Tackling the Eyjafjallajökull

Volcanic Ash Crisis:

How the EU influenced the International Civil Aviation
Organization

Karolina Krystyniak

Abstract

The goal of this single-case study is to contribute to understanding of the Eyjafjallajökull volcanic ash crisis from the institutional perspective.

The Eyjafjallajökull eruption in April 2010 and the subsequent volcanic ash crisis grounding the flights across Europe demonstrated certain procedural inadequacies in the international aviation regime. This prompted the two institutions responsible in the area of civil aviation - the EU and ICAO - to interact with each other in order to tackle the crisis. The EU, supported by the expertise of the European aviation bodies adopted an approach to volcanic ash that allowed resuming the flight operations in Europe. This approach was afterwards incorporated by ICAO into its amended volcanic ash procedures.

Process-tracing technique is employed in order to analyze the EU - ICAO interaction by examining all their initiatives undertaken in the context of the crisis. As a result it is concluded that the EU exerted causal influence on ICAO in adoption of the new procedures through causal mechanism based on commitment. The theoretical framework, constructed on the basis of the approaches that complement each other: regime theory, epistemic communities, normative institutionalism and the conceptual framework of institutional interaction, provide interpretations for the case analysis.

Key words: European Union, ICAO, Volcanic Ash Crisis, Institutional Interaction, Aviation
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1   Introduction

International governance is characterized by an increasing number of institutional arrangements. Paraphrasing the words of Oran Young: we live in the world of international institutions[1]. These are able to influence each other's development and effectiveness (Gehring and Oberthür, 2009). The European Union itself 'the most highly institutionalized international organization in history, in terms of depth as well as breadth...' (March and Olsen, 1998 cited in: Jönsson and Tallberg, 2001) is one of them.

This thesis examines the EU's ability to influence the organization that represents the international aviation regime – the International Civil Aviation Organization (ICAO). With this purpose, the case of institutional interaction between the EU and ICAO in the context of volcanic ash crisis is investigated.

The phenomenon caused by eruption of the Icelandic volcano Eyjafjallajökull in April 2010 created conditions for the institutional interaction between the two institutions to emerge. The analysis focuses on a period of about one year- from the eruption of Eyjafjallajökull (14th April 2010) till the volcanic ash exercise organized by ICAO (13-14 April 2011) and the assessment session that followed (spring 2011). Clear time frame and delimited scope of the research promise a successful single case study.

This section is to place the research in a wider context. Why to study the EU's interaction with other international institutions? And more generally: Why is it interesting to study international aviation from political science perspective?

First, the EU is becoming an increasingly important international actor in many issue-areas. This may often cause an overlap of competences and 'nesting' of the EU within larger international regimes or institutions. '[T]he growing institutional density and interdependence at both the international and EU levels' (Oberthür & Gehring, 2006:3) raises ever more questions of international and interinstitutional cooperation and coordination.

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[1] Original citation: 'We live in the world of international regimes'. (Young, 1980)

Interaction may have synergistic or disruptive implications (Ibid.). On the one hand conflicts may emerge if regulatory systems are incompatible. On the other hand institutional interaction may produce synergies if regulatory approaches are mutually reinforcing (Ecologic).

Notably, the study of the effects of institutional interaction has a very practical dimension. The EU itself has been sponsoring research projects such as: *Concerted Action on the Effectiveness of International Environmental Agreements;* and *Institutional Interaction: How to prevent Conflicts and Enhance Synergies between International and EU Environmental Institutions* with the purpose of learning how to enhance the effectiveness of international environmental governance. Particularly the issue-area of international environmental governance attracted the most attention from the scholars investigating institutional interaction, especially from Oberthür and Gehrning. These two scholars developed a conceptual framework of institutional interaction on the basis of a large volume of cases. Since their framework is of universal applicability, independently of the issue-are, it is applied in the analysis in this paper.

But why is it interesting to study international aviation at all? Aviation is exciting and fascinating to many people. There are several features that make this industry and issue-area especially interesting, also from political science point of view.

Due to creation of single market of air services and the unprecedented Single European Sky initiative the EU is becoming ever more important aviation actor on the global aviation arena. Aviation is a strong industry sector in Europe. The European airspace is the busiest in the world (ICAO, 2010a). Even though it is difficult to estimate, the air traffic in Europe accounts for at least a quarter of worldwide air traffic. What is more, Europe has also become the second biggest (after the US) global producer of civil aircraft (European Commission web page). The European[2] Airbus is now the biggest competitor to Boeing.

Aviation is also an important industry on a global scale - its global economic activity is estimated at $3.5 trillion (Ibid.), which accounts for about 0,7% of the world GDP (Keilir Aviation Academy, 2010).

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[2] Airbus originated as a consortium of aircraft manufacturers from France, Germany, Spain and UK.

At the same time aviation is a vulnerable business. During the last decade the air industry lost about $50 billion due to extraordinary series of crises triggered by terrorism, SARS, influenza, earthquakes, economic crisis, volcanoes (Ibid.)…

The international aviation regime is based on well-established institutions that aim at guaranteeing safety, security and smooth flow of air traffic. Within this very dense regulatory space of international aviation the EU created its own aviation regime (Kassim & Stevens, 2010).

Generally, without institutional arrangements on international level this 'strange but wonderful industry' (IATA web page) could not function or at least not in its current shape.

Moreover, aviation may be seen as a factor contributing to progress of globalization and interdependence due to fast transportation of goods and people everywhere on the globe (Jönsson, 1987; IATA web page). Aviation connects over 2.4 billion people and 40 million tonnes of cargo per year (IATA web page).

Furthermore, international aviation issue-area represents a certain combination of security and economic aspects, hence 'high politics' and 'low politics'. For long time aviation directly engaged interests of national security, prestige and sovereignty. Today, the two former ones may be loosing importance, however the principle of sovereignty prevails and it is supported by the international aviation regime.

Another distinct feature of aviation is its dependence on technology (Jönsson, 1987:40). Aviation's technical character and specific terminology make it seem a 'strange' and hermetic industry and its functioning and rules difficult to understand.

On the other hand aviation is an industry that attracts a lot of media attention – especially whenever an aircraft incident or accident occurs. This certainly contributes to the paradox of fear of flying – even though air transport is on of the safest modes of transport, it is probably the most feared one.

Finally, all transport policies are subject to many conflicting pressures, arising from demands such as: safe operation, respect for the environment, economical efficiency, the public interest, private profit, convenience and price (Stevens, 2004:1). The regulators have the responsibility to establish the right balance among them all.

1.1   Literature Overview

Regrettably, aviation did not attract much attention from the political science. The few scholars that are interested in this topic address the problem of aviation as a 'largely overlooked issue-area' (Jönsson, 1987:4) and 'an under-researched industrial sector' from this perspective (Kassim & Stevens, 2010: 257).

Most of the existing accounts on aviation focus on the liberalization of the market in air services (e.g.: Dobson, 2010; Stevens, 1997; Richards 1999; 2001; O'Reilly and Stone Sweet, 1998; Karagiannis & Hértier, 2010). Such accounts however could not contribute to this paper, provided that the problem of liberalisation lies outside the area of interest of the present research.

Conversely, Kassim and Stevens (2010) provide good explanation of the development of the air transport in the EU in the wider, international context. Kassim and Stevens (2010) investigate how the EU became involved in air transport, how it developed its comprehensive policy and how it brought about a transformation in the sector. The authors explain the development of the single market in air services and how the common air transport policy was extended and expanded beyond liberalization. They assess the impact of EU action domestically and internationally and analyze the EU's involvement in aviation. They put special emphasis of the international context of the EU's development as an international aviation actor.

There are also accounts applying theoretical perspectives on international aviation regime (Jönsson, 1987; Nayar, 1995; Young, 1980). Jönsson (1987) examines various explanations of formation, maintenance and change of international aviation regime. Nayar (1995) explains the formation of the international aviation regime based on realist approach. Finally, Oran Young (1980) introduces a concept of regimes as social institutions.

On the other hand, the concept of institutional interaction has recently received much attention in the context of environmental governance, with particular focus on the EU-ICAO interaction (Oberthür 2003; Oberthür and Gehring, 2003; 2006; Gehring and Oberthür, 2009; Wettestad, 2009). Oberthür and Gehring developed a conceptual framework of institutional interaction on the basis of the already mentioned multinational project *Institutional Interaction – How to Prevent Conflicts and Enhance Synergies between International and European Environmental Institutions*. It has been

conducted with financial support of the EU between 2000 and 2003. The models of interaction were developed on the basis of comparative assessment of more than 100 cases of institutional interaction in the realm of international and EU environmental institutions. This framework for analysis of institutional interaction between international institutions is the first step towards building a theory of institutional interaction and it is applied in this research in order to investigate the EU-ICAO institutional interaction in the international civil aviation issue-area.

All in all the scarcity of the literature on international aviation and the recent and not yet deeply researched event of the Eyjafjallajökull volcanic ash account for the innovative character of this research. To the knowledge of the author this is the first analysis of institutional interaction in the context of the volcanic ash crisis.

1.2   The Plan of the Paper

The paper is organized into six chapters. The following chapter 'The Complex World of International Aviation' introduces the relevant international and European aviation institutions and their competences. The competences of the EU in air transport are discussed, as well as the EU status at ICAO. The third chapter provides a conceptual guidance to the analysis. Approaches on international institutions are presented, namely: international regimes, epistemic communities, normative institutionalism, as well as the conceptual framework of institutional interaction. The fourth chapter introduces case study method and the process-tracing technique as the methodology applied in the present research. The fifth chapter consists of the analysis of the EU – ICAO interaction in tackling the volcanic ash crisis. All relevant institutional developments by both the EU and the ICAO in the context of tackling the crisis are analyzed. The last, sixth chapter presents the final conclusions and suggestions for future research.

2 The Complex World of International Aviation

This chapter sets the scene for the institutional interaction to be investigated. It puts the whole research in a wider context that helps to understand the issue-area of international aviation and the relevance of the investigated problem. Why is it even interesting to study such institutional interaction? What is so special about the relation between the EU and the ICAO? How does it work, who is who and what are their responsibilities? How and when it all begun and developed?

This chapter aims at introducing the topics of international aviation and the air transport in Europe from historical and legal perspective. It outlines the mosaic of aviation organisations, their competences and the relationships between them.

I hope that this chapter will be helpful in overall understanding of the purpose of this thesis.

2.1 ICAO and the Chicago Regime

The fundament of the international regulation of aviation was laid down by the Paris Convention signed in 1919 by 26 states at the Peace Conference in Paris. The Paris Convention founded the principle of unrestricted airspace sovereignty, by stating that each state has a 'complete and exclusive sovereignty over the airspace above its territory.' (Jönsson, 1987: 29) Consequently each state had the power to decide on all air traffic within its airspace, including overflight and landing which required a government approval (Ibid.: 29). Such approach was a result of the political climate in Europe where the military security was the main concern (Ibid.).

The postwar framework for international aviation was agreed in 1944 at the International Civil Aviation Conference in Chicago. Fifty-four states attended the conference and 52 of them signed the Convention on International Civil Aviation. The

Chicago Convention that entered into force in 1947 created the International Civil Aviation Organization (ICAO) which became the United Nations specialized agency.

The ICAO was set up as an institution regulating the technical aspects of the air industry through facilitating international cooperation in matters of safety, navigation and standardization (Jönsson, 1987: 32).

