OPERATIONAL LEVEL WITH AN IMPACT ON FUEL CONSUMPTION REDUCTION

11.1.1. DESCRIPTION

Using best practices and procedures in ground operations to reduce fuel consumption:

• Loading the aircraft so that the position of the center of gravity in flight is as backward as possible, thus ensuring a minimum fuel consumption;
• Transmission of flight schedules as close as possible to take-off time;

Using best practices and procedures during the flight:
• Use of optimal cruise level;
• Extending the studies regarding the impact of applying some CDA (Continuous Descent Approach) procedures at all airports with significant traffic volume;
• Minimum landing flaps, where possible;
• Take-off with FLEX method/Assumed Temp/Derate for the engines protection and as low consumption as possible on long-term;
• Accelerating at a more economical “Enroute climb” speed, under level 100 where possible.

11.1.2. CATEGORY
More efficient operations (Best practices in operations).

11.1.3. START DATE
Air carriers have been applying this action for several years due to economic reasons (fuel consumption reduction).

11.1.4. DATE OF FULL IMPLEMENTATION
In use.

11.1.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION
At international level, according to the studies, it is expected that measures to improve the practices and procedures applicable in the field of flight operations can lead to a reduction in CO2 emission by 2020 up to 3%.

11.1.6. REFERENCE TO EXISTING LEGISLATION
/

11.1.7. IF A NEW LEGISLATION IS PROPOSED
Law on Climate Change is under development and is expected to be in charge by the end of 2019.
11.1.8. RESOURCES NEEDED FOR IMPLEMENTATION
Training of flight crews and aviation staff on the application of the best practices and procedures in the field of flight operations.

11.1.9. LIST OF STAKEHOLDERS INVOLVED
Air carriers, airport operators.

11.2. ESTABLISHMENT OF REPORTING SYSTEM FOR THE EU DIRECTIVE 2009/29/EC (EU ETS)

11.2.1. DESCRIPTION
Preparation of aircraft operators for implementation of the EU ETS Directive

11.2.2. CATEGORY
Regulatory actions/Other (Conferences/workshops).

11.2.3. START DATE
Year 2019

11.2.4. DATE OF FULL IMPLEMENTATION
To be determined later.

11.2.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION
Establishment of efficient reporting system for the EU Emission Trading Scheme.

11.2.6. REFERENCE TO EXISTING LEGISLATION
/

11.2.7. IF A NEW LEGISLATION IS PROPOSED
Under development.

11.2.8. RESOURCES NEEDED FOR IMPLEMENTATION
/
11.2.9. LIST OF STAKEHOLDERS INVOLVED
MEMSP, MIE, SEPA, CAD, aircraft operators.

11.3. CREATION OF A MONITORING, REPORTING AND VERIFYING SYSTEM FOR THE SUCCESSFUL IMPLEMENTATION OF THE EU EMISSIONS TRADING SCHEME

11.3.1. DESCRIPTION
EU ETS AND CORSIA

In respect to the issue of climate change, Serbia is working on international and domestic level in order to contribute to global combating of climate change. Serbia’s engagement on international level includes two equally important, mutually supportive courses of action, that is, adherence to relevant international multilateral environmental agreements and the EU accession process. EU accession process is regarded as a paramount national priority. Approximation of the EU acquis, including EU ETS, into national legislation represents a process whereby the national legal framework and overall political, social and economic reality are strongly and increasingly shaped, even more so after the official initiation of accession negotiations with the EU in June 2016. In its path towards full-fledged EU membership Serbia has to adopt complete body of EU legislation. Important part of the EU legislation is the climate related legislation, inter alia, EU ETS and Aviation ETS legislation. In that respect, for activities other than aviation, Serbia will not be officially part of the EU ETS until joining the EU. Accordingly, Serbia is planning development of administrative, regulatory and institutional framework in the coming years in order to be ready for implementation and enforcement of this demanding legislation.

Also, national aircraft operator Air Serbia is included in the Aviation EU ETS and de facto implements requirements laid down by the Directive 2008/101/EC on inclusion of aviation activities in scheme for greenhouse gas emission allowance trading within the Community. Air Serbia is being regulated by Germany as administering Member State. It has undergone all necessary accreditation procedures and established all necessary protocols and administrative structures for successful implementation of the Aviation ETS in Serbia. Therefore Serbia via its national aircraft operator Air Serbia and its active participation in the Aviation EU ETS
scheme is contributing to reducing greenhouse gases emission and will continue to do so during next period up to and beyond 2020.