Notably, the Chicago Convention reaffirmed the principle of state sovereignty created by the Paris Convention (Kassim & Stevens, 2010; see art.1 of the Chicago Convention).

It is also necessary to point out, that as provided by the art. 3, the Chicago Convention in only applicable to civil aircraft, excluding from the provisions 'all military, police, customs and other state-operated aircraft'.

The International Air Transport Agreement was also signed at the Conference in Chicago. It set out 'the five freedoms of the air', while guaranteeing multilateral exchange only of the first two freedoms, i.e. overflight and landing for non-traffic purposes. (Kassim & Stevens, 2010: 24-25). The Chicago Conference failed to reach a multilateral agreement on the remaining 'freedoms' and therefore these must have been subject to bilateral bargaining (Jönsson, 1987: 32).

The five freedoms of the air are as follows (Jönsson, 1987; Kassim & Stevens, 2010, ICAO):

Technical freedoms:

- First Freedom: the right to fly across the territory of another state.
- Second Freedom: the right to land for non-traffic purposes (re-fuelling or maintenance).

Commercial freedoms:

- Third Freedom: the right to put down in another state traffic from the aircraft's home state.
- Fourth Freedom: the right to take on board in another state traffic destined for the aircraft's home state.
- Fifth Freedom: the right to embark and set down in another state traffic to or from a third country.

Only the first five have been officially recognised as 'freedoms' by international treaties (ICAO), however further ('so-called') freedoms have been defined by legal literature (European Parliament, 2000):

- Sixth Freedom: the right to provide transport services between two countries other than the country in which the aircraft is registered across the territory of that country.
- Seventh Freedom: the right to operate completely outside the territory of the state of registration and to set down or take on passengers, mail or freight originating in or destined for a third State, which is not the State of registration.
- Eighth Freedom: The right to transport passengers, mail or freight from one point to another within the same State, which is not the State in which the aircraft is registered.

According to the Chicago Convention, all aeronautical agreements concluded between the contracting states are to be registered with the ICAO Council (Abeyratne, 1994).
The Bermuda agreement of 1946 between the US and UK- at that time the world's strongest aviation industries- was the first agreement of this kind and served as a benchmark for the future ones (Kassim & Stevens, 2010: 25; Jönsson, 1987: 34). The number of so far concluded bilateral air services agreements (ASAs) under ICAO is about 4000 (IATA web page). They have the 'full status of an international treaty' and are provided the legal basis by the Chicago Convention (Kassim & Stevens, 2010: 25).
It is worthy of note that the Bermuda-type of agreement actually 'diluted the principle of airspace sovereignty' by complementing it with elements of international regulation (Jönsson, 1987: 34).

Furthermore the governments that gathered in Chicago decided that the airlines should be responsible for tariffs setting. For this purpose in 1945 the International Air Transport Association (IATA) was founded in Havana, Cuba as a successor of the International Air Traffic Association, founded in 1919. IATA was created as a global organization with the competence of negotiating the fares of the airlines. Today, IATA with its 230 members - airlines from over 115 countries from around the globe no longer has control over the tariffs. Flights by its members represent 93% of the world's international scheduled air traffic (IATA web page). IATA evolved into a forum of

intensive cooperation between the airlines and contributed to the development of a global scheduling, reservations, purchasing and communication system, standardizing tickets, carrier and location codes, coordinating airport handling of passengers, baggage, cargo and mail (Jönsson, 1987: 35).

Eventually, IATA became an important player on the global aviation scene, with ability to pressure governments with purpose of safeguarding the interests of the global airline industry (Kassim & Stevens, 2010).

ICAO has today 190 states are members. All of them are simultaneously contracting parties of the Convention on International Civil Aviation.

The ICAO's mission '[a]s the global forum for cooperation among its Member States and with the world aviation community' is to set 'standards and recommended practices for the safe and orderly development of international civil aviation' (ICAO web page).

The Organisation has three main bodies: the Assembly, the Council and the Secretariat.

The Assembly is 'composed of representatives from all Contracting States' and it 'meets every three years, reviewing in detail the work of the Organization and setting policy for the coming years. It also votes a triennial budget' (Ibid.).

The Assembly elects a Council for a three-year term. The Council is a governing body composed of 36 states that 'gives continuing direction to the work of ICAO', adopts the Standards and Recommended Practices (SARPs) and is responsible for incorporating them as Annexes[3] to the Convention on International Civil Aviation (Ibid.).

The Council is assisted by a number of commitees (European Commission web page): the Air Navigation Commission (technical matters), the Air Transport Committee (economic matters), the Committee on Joint Support of Air Navigation Services and the Finance Committee and the Committee for Aviation Environmental Protection (noise and engine emissions).

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[3] The Annexes to the Chicago Convention are as follows:
Annex 1 Personnel Licensing; Annex 2 Rules of the Air; Annex 3 Meteorological Service for International Air Navigation; Annex 4 Aeronautical Charts; Annex 5 Units of Measurement to be Used in Air and Ground Operations; Annex 6 Operation of Aircraft; Annex 7 Aircraft Nationality and Registration Marks; Annex 8 Airworthiness of Aircraft; Annex 9 Facilitation; Annex 10 Aeronautical Telecommunications; Annex 11 Air Traffic Services; Annex 12 Search and Rescue; Annex 13 Aircraft Accident and Incident Investigation; Annex 14 Aerodromes; Annex 15 Aeronautical Information Services; Annex 16 Environmental Protection; Annex 17 Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference; Annex 18 The Safe Transport of Dangerous Goods by Air.

Standards and Recommended Practices (SARPs) 'cover all technical and operational aspects of international civil aviation, such as safety, personnel licensing, operation of aircraft, aerodromes, air traffic services, accident investigation and the environment' (Ibid.).

The adoption of the SARPs by the ICAO does not undermine the sovereignty principle of its member states (Kassim & Stevens, 2010: 24). According to the provisions of the Chicago Convention these norms are implemented to the national law by the aviation authorities of the contracting states. In conformity with international law the contracting states 'are free to choose the means of implementation they see fit according to their traditions and political organization.' (Reuter, 1989 cited in: Abeyratne, 1994). Additionally, the governments are allowed to impose more restrictive measures (Kassim & Stevens, 2010: 24).

In the view of international law the Chicago Convention is an international transaction of legal character, like any other international treaty or agreement (Abeyratne, 1994).

Treaties are recognised as a source of international law by the international Court of Justice and by the Vienna Convention on the Law of Treaties (Ibid.).

According to Abeyratne (1994) the provisions of the Vienna Convention reflect 'the fact that every treaty in force is binding upon the parties and must be performed by them in good faith.' Overall, the compliance with international treaties is mandatory (Ibid.).

Abeyratne (1994), points out that ICAO has 'quasi-legislative powers'[4] which means that ICAO exercises law-making functions. This can be concluded from analysis of the Chicago Convention.

First, the contracting states are obliged to ensure highest degree of implementation of the organization's regulation of the international civil aviation. Second, they are obliged to notify all differences between their own law and the rules of ICAO. Third, the ICAO's international Standards have clearly mandatory character (reflected by the wording of the Convention) and the Recommended Practices, although in the light of the Convention seem to have advisory connotation, are attributed a regulatory character by other ICAO documents.

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[4] ICAO has 'quasi' legislative powers- provided that 'legislative power is usually attributed to a State' (Abeyratne, 1994).

Furthermore, in order to facilitate the adaptation of the Standards and Recommended Practices (SARPs) to the national law, ICAO sets a lengthy time frame for their implementation.

Finally, the Organization regularly conducts safety audits in order to determine the status of implementation of the relevant (SARPs). If safety concerns are identified- the ICAO provides 'recommendations for their solution' (ICAO web page).

In summary, the ICAO's regulatory framework for the international civil aviation is based on international law.

2.2   The EU Air Transport Policy

After the Second World War the European states engaged in reconstructing of their ruined aviation industries.

In the beginning of the European integration there was 'almost no substance to the common transport policy' (Stevens, 2004: 3). The European states have been strongly attached to the principle of sovereignty and therefore Europe was characterized for long time by existence of small separate aviation markets (Kassim & Stevens, 2010). Considerable progress towards the development of EU transport policy was made during the 1980s and 1990s. The 'commonization' of the air transport in Europe accelerated since 1984- when the development of the internal market in air services begun. However, the outline for common transport in air was not included in the EC treaty until the Single European Act of 1986.

The EU liberalised its air transport in stages by adopting three subsequent 'packages' of market liberalisation measures. The single market in air services was 'substantially in place' in 1993 (Kassim & Stevens, 2010: 128), however it was completed on 1 July 1997, after the establishment of full cabotage rights (Eighth Freedom).

Kassim and Stevens (2010) point out that when the Community started becoming a civil aviation actor, the international norms governing the industry were already there, adopted under the Chicago regime. Nevertheless, as a consequence of the establishment of the single market between the Member States, in order to improve its effectiveness, a

greater harmonisation and a more coherent regulatory framework of the industry became desired.

The EU is now a regulator of economic aspects of the industry and a competition authority. A part from that, the EU's legislation encompasses roughly all aspects of civil aviation: supply of services and licenses, passenger's rights, air safety, air security, air traffic management, environmental protection, external aviation policy.

In 1999 the EU Commission, motivated by growing air traffic congestion, launched an ambitious initiative - Single European Sky (SES) – 'intended to organise airspace and air navigation at a European rather than at a local level' (Commission web page) and thus contributing to enhancement of safety and efficiency on the European skies.

The first package of measures (SES I) was adopted in 2004. Until then the European skies had been organised in a fragmented way, with each state providing airspace navigation within its frontiers. The principal objective of the SES was to create an efficient, safe and truly 'single' European sky. The way for achieving this was through merging of portions of airspace into wider blocks regardless national frontiers and creating Functional Airspace Blocks[5] (FABs). Their establishment is supported by the European Organisation for the Safety of Air Navigation (Eurocontrol), mandated to do so by the European Commission.

The second package of measures- Single European Sky II was launched in 2008 with the objective of reforming and improving the implementation of SES. It also set the deadline for the establishment of FABs by 2012.

The EU aviation regulatory framework was developed relying on expertise of separate, already existing European aviation bodies, particularly the European Civil Aviation Conference (ECAC) and the European Organisation for the Safety of Air Navigation

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[5] Nine FAB initiatives are currently being implemented (Eurocontrol web page):
NEFAB (North European FAB): Denmark, Estonia, Finland, Iceland, Norway, Sweden, Latvia;
NUAC: Nordic Upper Airspace Centre, Denmark, Sweden; BALTIC FAB: Poland, Lithuania;
FABEC (FAB Europe Central): France, Germany, Belgium, Netherlands, Luxembourg, and Switzerland;
FABCE (FAB Central Europe): Czech Republic, Slovak Republic, Austria, Hungary, Croatia, Slovenia, Bosnia and Herzegovina;
DANUBE: Bulgaria, Romania; BLUE MED: Italy, Malta, Greece, Cyprus, (Egypt, Tunisia, Albania, Jordan);
UK- IRELAND FAB: United Kingdom, Ireland; SW FAB: Portugal, Spain.

(Eurocontrol) as well as the newly established European Aviation Safety Agency (EASA).

European Civil Aviation Conference (ECAC) was established in 1955 as a regional organization of the ICAO. It grew to 44 member states from initial 19 founding states (including all of the EU member states) creating a truly pan-European membership. It has been the main forum for the discussion and study of the technical aspects of the civil aviation among the national specialists and the industry representatives (Kassim & Stevens, 2010: 62). Though ECAC was established as a consultative body issuing recommendations without power to impose decisions on the member states, it gained a wide appreciation in the sector (Ibid.: 62).

ECAC is working in a close cooperation with the EU, EASA, Eurocontrol, ICAO, regional organisations from other parts of the world and organisations representing all parts of the aviation industry and their professionals (ECAC web page).

In many occasions the EU drew on studies and other developments of ECAC in creating its regulation, however the measures adopted by the EU were usually more radical, than those agreed in ECAC (Kassim & Stevens, 2010). All in all, ECAC has been an important partner for the EU, and often being a source of inspiration for the latter.

The European Organisation for the Safety of Air Navigation (Eurocontrol) has its origin in a convention signed in 1960 by Belgium, France, Germany, Luxembourg, Netherlands and UK.

Eurocontrol was the first post-war collaboration structure in the European air traffic control sector (Eurocontrol web page). Now it has 39 member states and the EU as a member. It is a specialist forum where actual cooperation in air navigation takes place between the EU and non-EU member states. What is more, Eurocontrol provides a platform of civil-military coordination, managing of day-to-day air traffic management (ATM) operations as well as crisis situations management (Ibid.).

Finally, Eurocontrol is a key actor in bringing the Single European Sky to life by providing its technical expertise and working together with all aviation partners.

In the 1990s the EU realised that its normal legislative procedure was not adequate to regulate aviation safety and that an institutional arrangement permitting more rapid adaptation of safety norms as well as inclusion of Norway and Switzerland in the process were needed. As a result, the European Aviation Safety Agency (EASA) was established in 2002, on a basis of the Council and the Parliament regulation

(1592/2002). Its Management Board includes one representative from each EU member state, the Commission, Iceland, Norway and Switzerland.

The agency's responsibilities include technical matters of aviation, particularly (EASA):

- expert advice to the EU for drafting new legislation;
- implementing and monitoring safety rules, including inspections in the Member States;
- type-certification of aircraft and components, as well as the approval of organisations involved in the design, manufacture and maintenance of aeronautical products;
- authorization of third-country (non EU) operators;
- safety analysis and research.

EASA enjoys important executive and advisory functions (Kassim & Stevens, 2010: 135). The basic safety regulation developed by the agency goes through EU's normal legislative procedures, whereas the detailed ones are adopted under comitology procedure, as Commission's regulations (Ibid.).

As seen above, the EU has created 'a complex new institutional geography' that governs aviation in Europe (Ibid.: 262).

The EU's involvement in aviation has also had a 'revolutionary' far-reaching impact beyond the borders of its member states (Ibid.).

The EU has developed its external aviation policy based on three pillars: horizontal agreements, relations with key global partners and the Common Aviation Area with the EU's neighbours (Ibid.: 171).

The dawn of the EU's external policy was marked by the 'open skies' judgements of 2002 of the European Court of Justice. This case law 'heralded the arrival on the scene of a new important player with certain exclusive responsibilities in external relations in the field of aviation'(Commission web page).

The legal implication of the 'open skies' ruling was that the EU member states were no longer allowed to conclude agreements with third countries on an exclusive bilateral basis and are required to bring their so far concluded agreements into line with the EU law (Kassim & Stevens, 2010: 170). To put it simply, all EU member states must be granted the same air traffic rights with respect to the market of the third country partner,

as the member state that concluded the agreement with that third country. Furthermore, the Commission was authorised by the Council to negotiate 'horizontal' agreements with third countries acting on behalf on the EU. Consequently, new era of agreements concluded at Union level begun.

The Commission has launched negotiations with key aviation states 'to achieve global agreements in the major regions of the world' (Commission web page). So far it has concluded agreements with the US (2007) and with Canada (2009), and entered negotiations with Australia, New Zealand and Brazil.

Another important manifestation of its external competences is the creation by the EU of the European Common Aviation Area (ECAA).

The objective is to integrate the South-Eastern European neighbours into the EU's aviation single market, as well as to extend it to the partner states from the Union for Mediterranean. ECAA cooperation aims at maintaining high level of aviation safety and security, optimizing Air Traffic Management and combating climate change in the region (Commission web page).

In case of ECAA agreements the EU exchanges air traffic rights for acceptance of its aviation regulatory regime (Kassim & Stevens, 2010: 172).

In 2006 a group of South-Eastern European partners (Albania, Bosnia and Herzegovina, Croatia, FYROM, Montenegro, Serbia and Kosovo under UNSCR 1244) reached the ECAA agreement with the EU (Commission web page). As soon as they have implemented the aviation acquis, their airlines will have open access to the European single market in air services (Ibid.).

On the whole, as Kassim and Stevens (2010: 172) noted, the EU is creating 'an entirely new model of air service relations'.

Finally, the EU has at its disposal a powerful tool of a global reach aimed at further improving aviation safety in Europe - the so called 'blacklist' of the airlines banned within the EU.

Prompted by a number of serious air crashes between 2004 and 2005, the Commission proposed a legislation to establish an EU-wide list of unsafe air carriers banned from operating within the EU airspace (Kassim & Stevens, 2010: 137). The list has been established in 2005 on a basis of Regulation 2111/2005 and published for the first time in 2006.

The regulation sets out the criteria to be followed during the random inspections of third country aircrafts. Such inspections are conducted by the national civil aviation authorities. If an airline demonstrates serious safety deficiencies, it is notified to the Commission who decides whether to put the airline on the ban list (European Union web page) and by this to deprive it of the right to enter the EU airspace. The latest 'blacklist' includes 269 air carriers from 21 states (Ibid.).

Overall, the Commission's list is deemed a successful incentive for the airlines to meet the international standards of safety (European Parliament web page).

2.3 The EU and ICAO

Article 220 (ex Article 302 TEC) of the Treaty on the Functioning of the European Union states that: '[t]he Union shall establish all appropriate forms of cooperation with the organs of the United Nations and its specialised agencies (…)'.

The European Union has Delegations to several UN bodies, including delegation to the UN headquarters in New York. In 2005 the EU established Representation to ICAO in its office in Montreal.

The EU member states are all members of the UN in their own right, whereas the Union has had status of permanent observer at the UN since 1974 (European Commission web page).

However, 'the status of the European Community at ICAO is still in question' in spite of the European Union having 'extensive powers and responsibilities in the field of air transport, notably in virtually all areas within ICAO's remit, as well as being a major financial contributor to ICAO technical cooperation programmes'(Ibid.).

Following the decision of the ICAO Council in 1989 the EU, represented by the Commission has been participating as observer in the ICAO Assembly, in committees, technical panels and study groups.

In 2002 the European Commission expressed the intention of negotiating the EU membership of ICAO, even though according to Article 92 of the Chicago Convention, adherence to the Organization is only possible to states.

Nevertheless, the EU member states agree that the Union's importance should be better reflected within ICAO. At present there are informal arrangements in place, such as coordination meetings of the EU member states in preparation and during ICAO Assembly and Council sessions.

In the light of the EU's growing importance on the international aviation scene, in 2008 the EU signed a Memorandum of Cooperation with ICAO on security inspections (Kassim & Stevens, 2010: 160).

Recently, on 4 May 2011 the European Commission signed a Memorandum of Cooperation with the International Civil Aviation Organisation. According to Vice-President and Commissioner for Transport Siim Kallas:

> This Memorandum of Cooperation will create a win–win situation for all parties involved. ICAO will benefit from more resources and expertise; Europe will benefit from ICAO expertise and will strengthen its position in this global forum. (Commission web page).

On the whole the cooperation agreement provides a framework for enhanced cooperation between the EU and ICAO in the areas of aviation safety, security, air traffic management, and environmental protection (European Union, 2011a).

3 Theoretical Framework

This chapter provides a conceptual guidance to the analysis and explanation of the case of the EU-ICAO interaction in the context of volcanic ash crisis.

An established theory of institutional interaction does not yet exist, however there is a variety of approaches on international cooperation and on institutions that may be helpful in explaining the problem analysed in this thesis.

The theoretical framework applied here focuses the research and situates it 'in scholarly conversation' (Anfara & Vincent, 2008). Consequently, possible theoretical and analytical approaches to the problem of international organisations and institutions are discussed here. Given the fact that the system of international aviation based on the Chicago Convention is broadly recognised as an example of international regime (Jönsson, 1987; Nayar, 1995; Kassim & Stevens, 2010) this chapter begins with a short discussion on the regime theory an continues presenting the fundamental findings of the epistemic communities approach, and later focuses on New Institutionalism. Finally the conceptual framework of institutional interaction by Gehring and Oberthür (2006; 2009), that will guide the case analysis is introduced.

3.1 Approaches on International Institutions

3.1.1 Regime Theory

Regime Theory emerged in the 1970s to explain cooperation between states on the international arena drawing on rational choice approach. Nevertheless, the study on international regimes has undergone an essential change until today. At least three theoretical approaches have developed within it: neoliberal (interest-based), rationalist (power based) and cognitivist (knowledge-based) (Niemann, 2006).

According to neoliberals and neorealists, including Robert Keohane, international regimes emerge in order to reduce transaction costs and they are usually created by a

hegemon (Jönsson, 1987). Stephen Krasner (1983), recognised as neorealist, developed the most commonly accepted definition of international regime as a set of 'implicit or explicit, principles, norms, rules, and decision making procedures around which actors' expectations converge in a given issue-area'.

From the institutionalist point of view, however, the neoliberal and rationalist approaches were not sufficient to explain the complexity of cooperation among states (Nayar, 1995).

According to cognitivists, such as John Ruggie and Peter Haas, the formation of regimes is viewed mainly as a result of distribution of knowledge.

Finally, Oran Young who became particularly known for his studies on regime effectiveness, claimed that regimes are social institutions and that they are created as a result of 'the conjunction of behavioural regularities and convergent expectations'. It means that they govern the actions of those who are interested specific activities and they fulfil certain functions (Young, 1980). The regimes are very common throughout the international system and they vary greatly regarding their scope, areal domain and membership (Ibid.). The global regime for international aviation constitutes an extensive type of regime.

The substantive component of an international regime is 'a collection of rights and rules' (Ibid.). An actor is entitled to a right when occupying a recognized role. For instance the members of ICAO have a right to use and enjoy the airspace.

Conversely, 'rules are well-defined guides to action or standards setting forth actions that members of some specified subject group are expected to perform (or refrain from performing) under appropriate circumstances' (Ibid.). Any rule represents the following features: '(a) an indication of the relevant subject group, (b) behavioural prescription, and (c) a specification of the circumstances under which the rule is operative' (Ibid.).

Three central categories of rules are recognized: use rules, liability rules and procedural rules. For instance, in the case of the ICAO/IATA system its members are obligated to adhere to certain safety rules in the use of international airspace.

3.1.2 Epistemic Communities

John Ruggie introduced the concept of 'epistemic community' which was subsequently elaborated by Peter Haas (1992). An 'epistemic communities' approach to the study of policy coordination among states that essentially departs from the concept of knowledge and information as power.

An epistemic community is 'a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area.' (Haas, 1992) The principal feature of epistemic communities distinguishing it from other knowledge-based groups is that their members share normative and causal beliefs. They generate 'consensus about the knowledge' or rather - from the constructivist point of view – the 'interpretations of knowledge' which are accepted by their members (Ibid.).