The Republic of Serbia, as all the 44 ECAC states, also voluntarily participates in CORSIA. In that matter, national air operator Air Serbia submitted its Emissions Monitoring Plan, which has been approved by CAD.

11.3.2. CATEGORY
Economic/market-based actions, Regulatory actions/other (Requiring transparent carbon reporting).

11.3.3. START DATE
Baseline period of CORSIA started on January 1st 2019, with the obligation of air operators to monitor CO2 emissions from international operations. Serbian air operator Air Serbia, has therefore submitted its EMP.
System will be developed through a project and it will include, among other things, recommendations for beginning of implementation.

11.3.4. DATE OF FULL IMPLEMENTATION
For the CORSIA- according to ICAO plans.

11.3.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION
GHG emission reduction, including that from aviation sector in a cost-effective and economically efficient manner.

11.3.6. REFERENCE TO EXISTING LEGISLATION
Annex 16, Volume IV

11.3.7. IF A NEW LEGISLATION IS PROPOSED
Under development.

11.3.8. RESOURCES NEEDED FOR IMPLEMENTATION
Financial resources already provided by EU.
11.3.9. LIST OF STAKEHOLDERS INVOLVED
MEMSP, MIE, SEPA, CAD, aircraft operators.

11.4. IMPLEMENTATION OF CDO LANDING PROCEDURES AND DEVELOPMENT OF PBN PROCEDURES

11.4.1. DESCRIPTION

CDO procedures have not been officially introduced in Serbia regulatory system yet. In accordance with Local Single European Sky Implementation Plan (LSSIP) for Serbia, the full implementation of CDO is going to be considered for Belgrade and Nis Airports. Implementation of CDO for Belgrade and Nis airports should be approached gradually by ANSP in its terminal airspace optimization activities, by introducing interim procedures during low traffic load periods and their evaluation of performance.

ANSP and dominant aircraft operators should jointly make the final decision on permanent introduction of CDO procedures at Belgrade and Nis airports, after full evaluation of the effects of interim procedures, collected during the trial period.

In the meantime, before the operational procedures enter into force, in conducting its operational work SMATSA authorized air traffic controllers to allow direct routings whenever the traffic situation permits so, thus contributing to the reduction of fuel consumption, and consequently CO₂ emission. The following actions have been taken:

- All arrival procedures (STARs) are designed in order to accommodate Continuous Descent Operations (CDO) and when traffic situation allows, aircraft operators may perform them as CDO.
- Inbound aircraft are directed to IAF with information about the distance to FAF, and are cleared for descent with optimum vertical profiles until the altitude over FAF. In case of radar vectoring and in case of complex traffic situation, aircraft are kept at a certain altitude, and are informed about the distance to FAF and the position after which they will be able to continue optimal gradient descent.
• All activities related to airspace design in terminal airspace take into account the requirements of air carriers for the shortest and optimal routes, thereby leading to CO2 savings. Before making any decision in Airspace Management domain, mentioned activities take into account analysis on the potential amount of fuel savings and CO2 emission reduction.

• Whenever the traffic situation allows, outbound aircraft are suggested to take the shortest route to the TCP and often, with previous coordination with adjacent ATC unit, aircraft are cleared for direct routes to the TCP within adjacent FIR, significantly reducing the distance travelled, as well as CO2 emission. Whenever the traffic situation allows, the outbound aircraft are approved for the requested flight level with optimal climb gradient and no speed limits.

Serbia PBN Implementation Plan is elaborated and published, anticipating PBN STAR procedures (to be developed as RNAV 1 and RNP 1) to enable CDO, and thus giving a full contribution to CO2 emission reduction.

11.4.2. CATEGORY
Improved air traffic management and infrastructure use; more efficient operations.

11.4.3. START DATE
2015

11.4.4. DATE OF FULL IMPLEMENTATION
Upon evaluation of the effects of interim procedures and data collected during the trial period.
2015 – 2022

11.4.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION
Fuel savings and CO2 emission reduction.