Epistemic communities, being providers of scientific or technical expertise and advice may become strong transnational actors and 'may contribute to the creation and maintenance of social institutions that guide international behavior.'(Ibid.)

Haas observes that recent history has seen a shift in decision-making being increasingly concerned with technical issues. This is due to the fact that technology has become an inherent element of the human life. It should be noted that this is particularly true regarding the technological advances in the air transport industry. Given the EU's involvement in the regulation of the technical aspects of the sector, the EU decision makers must turn for advice to the relevant 'epistemic communities', i.e. the aviation expert bodies such as EASA, ECAC, Eurocontrol…

As a result the international agenda has become increasingly complex. What is more this growing complexity generates uncertainty and therefore again 'decision makers have turned to specialists to ameliorate the uncertainties and help them understand the current issues and anticipate future trends.' (Ibid.)

The concept of uncertainty is particularly important in the context of the present research because 'in the face of uncertainty, and more so in the wake of a shock or crisis, many of the conditions facilitating focus on power are absent.'(Ibid.) In situations of uncertainty, shock or crisis epistemic communities provide advice and predictions of likely results of certain actions.

3.1.3 Normative Institutionalism

The term 'new institutionalism' was invented by March and Olsen (1984). New institutionalism emerged as an approach making a strong point that institutions 'are political actors in their own right.' (March & Olsen, 1984 cited in Lowndes, 2002: 94) Political institutions according to March and Olsen (Ibid.) are: 'collections of standard operating procedures and structures that define and defend interests.'

Further, three main types emerged within the New Institutionalist approach: normative institutionalism, rational choice institutionalism and historical institutionalism.

Normative institutionalism's main argument is that institutions can influence the actor's behaviour through shaping the norms and values (March&Olsen, 1989 cited in Lowndes, 2002:95). Institutions are seen not as being static, but as a process (Ibid: 99).

According to rational choice institutionalist institutions are designed in order to solve collective problems (Lowndes, 2002: 97) They also see that 'Institutions tend to be self-reinforcing and remarkably enduring' (Ibid.:105). Finally, historical institutionalists describe political process as 'path dependent' (Pierson, 2000) arguing that institutions are resistant to change (Wiener and Diez, 2009).

New institutionalism is interested not only in the impact of the institutions, but particularly in interaction between institutions and other actors (Lowndes, 2002: 103).

Institutions are not equal to organisations- (Ibid.: 101-102) institutions are understood in a broader sense i.e. as 'stable, recurring pattern of behaviour' (Goodin 1996 cited in Lowndes, 2002: 102).

According to normative institutionalists, institutions 'evolve' continuously (Lowndes, 2002: 105. March and Olsen (1989) claim that they 'simplify' political life (cited in Lowndes, 2002: 105). Their 'logic of appropriateness' is 'a perspective that sees human action as driven by rules of appropriate or exemplary behavior, organized into institutions' (March & Olsen, 2009). Accordingly, they see the important role of institutions:

> Institutions are organizational arrangements that link roles/identities, accounts of situations, resources and prescriptive rules and practices. They create actors and meeting places and organize the relations and interactions among actors. They guide behavior and stabilize expectations. (March & Olsen, 2009)

Furthermore, normative institutionalists stress the dynamics of rules of appropriateness- the ability of the institutions to evolve and adapt, especially when faced with critical

situations. 'Actors are likely to learn from disasters, crises and system breakdowns – transformative periods where established orders are delegitimized, challenged or collapse.' (March & Olsen, 2009). Lessons learned from experience improve effectiveness and adaptability of the polity and are a source of progress and wisdom (Ibid.). 'Rules of appropriateness are seen as carriers of lessons from experience (…) Rule-driven behavior associated with successes or survival is likely to be repeated. Rules associated with failures are not.' (Ibid.)

Finally, 'individuals have multiple roles and identities' within different institutions and these may sometimes collide (Ibid.)…

3.2 Conceptual Framework of Institutional Interaction

Since this thesis focuses on the interaction between the EU and ICAO, the conceptual framework of institutional interaction by Gehring and Oberthür (2006; 2009) seems suitable to be applied here. Regrettably, no established theory of institutional interaction exists. As Gehring and Oberthür (2009) point out, the theory development has just begun. Nevertheless, the framework developed by them provides useful tools in approaching the problem of how international institutions may influence each other. It focuses 'on the exploration of causal mechanisms of institutional interaction' (Ibid.).

Conceptually, the framework of institutional interaction draws on regime effectiveness approaches and the causal analysis of regime consequences (Ibid.). Empirically it derives from the findings of a European research project[6] on interaction between the EU and the international environmental institutions.

To begin with, it is essential to explain two concepts: the concept of international institution and the concept of institutional interaction. According to Oberthür and Gehring (2003) 'international institutions' relate to international regimes and specific international organisations that are parts of international governance. They may be defined as 'persistent and connected sets of rules and practices that prescribe behavioural roles, constrain activity, and shape expectations' (Levy el al. 1995 cited in:

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[6] See: < http://ecologic.eu/projekte/interaction/index.htm>

Oberthür and Gehring, 2003). Both the EU and ICAO classify as international institutions.

Meanwhile 'institutional interaction' is understood as '[t]he ability of international institutions to influence each other's development and effectiveness' (Gehring & Oberthür, 2009). The term 'interaction' is used to emphasize that 'interinstitutional influence is rooted in decisions taken by the members of one of the institutions involved. It is thus action that triggers interaction.' (Oberthür & Gehring, 2006:4)

In order to establish an incident of institutional interaction three elements must be identified (Ibid.): the source institution, the target institution and a cause-effect relationship between them. In case of this research, the EU is the source institution (as independent variable) which exerts influence on the dependent variable.

Consequently, ICAO is the target institution (dependent variable) and it is subject to influence that originates from the source institution (EU). Finally, a cause-effect relationship between the source and the target institutions must be established. Institutional interaction exists only when an effect within target institutions is observed, and that this effect is attributable to the source institution. 'Without established causation, there will be no interaction, but merely correlation.'(Oberthür & Gehring, 2003).

Influence travel from one institution to another through 'causal mechanism'. The identification of causal mechanisms of interaction helps analyzing 'real-world' cases of institutional interaction (Gehring & Oberthür, 2009).

George and Bennet (2005: 137) building on different definitions propose their interpretation of causal mechanisms as:

> [U]ltimately unobservable physical, social, or psychological processes through which agents with causal capacities operate, but only in specific contexts or conditions, to transfer energy, information, or matter to other entities. In so doing, the causal agent changes the affected entity's characteristics, capacities, or properties in ways that persist until subsequent causal mechanisms act upon it.

Institutional interaction may have two main consequences for the target institution (Gehring & Oberthür, 2009; 2003). First, if the effects of interaction support the objectives of the target institution- they will create synergy. Second, if they contradict the objectives of the target institution- they will result in disruption.

However it is worth noting that Oberthür and Gehring (2003) in their research identified similar numbers of synergistic and disruptive cases of interaction.

In order to examine how causal influence may be transferred from the source to the target institution, they develop four causal mechanisms of institutional interaction. Furthermore, they derive particular ideal types of institutional interaction driven by the same causal mechanism, but reflecting different characteristics.

These are the causal mechanisms that may drive institutional interaction (Oberthür & Gehring, 2006): Cognitive Interaction; Interaction Through Commitment; Behavioral Interaction; and Impact-Level Interaction.

In this paper the causal mechanism of Interaction Through Commitment and particularly, its ideal type of interaction between 'nested institutions' is applied in order to explain the EU-ICAO interaction.

This type of causal mechanism is in general based on 'the power of international norms' (Gehring & Oberthür, 2009). It means that new obligations created under one institution may have influence on the actors' preferences and behaviour regarding another institution. This is in line with how 'logic of appropriateness' explains why actors follow the norms:

> Rules are followed because they are seen as natural, rightful, expected, and legitimate. Actors seek to fulfil the obligations encapsulated in a role, an identity, a membership in a political community or group, and the ethos, practices and expectations of its institutions. (March & Olsen, 2009)

Interaction Through Commitment emerges in four steps (Gehring & Oberthür, 2009). First, an obligation that might be relevant for the target institution is agreed upon by members of the source institution. Next, this obligation commits state or states that are members of both institutions. Third, this commitment results in change of preferences and behaviour of those states in relation to the target institution. Finally, this modification of preferences and behaviour influences the decision-making process of the target institution as well as its output.

Finally, the real world phenomena of interaction are usually complex, involving number of actors and causal paths where influence between each two actors runs back and forth. The analysis of institutional interaction requires analytical disaggregation of this interaction into 'a suitable number of cases' identifying one independent and one dependent variable and the causal pathway leading from the former to the latter one (Oberthür & Gehring, 2003).

3.2.1 Nested Institutions

In light of the characteristics of the EU, ICAO and their relationship, the interaction between them may be classified as the interaction through commitment among 'nested institutions' (Gehring & Oberthür, 2009).

This type of interaction may occur between institutions of smaller - regional membership (EU) and a larger – global membership (ICAO).

On the one hand the issue-areas that they govern are significantly overlapping and the objectives are shared, on the other hand decision-making in regard to new obligations differs significantly.

The impulse for the interaction lays in the diverging membership. Young (1996) established the concept of 'nestedness' that describes the relationship of a smaller institution to another one that is broader functionally or geographically.

Gehring & Oberthür (2009) outline three characteristics of this ideal type of interaction.

First, institutions with unequal memberships may develop different obligations, even if they pursue identical objectives. Moreover, it is usually easier to reach agreement within a smaller than a larger global institution. Second, obligations agreed upon within the source institution 'streamline the preferences of its members' (Ibid.). Consequently, the members may wish to expand these obligations to other countries (in order to commit competitors to costly obligations, to preclude free-riding, to reinforce the effectiveness of their agreement, etc.) Third- the fact that the members of the smaller institution share a common agreement contributes to forming of a natural coalition during negotiations within larger institution.

The effect of interaction between nested institutions is deemed to be primarily synergistic, provided that the two institutions have similar objectives and consequently generate compatible priorities (Ibid.). This type of interaction 'provides a mechanism for policy diffusion', however with no guarantee that it will be achieved (Oberthür & Gehring, 2003).

4   Methodology

4.1   Aim and Research Questions

A clear statement of the research problem is essential in order to focus the investigation (George & Bennet, 2005: 74).

The problem investigated in this thesis is whether the EU has an ability to influence an international organisation such as ICAO. In order to do so, the case of 'institutional interaction' understood as '[t]he ability of international institutions to influence each other's development and effectiveness' (Gehring & Oberthür, 2009) between the EU and ICAO in the context of the volcanic ash crisis is investigated.

The case chosen to be investigated for the purposes of this research represents two problems that have not received (in the author's opinion) sufficient scholarly attention: international aviation and the EU's role within it, and the phenomenon of the Eyjafjallajökull volcanic ash crisis. The aim of this paper is in particular to contribute to the problem of the Eyjafjallajökull volcanic ash crisis from institutional perspective.

As it will be further elaborated on, the outcome of the deemed EU-ICAO interaction is the adoption by ICAO of a new Volcanic Ash Contingency Plan for Europe. In order to trace how this outcome came about, the technique of process-tracing will be employed.

Influence travel from one institution to another through causal mechanism. Therefore a causal mechanism between the EU and ICAO in the context of volcanic ash crisis will be investigated. The theoretical framework will provide possible explanations to the investigated case.

The aim of this research is similar to the 'disciplined configurative' theory-building research objective recognized by Arend Lijphart and Harry Eckstein (George&Bennet, 2005: 75). However, according to these two scholars this type of research objective implies the use of established theories to explain a case (Ibid.). In the case of this research the investigator does not have a sound theory at her disposal, but merely a

theoretical framework. Thus the concepts included in the framework will guide the analysis of the case of interaction between the EU and ICAO and will help to provide explanations for its outcome.

Accordingly, the research questions have been formulated as follows: *How has the volcanic ash crisis been tackled? Has the adoption of a new volcanic ash approach by ICAO been influenced by the EU?* If so*: How has the EU influenced ICAO?*
The technique of process-tracing will be employed to provide the answers. In order to answer the first question a detailed analysis of all of the institutional developments aimed at tackling the crisis produced by the EU and ICAO will be performed. In regard to the remaining questions, the causal mechanism between the EU as source institution and ICAO as target institution will be looked for.

4.2 Hypothesis

My hypothesis regarding the outcome of the EU-ICAO interaction is consistent with the theoretical framework adopted in this thesis and it is already suggested by the title of the paper: *Tackling the Eyjafjallajökull Volcanic Ash Crisis: How the EU influenced the International Civil Aviation Organization.* It is hypothesized that the interaction between the EU and ICAO actually took place, and that the outcome of this interaction, namely the adoption of a new volcanic procedure by the ICAO, was the result of the EU exerting influence on the ICAO through a causal mechanism
It is predicted, that according to the framework of institutional interaction this causal mechanism will be based on the difference of memberships and commitments creating interaction between 'nested institutions'. Such interaction in turn is likely to produce synergistic effects between the two institutions.

4.3 Case Study Method

This research has been designed adhering to a great extent to the methodological advice produced by Alexander L. George and Andrew Bennet (George&Bennet, 2005). The

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standards and best practices in the use of case studies identified by them are of a tremendous help to a young researcher.

Considering both the strengths and the weaknesses of the case study method, this approach has been chosen as the most appropriate to pursue the objective of the present research. Due to the author's interest in one particular case- the interaction between the EU and the ICAO in tackling of the volcanic ash crisis- the research takes form of a single-case study. Such methodological choice is also dictated by the space and time constraints that this project is subjected to.

When designing a case study, the researcher must address several questions (George & Bennet, 2005: 77). This may help him or her to delimit and define the scope of the research. A well defined class and subclass of the phenomenon under investigation may allow the researcher to develop contingent generalizations applicable to these categories.

A case is 'an instance of a class of events' where 'class of events' refers to 'a phenomenon of scientific interest' (Ibid.: 17). Therefore, a case study 'is a well defined aspect of a historical episode that the investigator selects for analysis' (Ibid.: 5), and it may be generalizable to other events.

The present paper looks closer at the event of the Eyjafjallajökull volcanic ash crisis. The aspect of it that is being investigated, i.e. the 'case' is the interaction between the EU and the ICAO in tackling of the crisis. Generally, this case pertains to a 'class of events' of institutional interaction, and more particularly to a 'subclass' of interaction between nested institutions.

Usually, successful studies work with a smaller-scope, well defined subclass of the general phenomenon (Ibid.:77)

The case study method offers a range of advantages with particular relevance for this research. The case studies may not be well suited to assess *how much* a particular variable affects the outcome, however they are strong in answering *whether* and *how* (George&Bennet, 2005: 26) or *why* and *how* (Yin 2003: 53) a variable mattered to the outcome.

George and Bennet (2005) identify four strong advantages of case study method especially valuable in testing hypothesis and for theory development.

First advantage of the case study is that it permits to achieve 'high levels of conceptual validity' (Ibid.:19) in the research. It also helps the researcher to identify and to measure the indicators best representing the theoretical concepts that he or she is interested in (Ibid). The context matter a lot in case studies, and thus detailed consideration of contextual factors is needed.

Second, the case study method is a powerful tool in the 'heuristic identification of new variables and hypotheses' (Ibid.:20). The observations are of course driven by the theory, nevertheless they are not determined by the theory. The study of deviant cases, archival research or interviews can shed new light on the outcome and prompt the researcher to examine previously overlooked evidence and consequently to develop new theories.

Third, case studies are particularly useful in exploring causal mechanisms. Within a single case a large number of intervening variables is closely observed. Furthermore, the operation of causal mechanisms is scrupulously examined what may help identify the conditions responsible for the activation of the causal mechanism in the case. Therefore, case studies have the ability to uncover or refine a theory about a specific causal mechanism (Ibid.: 31).

Fourth advantage of case studies is 'their ability to accommodate complex causal relations such as equifinality, complex interaction effects, and path dependency' (Ibid.: 22). Case studies pay special attention to the possibility of many alternative paths existing to the same outcome. What is more: 'Case studies also require substantial process-tracing evidence to document complex interactions.' (Ibid.: 22)

On the other hand, the case studies method's limitations must be also taken into account and the critiques noted.

According to George and Bennet (2005) one of the most common critiques of the case study and especially of single-case study method is case selection bias. However, there is couple of contrary arguments. First of all, selection of cases with some prior knowledge about them can allow much stronger research design, i.e. enable crucial, most-likely or least-likely cases for theory (Ibid.:24). Second, cases having the same outcome can be deliberately selected by the researcher with purpose of identifying the

potential causal paths and variables that lead to the dependent variable that the researcher is interested in (Ibid.: 23).

Another risk, is that of either understating or overstating of the relationship between independent and dependent variables (Ibid.:24). The critique of over-generalization of the results is particularly directed toward a single-case study. However, the advice for the researchers to prevent this shortcoming to occur is to 'carefully define and limit the *scope* of their findings to a well-specified population that shares the same key characteristics as the cases studied.' (Ibid.: 25)

Finally, the argument of the case study's inability to estimate the 'causal effect' or how much a particular variable affects the outcome has been dismissed already. This research asks different questions, particularly *whether* and *how* the variable mattered.

4.4   Process-tracing

The empirical causal relationship between an independent variable and a dependent variable can by analysed by employing methods of causal inference (Gehring & Oberthür, 2009). Therefore, in order to achieve the aim of the present research, process-tracing is employed as a technique epistemologically compatible with and complementary to the case study method.

Process-tracing is a strong method of inference due to its 'insistence on providing a continuous and theoretically based historical explanation of a case, in which significant step toward the outcome is explained by reference to a theory' (George & Bennet, 2005: 30). It is employed to provide explanations for particular cases. It traces linkages between possible causes and observed outcomes (Ibid.:5).

When using process-tracing the implications of the hypothesized causal mechanism are observed closely in the context of individual cases (Ibid.). Therefore, process-tracing is a powerful method 'for testing theories about causal mechanisms in individual cases' (Ibid.:129). However, it is also a good technique for theory development. Process-tracing may be useful in assessing the predictions of a theory and it is important for generating and assessing evidence on causal mechanisms (Ibid.).

Process-tracing does not need to focus on the individual actors' level of analysis. Therefore it can be used to explain "macrohistorical" or "macrolevel" phenomena

Ibid.). It is considered, that the case being investigated in this research (interaction between the two institutions during and in aftermath of the volcanic ash crisis) is such type o phenomenon.

It is sensitive to the possibility of equifinality, by documenting alternative causal paths leading to the same outcome (Ibid.)

Process-tracing is a good technique for political scientists 'who are sensitive to the complexities of historical events but are more interested in theorizing about categories of cases as well as explaining individual cases.' (Ibid.: 223)

Yet, '[h]ow do we know process tracing when we see it? (Checkel, 2005). This is how Checkel defines it:

> The application of process tracing usually means to trace the operation of the causal mechanisms(s) at work in a given situation. One carefully maps the process, exploring the extent to which it coincides with prior, theoretically derived expectations about the workings of the mechanism. (Checkel, 2005)

Furthermore, the researcher traces a number intermediate steps between the independent and dependent variables as predicted by the theory (Checkel, 2005).

Nevertheless, the possibility of reaching definite conclusions through process-tracing depends on the information available. As Checkel (2005) puts it: 'the data for process tracing is overwhelmingly qualitative in nature' and that logistically the biggest challenge 'is the significant amount of time and data that it requires' (Ibid).

Checkel also reminds the researcher of risk of losing sight of the big picture when performing process-tracing. This methodological choice can make easy 'to loose sight of broader structural context and the normative implications of one's work' (Ibid.).

In the next chapter process-tracing is employed in order to analyze all developments by the EU and ICAO in their efforts to tackle the volcanic ash crisis, with a special emphasis on the ICAO responses to the EU proposals regarding the solutions for the crisis and its consequences. The process-tracing aims at uncovering all signs of interaction between the two institutions.

The material analyzed embraces all relevant documents published since the eruption of the volcano in Iceland (14th April 2010 until the spring 2011). These include: EU and ICAO press releases, speeches by the officials from both institutions, information notes, official documents, working papers, journals and reports. They are complemented by selected articles from on-line newspapers and reports by other organizations.

Furthermore, the theoretical framework is applied in order to provide the explanation of the outcome of the case.

5 Analysis of the EU – ICAO Interaction in Tackling the Volcanic Ash Crisis

5.1 Background

In April 2010 Europe faced an unprecedented situation: a volcanic ash crisis. This event created a context for the EU and ICAO to interact among each other. The cooperation between these two institutions turned out to be critical in managing of the crisis, due to extensive overlap of their competences in the area of civil aviation.

The appearance of volcanic ash is a complex phenomenon having a serious impact on aviation. Certain facts and aspects of this phenomenon and particularly in the context of the crisis situation of April 2010 must be clarified before the analysis is carried out.

Given the fact that all the documents relating to the event of April 2010 call it 'volcanic ash crisis', it is necessary to explain what is meant by a 'crisis'. In December 2010 ECAC Forum came up with a definition well suited to describe the situation in Europe following the Eyjafjallajökull eruption:

> Crisis might be defined as the point at which threat, urgency and uncertainty come together to pose immediate issues around whether it is feasible to carry on with business as usual (…) (ECAC, 2011).

All had begun on the 14th of April 2010. On that day the Icelandic volcano Eyjafjallajökull threw an enormous cloud of steam and volcanic ash[7] into the

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[7] Volcanic ash refers to plumes of dust that a volcano ejects into the atmosphere during the eruption. It consists of small particles of pulverized rocks and silicates and other substances. These can persist in the atmosphere for several days and be transported by winds over very long distances (Meteo France web page). During last 30 years volcanic activity has caused about hundred incidents affecting long haul flights (Ibid.)

atmosphere. In the following days the cloud spread South and East being the reason for closure of much of the European airspace, what in turn grounded the air traffic.

Overall, as the Commissioner responsible for Transport, Siim Kallas said: '[t]he European Union has been hit by an unprecedented crisis…' (European Commission, 2010d).

Volcanic ash is regarded as a potentially catastrophic hazard to aviation (Science Daily web page).

Considering threats that this phenomenon poses to aircraft, ICAO had developed its approach to volcanic ash based on the principle of strict avoidance (see: Annex 3 to Chicago Convention). It is worth noting the potential problems that volcanic ash might cause to an aircraft in order to realise the seriousness of the threat. These are, according to the ICAO Volcanic Ash Contingency Plan:

- Engine failures and malfunctions
- Subsequent failure of electrical, pneumatical and hydraulic systems
- Blocking of sensors, resulting inter alia in erroneous airspeed indications
- Smoke, dust and/or chemical pollution of cabin air; resulting in the need for aircrews to use oxygen masks
- Communication problems
- Loss of visibility through cockpit windows.