11.4.6. REFERENCE TO EXISTING LEGISLATION
Roadmap for performance-based navigation implementation plan in Serbia
11.4.7. IF A NEW LEGISLATION IS PROPOSED
/

11.4.8. RESOURCES NEEDED FOR IMPLEMENTATION
Training of ATC operational staff and PANS-OPS designers.

11.4.9. LIST OF STAKEHOLDERS INVOLVED
CAD, SMATSA, Belgrade Airport and Nis Airport, airspace users.

11.5. DCT OPTIONS FOR PLANNING AND EXECUTION OF FLIGHTS

11.5.1. DESCRIPTION
As a regular working practice, the constant improvement and optimization of the route network led to the situation where the length of the most frequent routes within FIR Beograd were just 2% greater than its length at great circle per city-pair.

Having introduced the SEAFRA and, therefore enabling Free Route airspace above FL325, the ANSP provided additional DCT options below FL325 which are available in the RAD document.

11.5.2. CATEGORY
Improved air traffic management and infrastructure use.

11.5.3. START DATE
10 February 2012.

11.5.4. DATE OF FULL IMPLEMENTATION
8 December 2016.

11.5.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION
Fuel savings and CO2 emission reduction.
11.5.6. REFERENCE TO EXISTING LEGISLATION

Regulation on Air Traffic Flow Management (transposing Commission Regulation No 255/2010)

11.5.6. IF A NEW LEGISLATION IS PROPOSED

11.5.7. RESOURCES NEEDED FOR IMPLEMENTATION

11.5.8. FUTURE ENDEAVORS
Implementation of FRA in the airspace below FL325.

11.5.9. LIST OF STAKEHOLDERS INVOLVED
ANSP, airspace users and NM.

11.6. FREE ROUTE/ FREE ROUTE LIKE CONCEPT

11.6.1. DESCRIPTION

Three ANSPs (SMATSA, Croatia Control and BHANSA) responsible for the ANS provision in the airspace of four states – The Republic of Serbia, Montenegro, Croatia and Bosnia and Herzegovina offered airspace users the possibility to plan and execute flights free of fragmentation by state or AoR borders, by implementing cross-border Free Route Airspace (FRA) – South-East Axis Free Route Airspace (SEAFRA) during night (23.00-05.00 UTC winter time and 22.00-04.00 UTC summer time) and above FL325.

SEAFRA plays a major part in the European Union (EU) initiative to develop the Single European Sky regardless of state or FAB borders, with an aim to improve safety, efficiency and air traffic capacity in Europe.
11.6.2. CATEGORY
Improved air traffic management and infrastructure use.

11.6.3. START DATE
30.4.2015

11.6.4. DATE OF FULL IMPLEMENTATION
December 2018

11.6.5. EXPECTED EFFECTS DUE TO THE IMPLEMENTATION

The main benefit of SEAFRA the reduction of direct operational cost that results from reduction in flight distances flown within FRA. SEAFRA is also expected to bring the following qualitative benefits:

- Greater flight planning flexibility for aircraft operators;
- Greater predictability of flight times;
- Increased air carrier’s flight efficiency (approx. 2% p.a.).

11.6.6. REFERENCE TO EXISTING LEGISLATION

Regulation on Air Traffic Flow Management (transposing Commission Regulation No 255/2010)

Regulation on detail rules for the implementation of air traffic management (ATM) network functions (transposing Commission Regulation No 677/2011)

11.6.7. IF A NEW LEGISLATION IS PROPOSED
/

11.6.8. RESOURCES NEEDED FOR IMPLEMENTATION
Training of ATS operational staff.

11.6.9. LIST OF STAKEHOLDERS INVOLVED
Provider and users of air navigation services.
11.7. IMPROVEMENT OF AIRCRAFT FLEET

11.7.1. AIR SERBIA ACTIONS ON IMPROVEMENT OF AIRCRAFT FLEET.

By the end of 2015, Air Serbia has improved its aircraft fleet by replacing older aircrafts type B737-300 (though not all) with more fuel efficient and technologically improved type A319/320 and A330. Also, in previous years, operator Air Serbia replaced ATR72-200 with ATR72-500. Current fleet of Air Serbia consists of ATR72-500, A319/320, A330, B737-300 aircraft type.

This is contributing to reducing fuel consumption during both flight and LTO operations and will have significant contribution in reducing CO2 emission and other environmental benefits attributed to new technologies.

11.7.2. ALTERNATIVE FUELS
At the moment there are no measures taken by aerodromes nor aviation industry to introduce alternative fuels.

12 CONCLUSION

Republic of Serbia is strongly dedicated to participate in all present and future international activities in area of emission reduction which is initiated by recognized international bodies.