Each of these potential problems may endanger the flight and therefore put on risk the cabin crew and the passengers' and lives.

Most national civil aviation authorities in Europe, triggered by the spreading ash cloud decided to follow the ICAO guidelines and consequently to close their airspace. Due to the widely spread volcanic cloud there was no place for re-routing (ICAO, 2010a). Given the fact that the European airspace is 'the busiest and most complex in the world' (Ibid.) this had tremendous consequences.

The impact of this action by the states is assessed in the Eurocontrol's draft report and it puts forward striking numbers (Eurocontrol, 2010). During the main period of the crisis (15-22 April) 104,000 flights were cancelled. This means that on average 48% of expected traffic over those 8 days of crisis was grounded. The crisis reached its peak on the 18th of April with 80% of flights cancelled. Overall, approximately 10 Million

passengers were unable to board their flight. In addition the financial impact of the crisis to airline industry is estimated at €1.7 billion of revenue loss (Keilir Aviation Academy, 2010).

The international aviation is by definition global, and so are the effects of the European crisis. The shutdown of major European airports generated a significant impact on international air traffic as a whole. Airports such as Heathrow (London), Charles de Gaulle (Paris) and Schiphol (Amsterdam) are hubs of great importance for global air transport. As a consequence, on April 16 the world-wide traffic decreased roughly by 18% (Northwestern University web site).

Research project on the Eyjafjallajökull Event applying complex network theory conducted by the Northwestern University stresses this inter-dependence within the international aviation system:

> Like many other technological or biological systems, the global aviation grid is a large and complex network in which even small changes may lead to unexpected consequences for the network as a whole, and indeed airports around the entire world are significantly affected by the shutdown of the European centers. (Northwestern University, 2011).

This is why the problem of ash crisis was remarkably relevant both for the European and the international aviation institutions. Accordingly, the EU and the ICAO engaged vigorously in the search for the solutions to tackle the crisis.

5.2   Action by the EU

The number of operating flights was dropping every day since the volcanic eruption.
On the 17th of April there were only 5,335 actual flights, comparing to 22,653 flights on the same day the week before (Eurocontrol, 2010).
The EU realised that in this situation a strict avoidance of volcanic ash was not a solution, and a more differentiated approach to the problem was needed.
During the weekend 17-18 April the European Commission, together with the Spanish Presidency and Eurocontrol, took the initiative to propose a coordinated European approach to gradual, safe re-opening of the European airspace (Commission web page).

On the 18th of April the Commission's President Barroso decided to set up an ad hoc group for a task of assessing the impact of the volcanic ash crisis on the air travel industry and its economic consequences in general (European Union, 2010b).

Vice-President Kallas (Transport), assisted by the Vice-Presidents Almunia (Competition and State Aids) and Rehn (Economic and Monetary Affairs) were responsible for leading the work of the group (Ibid.).

On the 19th of April an informal extraordinary meeting of EU Transport ministers took place via video/audio conference. The aim of it was to agree on and validate the measures prepared during the weekend (European Union, 2010c).

The Ministers have agreed to reinforce a coordinated European response in respect to the crisis, through the European Commission and Eurocontrol. As a result, from the 20th of April, the European airspace was gradually re-opened in a coordinated manner, on the basis of these new procedures (Commission web page).

Based on the existing technical studies and available data Eurocontrol established three types of zones (European Union, 2010c).

First zone- a 'no fly zone'- is located in the central nucleus of the emissions where it is impossible to guarantee safety. There is a full restriction of operations.

In the second (intermediary) zone there are still amounts of ash, however it does not impede air traffic operations. Decisions about the operations need to be taken in a coordinated manner by the authorities of the Member States, however with additional restrictions and safety controls.

Third- a 'free-fly zone' is not affected by the ash and therefore there are no restrictions of any type to the operations.

In his statement following the extraordinary meeting of the 19th of April, the Transport Commissioner highlighted the three key principles that guide the work by the Commission in tackling of the ash crisis. These are: no compromise on safety; all decisions based on scientific evidence and expert analysis; and: more European co-operation to find solutions for the crisis.

On the 27th of April Siim Kallas presented a preliminary assessment of the economic consequences of the volcanic ash crisis for the air transport industry. As the primary priority of the Commission he recognised opening up of more airspace and getting

stranded passengers home (European Union, 2010d). Kallas also proposed a range of measures to help the air transport industry in overcoming of the crisis.

The Commission has decided to take two important initiatives. First, to create a working group of experts from Eurocontrol, the European Air Safety Agency (EASA), Member States, ICAO and the industry in order to develop a research and technology agenda.

Second, the Commission decided on the development of a new European methodology and coherent approach for safety risk assessment and risk management in relation to the closure and reopening of airspace (Ibid.).

Additionally, the Commission decided to prepare a paper to be submitted by the EU to the International Civil Aviation Organisation (ICAO) General Assembly in September 2010 (Ibid.).

At the extraordinary Transport Council held in Brussels on the 4th of May, the EU Ministers agreed on the Commission's proposals of actions and structural measures necessary to deal with the consequences of the crisis. They included, among others: a co-ordinated European action to review safety assessment for volcanic activity at EU level and to fast-track implementation of the Single European Sky in order to ensure better coordination and to improve pan-European mobility (European Union, 2010e). Furthermore, the need for revision of the ICAO guidelines was addressed.

As the main result of the Council, the ministers adopted conclusions on the *EU response to the consequences of the volcanic ash cloud for air transport* in the aftermath of the eruption of a volcano in Iceland (Ibid.).

On 21st May the Commission issued guidelines aimed at minimising the airspace closures in the event of volcanic ash reaching Europe. The guidelines are based on the EU's 'three zones' approach to volcanic ash and are a result of close work of the Commission, Eurocontrol, European Aviation Safety Agency (EASA) and the aircraft and engine manufacturers. The Commission assured, that the new guidelines guarantee highest standards of safety, at the same time offering more flexibility to the Member States in deciding how to manage their airspace (Commission web page).

The names of the zones correspond to the colours used to indicate them on the Volcanic Ash Advisory Centre (VAAC) charts. These are:

1. Black - "no-fly" zone with ash concentration level above 4000 microgrammes/m3.

2. Enhanced Procedures Zones:

   a) Grey zone with ash concentration level between 2000 and 4000 microgrammes/m^3 (two different approaches for flight operations recommended by EASA).

   b) Red zone with ash concentration level between 200 and 2000 microgrammes/m^3. According to EASA flights can take place.

3. White (normal) zone with ash concentration level below 200 microgrammes/m^3, where normal flight operations apply.

Furthermore, London Volcanic Ash Advisory Centre (VAAC) will publish updated charts every six hours, indicating three levels of predicted ash concentration (Commission 30/06/10). Eurocontrol will make these charts and all the updates available online.

At the transport Council meeting in Luxembourg on the 24th of June, the Commission reported to the ministers about the progress being made in response to the impact of the ash crisis. The new EU approach to volcanic ash based on the three zones have been in place since the 19th of April. The impact of volcanic ash on aircraft engines has been under investigation. Additionally, the EU has been preparing coordinated position on risk management in the event of volcanic eruptions for the ICAO Assembly session in September 2010 (Council, 2010).

Moreover, the Commission reported that the implementation of the Single European Sky was being accelerated.

Furthermore, Commission and Eurocontrol have decided to create a European Aviation Crisis Coordination Cell[8] (EACCC)- aimed at ensuring a rapid response to any future pan-European crisis affecting aviation (Commission web page).

Some member states asked the Commission to investigate ways to improve the situation of the air transport industry (Council, 2010).

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[8] 'The EACCC will have as its main role to facilitate the management of crisis situations affecting aviation in the European (ECAC) region and will be activated when circumstances beyond the normal environment of operations are evident (e.g. volcanic eruption)' (Commission web page).

In its *Volcano Crisis Report: Report on the actions undertaken in the context of the impact of the volcanic ash cloud crisis on the air transport industry* (European Commission, 2010), the Commission highlighted that the new 3-zone system applied for the whole EU airspace, allows greater access to the European airspace, at the same time fully guaranteeing the highest level of safety (Ibid.).

In relation to the new system the European Safety Agency (EASA) engaged in establishment of technical measures regarding the issues of aircraft certification and airworthiness.

As presented in the report, the EU engaged in coordination of the work of its Joint Research Centre (JRC), with the Research General Directorate and EASA. The objective of this coordinated work was to provide European contribution to the work of the ICAO EUR/NAT Volcanic Ash Task Force in reviewing the *Volcanic Ash Contingency Plan*- the 'plan' that formed the basis for the decisions of the national authorities to close their airspace in the first days after the volcanic eruption in April 2010.

From 27 to 30 July took place the first meeting of the International Volcanic Ash Task Force (IVATF) established by ICAO. The European Commission participated in the meeting alongside European Safety Agency (EASA) and Eurocontrol. The aim of this cooperation was to ensure the necessary level of consistency between the various outputs, and therefore to avoid the return of fragmented approaches (Commission 30/06/10).

The EU and other European aviation bodies have been coordinating their work and scrupulously preparing for safeguarding the common European interest at the 37th session of the ICAO Assembly. In this context on the 7th of September gathered a Council working group on aviation. This group, among other issues has examined and fine-tuned the Commission's working paper *Eyjafjallajökull Volcanic Ash Crisis* to be presented in Montreal.

The 37th session of ICAO Assembly generally resulted 'very satisfactory' from the European standpoint (ECAC, 2011). It is mainly due to a skilful preparation for the Assembly, including formation of ECAC/EU working groups. What is more, during the session (28/09-8/10/2010 in Montreal) EU coordination meetings took place at least

once daily with a noteworthy commitment of the Belgian Presidency. The meetings were led by the Belgian Director General of civil aviation Frank Durinckx.

Belgium, acting on behalf of the European Union and its Member States, Members of ECAC and Eurocontrol presented a working paper *Eyjafjallajökull Volcanic Ash Crisis*, which was subsequently considered by the Technical Commission.

The document demonstrates a European view on the existing tools and measures undertaken to tackle the volcanic ash crisis. It also includes a set of suggestions for further improvement at the global level, directed to the ICAO.

The main findings of the EU's working paper are summarized below.

The existing procedures proved to maintain the highest level of aviation safety (European Union, 2010f) during the recent volcanic ash crisis in Europe. However, the air traffic was very badly disrupted, causing severe revenue losses to the air operators as well as inconvenience to millions of passengers. According to the EU the eruption of Eyjafjallajökull has put in evidence that the civil aviation community's understanding of the effects of volcanic ash was inadequate. The EU and the airline industry addressed the need for a harmonized and a coordinated response to such kind of events.

Coping with effects of the volcanic ash requires action by different parties, with particular regard to meteorological services and the aero-engine ash tolerance. Furthermore, the EU identified a leadership role for ICAO, provided that the efforts are needed on the global level. The general aim is to achieve a harmonised, global approach in case of future regional or global crises significantly affecting aviation (Ibid.).

The EU proposed some initial actions, including the revision of the provisions in Annex 3 of the Chicago Convention in the light of the recent advances in technical capabilities. The strict avoidance guidance and undifferentiated approach included in the provision of the Annex 3 turned out to be inappropriate in today's operational environment.

In the opinion of the EU the ICAO should direct the ICAO International Volcanic Ash Task Force (IVATF) to take into account in its work the levels of ash tolerance agreed by the manufacturers.

The EU emphasized the importance of the meteorological services during periods of volcanic ash activity. To forecast the evolution of ash clouds and to achieve a good knowledge of their characteristics: position, amount, composition, altitude, projected trajectory and drift of volcanic ash is critical. The EU expressed its belief, that the Eyjafjallajökull experience leading to the refining of outputs of the volcanic ash

advisory centres (VAACs) in Europe, has left it better prepared to tackle the operational consequences of any future volcanic eruption.

In this regard the EU proposed potential improvements to the Annex 3, among others:

- Frequency of volcanic ash advisories- according to the current guidelines the advisories should be produced every 6 hours. The EU proposed a minimum frequency of three hours.

- Volcanic Ash Advisory Centre (VAAC) chart details- the EU suggested greater specificity of detail in VAAC chart showing different levels of measured ash concentrations, commensurate with engine tolerance levels.

According to the existing ICAO guidelines regarding volcanic ash- Annex 3 and the ICAO EUR Volcanic Ash Contingency Plan, the response by the European states to the Eyjafjallajökull eruption was to close their airspace. In the opinion of the EU this approach was precautionary and from today's perspective- not commensurate with the technical and meteorological advances. During the crisis, after discussions in the manufacturers' community acceptable volcanic ash thresholds for engines has been determined. They range, under certain conditions, from 2000 microgrammes/m^3 to a maximum level of 4000 microgrammes/m^3 (WP).

Subsequently the ICAO has incorporated the thresholds to the ICAO EUR/NAT Volcanic Ash Contingency Plan and has published its updated version.

The application of the new thresholds enabled the gradual re-opening of the European airspace during the Eyjafjallajökull crisis.

Overall, according to the EU the volcanic ash crisis has demonstrated that enhanced cooperation between the air traffic services, the aeronautical information services, particularly meteorological services is needed.

The lessons learned from the Eyjafjallajökull experience contributed also to further integration of the European airspace. The EU Transport Ministers decided to accelerate full implementation of the Single European Sky, including the appointment of the central European Network Manager- a single authority to manage European skies and to ensure a coherent approach to Air Traffic management (ATM) performance in Europe (ECAC, 2011). Eurocontrol has been nominated as Network Manager.

These actions are going to enable a more harmonized and coordinated approach to risk assessment and to tackling any crisis, in coordination with other neighbouring countries

and regions. The EU suggested that the ICAO should consider the benefits of coordinated network management in a wider context of the Organisation.

In the opinion of the EU the ICAO should lead the work at the global level to better address the disruptive effect of volcanic eruptions in the future. ICAO should therefore work on ensuring a global harmonised approach with guarantee of necessary levels of safety, as well as to make full use of today's knowledge and technologies in order to minimize the disruption.

5.3   Response by the ICAO

This section traces the developments by ICAO in regard to volcanic ash crisis. While the EU has been proactive in the search for solutions, the ICAO engaged in the work too and responded to many actions by the EU. It is interesting to see if the ICAO's response was caused by the EU exerting causal influence on it.

On the day following the Eyjafjallajökull eruption ICAO expressed its content about the situation in Europe:

> The International Airways Volcano Watch (IAVW) system, established by ICAO in coordination with the World Meteorological Organization (WMO), proved effective in ensuring the safety of air transport following the eruption of the volcano Eyjafjalla in Iceland on 14 April 2010.
> No incidents or accidents have been reported due to volcanic ash. Disruptions in air traffic, however, are being experienced in the United Kingdom and Scandinavia (ICAO News web page).

Nevertheless, the ICAO reminded that volcanic ash may constitute a serious safety hazard and ensured, that the IAVW[9] system was closely monitoring the movement of volcanic ash in atmosphere. The ICAO also ensured that it was monitoring safety concerns.

A few days after, the Council of the International Civil Aviation Organization met in order to assess the situation following the eruption of the Icelandic volcano. It also

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[9] The main components of the IAVW system are nine ash advisory centres responsible for identifying areas of volcanic ash and predicting their movement. The centres are distributed strategically around the globe: Anchorage, Buenos Aires, Darwin, London, Montreal, Tokyo, Toulouse, Washington and Wellington (see: http://www.metoffice.gov.uk/aviation/vaac/)

welcomed the EU Transport Ministers decision to gradually re-open the European airspace (ICAO News web page) 'in a safe and coordinated manner'. On the following day the ICAO Air Navigation Commission discussed initiatives regarding technical and scientific advances in aviation safety related to volcanic ash. The International Air Transport Association (IATA) participated in both meetings.

The ICAO ensured, that the Volcanic Ash Advisory Centre in London, according to the ICAO provisions[10] has been continuously updating information concerning the area affected by volcanic ash.

The ICAO recognised, that the disruptions in air traffic following the eruption of Eyjafjallajökull had been of an unprecedented scale and that more effort needed to be undertaken in establishing a safety framework for flight operations in airspace contaminated by the volcanic ash. Further, the Organization invited all groups of actors involved in air transport, i.e. states, the scientific community, aviation safety professionals, manufacturers, airports and airlines to participate in development of such a framework, by providing valuable input.

In the end of April the ICAO announced, that in response to the volcanic ash crisis in Europe it had established an International Volcanic Ash Task Force (IVATF).

The IVATF is a body that coordinates all work related to volcanic ash carried out by the ICAO both at regional and global levels (ICAO, 2010a). To monitor progress, quarterly teleconferences will be held. The IVATF was also entrusted to carry out following tasks in cooperation with the EUR/NAT Volcanic Ash Task Force (Ibid.):

- Evaluation of the Icelandic eruption.
- Revision of guidance on volcanic ash contingency plans.
- Review of operational response to volcanic ash encounter.
- Development of ash concentration thresholds.
- Improvement of ash detection systems.
- Review of notification and warning for volcanic ash.
- Improvement and harmonization of dispersion models.
- Improvement of visual volcanic advisory centre (VAAC products).

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[10] 'Since 1984, WAFC London has provided international forecasting services to meet Annex 3 to the ICAO Convention on Civil Aviation. This means having the ability to provide global forecasts of upper winds and temperatures for all flights throughout the world.' 'The London VAAC is responsible for monitoring and forecasting the movement and dispersion of volcanic ash originating from volcanoes in the north-eastern part of the North Atlantic Ocean' (Met Office web page).

Furthermore, ICAO with a help of experts from the contracting states and from the industry will be preparing a report on lessons learned from the crisis to be completed by May 2011. The Organization invited to join the Task Force, among others, the states where the Volcanic Ash Advisory Centres (VAAC) are located, as well as several organizations, including EASA, Eurocontrol, IATA and the European Commission (ICAO News web page).

In May 2010, ICAO was advancing its work on an internationally-harmonized safety risk management framework for flights operating in airspace contaminated by volcanic ash (Ibid.). The European and North Atlantic Regional Office of ICAO held a preparatory meeting in order to begin the process of amending the regional volcanic ash contingency plan.

On the 12 May the ICAO European and North Atlantic Volcanic Ash Force (EUR/NAT VATF) agreed on a common agenda to improve contingency plans in the European and North Atlantic Regions. The ICAO recognised that on the one hand the existing plans proved effective in preventing accidents, but on the other hand they resulted in unprecedented disruptions of air traffic and severe economic impact to the airline industry (Ibid.) and therefore they needed to be amended.

The meeting of EUR/NAT VATF was attended by more than 50 participants from contracting states, the European Commission, the scientific community and from the air transport industry. The overall atmosphere of the meeting was very cooperative. According to the ICAO EUR/NAT Regional Director Karsten Theil:

> The fact that all concerned parties are involved in the discussions shows a high level of resolve to propose options that will significantly improve responses to future volcanic ash emergencies, with emphasis on both safety and efficiency (Ibid.).

The first meeting of the International Volcanic Ash Force (IVATF) took place from 27 to 30 July 2010 in Montreal (ICAO, 2010b). One of the central items on the agenda was the results of meetings of the European and North Atlantic Volcanic Ash Force (EUR/NAT VATF), particularly:

- Evaluation of the Eyjafjallajökull eruption and lessons learned
- Revision of the existing guidance on volcanic ash contingency plans
- Follow-up action including recommendations

EUR/NAT VATF submitted to the IVATF a number of recommendations based on the experience gained among EUR and NAT service providers and users during the eruption of the Icelandic volcano. In this light the Volcanic Ash Contingency Plan for the European and North Atlantic Regions has been updated.

The document sets out standardised guidelines for the alerting of aircraft in event of volcanic eruption, and procedures that need to be followed in such situation (ECAC, 2011). However, it was not a final version - the Contingency Plan would be still subject to further review and revision.

The update included, among others, the adoption of three zones of different level of ash contamination, reflecting the previously endorsed levels by the EU:

- Area of Low Contamination: Airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or less than 200 microgrammes/m^3.

- Area of Medium Contamination: Volcanic ash may be encountered at concentrations greater than 200, but less than 4000 microgrammes/m^3

- Area of High Contamination: Volcanic ash may be encountered at concentrations equal to or greater than 4000 microgrammes/m^3, or where no ash concentration guidance is available.

What is more, the IVATF noted, that the manufacturers, aviation safety regulators, operators, meteorological authorities and research communities in Europe reached a consensus which permitted operations in areas of volcanic ash with densities forecast to be less than 200 microgrammes/m^3.

Further development of ash concentration thresholds and improvement of ash detection/avoidance systems was addressed by the IVATF.

The 37th session of the ICAO Assembly took place in Montreal, from 28 September to 8 October 2010. It was attended by some 1600 delegates, including representatives of 176 states and observers. The agenda was very busy - there were 75 items and 402 working papers have been presented.

As at every Assembly, an ICAO Council has been elected for another three-year term.

Among the issues discussed at the Assembly the most challenging proved to be the problem of climate change.

In regard to the issue of volcanic ash, four working papers have been presented: by the EU, by the ICAO, by the IATA and by the US.

The EU working paper's main findings have been presented in a previous section (Action by the EU). Summarizing, the EU identified a leadership role for ICAO in dealing with aviation crises due to international character and global effects of such events as well as suggested a range of potential improvements, including the revision of the Annex 3 of the Chicago Convention. Later evaluations of the 37th session of the Assembly reflect Europe's satisfaction from its results (ECAC, 2011).

The working paper *ICAO leading efforts on global volcanic ash warnings and avoidance* provides an overview of actions taken by the Organization in relation to volcanic ash threat (ICAO, 2010c). The Organization highlighted the importance of the volcanic ash advisory centres (VAACs) and the successful establishment of the International Airways Volcano Watch (IAVW).

The ICAO included the experimental thresholds used during the Eyjafjallajökull crisis in the Volcanic Ash Contingency Plan- EUR and NAT Regions. However, the approach of using these thresholds was still under validation and assessment by the International Volcanic Ash Task Force (IVATF) and that time it was still not sure if they would be applied globally within ICAO international airways volcano watch (IAVW).

International Air Transport Association (IATA) presented an information paper *Airline industry recommendations for operations in the presence of volcanic ash*.

IATA postulated reassessment of current requirements for volcanic activity reports. The Association addressed the need of one common standard in determining whether the flights should be operating or not, as well as improving the coordination of the various air traffic management (ATM) procedures (IATA, 2010).

IATA concluded also, that in the presence of volcanic ash the airlines should have the right to decide whether to operate a flight or not. However, guidelines, appropriate risk management tools and operational procedures are needed to be developed for both the operators and regulatory authorities to use as part of the assessment process (Ibid.)

The US in its working paper expressed its support for the operation of the volcanic ash advisory centres and meteorological offices. The US also highlighted challenges for ICAO to be considered globally with the support of the contracting states.

In December 2010 the ICAO presented the latest edition of the Volcanic Ash Contingency Plan- EUR and NAT Regions.

The three contamination levels distinguished by the Contingency Plan are to be used operationally in the European and North Atlantic region in case of any further eruption in the region (ECAC, 2011).

5.4 Assessment of the Crisis

Already in September 2010 Keilir Aviation Academy in Keflavik in Iceland organised a conference with objective to address the impact of the eruption of Eyjafjallajökull on air transport as well as learn how such event could be better dealt in the future. The Atlantic Conference on Eyjafjallajökull and Aviation was organised in cooperation with, among others, the President of Iceland, the Icelandic Ministry of Transport, ISAVIA, Icelandair, ICAO, IATA, Eurocontrol and the Civil Air Navigation Services Organisation (CANSO web page). Learning from the Eyjafjallajökull experience is especially relevant in the light of the warnings by the volcanologists that much more powerful volcanic eruptions could occur in near future (Keilir Aviation Academy, 2010).

At the conference the airlines representatives again criticized the governments' response to the crisis that caused losses to air transport industry estimated at €1.7 billion. From the airlines perspective the closing of large portions of airspace was too drastic measure (Ibid.). The authorities have been blamed for 'practicing risk aversion rather than risk management' (Ibid.). The need for improvements in the system has been emphasized.

Having this in consideration the European Commission presented a proposal of the new guiding principles letting the airlines decide, based on a risk assessment framework approved by the authorities, whether to operate a flight or not.

Two experts of the COT Institute for Safety, Security and Crisis Management: Erwin van Dijkman and Jaap Jochmann commented on the Eyjafjallajökull event for the ECAC News (ECAC web page). In their view the phenomenon was clearly a crisis situation. Dijkman and Jochmann recognise distinctive features of crisis decision-making. First, crisis decision-making is characterized by a certain degree of uncertainty.

'There is simply no time for lengthy decision-making processes, committee meetings, feasibility studies and second opinions' (ECAC, 2011).

Second, there is a time pressure and a demand for immediate action 'because there is a real threat to life or of severe damage if one remains inactive' (Ibid). Third, only partial information or uncertain data are available. Therefore, decisions are often made ad hoc or ill-researched. Furthermore, the case of Eyjafjallajökull event was particularly complex due to the enormous scale of the phenomenon:

> Crisis decision-making is further complicated in a multi-actor setting, especially when several organisational levels, government bodies and even countries are involved. In those situations it is very hard to secure a uniform approach (…) Most governments and operators in the aviation sector are relatively well prepared for contingencies but their plans are aimed predominantly at dealing with local disturbances, not with pan-European crisis decision- making processes. Moreover, with natural occurrences there may be little warning, and if one does not have pre-set criteria or norms for escalation, or if each country uses its own, precious time will be lost. (ECAC, 2011)

One year on from the eruption of Eyjafjallajökull the ICAO organised a volcanic ash crisis exercise (*VOLCEX 11/01*) in order to test the new crisis preparedness, particularly to validate the new ICAO guidance material- *Management of Flight Operations with Known or Forecast Volcanic Ash Cloud Contamination and the Volcanic Ash Contingency Plan- EUR and NAT Regions*. According to the new ICAO approach, the airlines are who decide whether to operate flights in the areas contaminated by ash. They are allowed to do so on the basis of a safety risk assessment accepted by the relevant national supervisory authority (CANSO web page).

The exercise took place from 13 to 14 April 2011 involving the European Commission, Eurocontrol, the European Aviation Safety Agency (EASA), the Volcanic Advisory Centre in London (VAAC), over 70 airlines, 14 air navigation service providers and 10 national regulatory authorities (Eurocontrol web page).

The exercise was a simulation of an eruption of another Icelandic volcano- Grimsvötn resulting in a volcanic ash cloud spreading over North Atlantic and Europe.

A Europe-wide assessment session to examine the lessons learned and the results of the exercise was to take place in June 2011.

According to preliminary conclusions presented by the Civil Air Navigation Services Organisation (CANSO web page), the volcanic ash exercise showed, that since the crisis in April 2010 the operational efficiency and decision-making have improved

considerably, however further efforts at European level to harmonise national responses are needed.

In June 2011 the Final Exercise Report (ICAO, 2011) has been published on the ICAO web site. The document describes the scenario of the exercise as well as gathers feedback from all groups of participants.

The VOLCEX 11/01 was the first volcanic ash exercise with participation of the new European Aviation Crisis Coordination Cell (EACCC). Activation of the EACCC during the exercise showed to improve the crisis management on the European level.

The VOLCEX 11/01 exercise was the first opportunity to check the amended volcanic ash procedures and to practice decision making after the Eyjafjallajökull crisis. The behaviour of the airlines subject to the new procedures was tested. It showed that even thought the airlines have different operational strategies, no airline would operate in an an airspace contaminated by high concentration of ash (Ibid.). Furthermore, the establishment of a small Airline Operator Crisis Cell (AOCC) in the Central Flow Management Unit (CFMU) was deemed a great success by the airlines.

The participants of VOLCEX 11/01 provided a lot of feedback. Generally the exercise was seen as a success and generated a lot of recommendations. It has been confirmed that still a more harmonised approach to operate in volcanic ash is needed in Europe. In meantime, however, the communication and training should be improved. The states should exchange information on their respective risk assessment frameworks and share the best practices.

The real eruption of the volcano Grimsvötn a month after the exercise showed that the actions tested during the VOLCEX 11/01 were able to ensure an effective management of the situation.

5.5   Results of the Analysis

The overall distinctive feature of the EU and ICAO during and in aftermath of the volcanic ash crisis was their highly collaborative behaviour. 'An extremely rapid and collaborative response was initiated' (ICAO, 2010a).

The European aviation organisations cooperated with ICAO in various international bodies and settings. The inclusive approach of cooperation was mutual- both the EU and

the ICAO usually invited each other and also invited other aviation stakeholders to participate in the relevant international and inter-institutional working groups.

The volcanic ash crisis also demonstrated a slight difference in the objectives of the two institutions. While ICAO seemed to be focused almost solely on the safety, the EU, as a region of high air traffic density, was also very concerned about the economic impact of the crisis on the air services industry. The EU has criticised the ICAO over its 'overly cautious approach'. Yet, in the view of ICAO the closing of the airspace, until more data was available, was the most responsible option. The economic loss of the air transport industry was regrettable, however the most important thing was that the volcanic ash crisis did not result in any catastrophe, that the lives of the passenger were not put on risk.

Moreover, until the event of Eyjafjallajökull there was never any action taken by the engine manufacturers or authorities to determine an acceptable level of tolerance of jet engines and aircraft to exposure to volcanic ash. Therefore there was no data to rely on. Generally, the period of the volcanic ash crisis was characterized by a high degree of uncertainty.

Before taking any action to re-open the European airspace the EU turned to the expert aviation body - Eurocontrol and then adopted an approach to volcanic ash based on its scientific advice. All the decisions taken at the EU level in the context of the volcanic ash crisis were results of the previous work with the technical aviation bodies.

The volcanic ash crisis demonstrated the flexibility of both the EU and ICAO, their ability to adapt and their innovativeness. The EU together with Eurocontrol created a new body- the European Aviation Coordination Cell (EACCC) aimed at ensuring a rapid response to any future crisis. Meanwhile, ICAO established International Volcanic Ash Taks Force (IVATF) in order to coordinate all work related to volcanic ash at the regional and at the global level.

Furthermore, the two institutions also manifested that they learn lessons from critical events. When the ICAO's 'strict avoidance' of volcanic ash approach turned out to be inadequate for Europe, both the EU and ICAO immediately initiated work on new procedures.

In the course of the crisis an in its aftermath the EU suggested to the ICAO certain improvements to be made, such as the revision of the ICAO contingency plan, elaborating of a global approach to volcanic ash and future crises situations, revision of the Annex 3 of the Chicago Convention, establishment of the volcanic ash thresholds tolerable to the jet engines. Subsequently, ICAO addressed most of the issues raised by the EU. Particularly, the adoption of the updated Volcanic Ash Contingency Plan distinguishing between three degrees of volcanic ash contamination clearly reflected 'the approach brokered by the European Commission'(European Union, 2011b).

Though ICAO has decided not to revise the Annex 3 as postulated by the EU, but it expected to further complement it with new guidance materials (ECAC, 2011).

If the EU is identified as the source institution, the ICAO as the target institution and the adoption of the new Volcanic Ash Contingency Plan as the effect of the EU's influence - did the actual interaction between the EU and ICAO take place?

It is concluded, that indeed the interaction took place through the causal mechanism of Interaction Through Commitment between 'nested institutions'. The four steps of this type of interaction seem helpful in explaining how the interaction took place.

First, when the air traffic in Europe was grounded, the EU developed a new 'obligation' or rather a rule to be followed by its members. Second, the 3-zones approach to volcanic ash was subsequently adopted by the European states and thus they proceeded to gradual re-opening of their airspace. Third, ICAO welcomed the new approach an initiated its work on incorporating of the 3-zones of volcanic ash concentration into its guidelines. Fourth- eventually the ICAO adopted the updated Volcanic Ash Contingency Plan, reflecting the level of ash concentration previously endorsed by the EU.

It is concluded, that the EU having proposed and adopted new approach to volcanic ash influenced adoption of the identical procedures within ICAO. According to the conceptual framework of institutional interaction, new norms created under smaller, source institution (EU) may provoke their members to seek to wider expand (ICAO) the new norms or obligations. Adoption of certain norms within a smaller institution (EU) facilitates their adoption within a larger institution (ICAO).

The EU – ICAO interaction resulted to be highly synergistic in its effects. It is deemed that the EU – through its proactive and cooperative behaviour influenced positively the

effectiveness of the ICAO, and therefore contributed to the new institutional developments by the Organization.

What is more, the EU wished to expand the new procedures to the international level. However, this proved to be much more difficult to achieve. The new Contingency Plan was adopted only for the Europe and North Atlantic region and ICAO did not decide to amend the Annex 3 of the Chicago Convention, as suggested by the EU.

Finally, can the effect on the ICAO be attributed only to the influence exerted on it by the EU? It is impossible to respond to this question decisively without constructing of counterfactual scenarios. Would this effect have taken place without the EU's influence on ICAO? It is quite doubtful. First of all, the EU has been very active and rapidly responded to the crisis by engaging in cooperation with the aviation technical bodies in order to produce the most appropriate response to the occurrences. In reality ICAO has worked on certain EU's developments in adopting on its new approach to volcanic ash in Europe. In each case ICAO relied, not only on its own, but also on the European aviation bodies' expertise. Probably the initial adoption of the 3-zone approach to volcanic ash in Europe facilitated and accelerated the adoption of similar approach in the new Contingency Plan, due to the fact that the European members of ICAO – constituting a considerable part of its membership - already adopted the 3-zone approach during the crisis in Europe.

However, it is worthy of note that the overall character of the situation in April 2010 in Europe – an event of crisis - created conditions favourable to emerging of interaction with synergistic effects among the EU and ICAO. Consequently, the critical character of this event played an important role in the investigated case.

6   Final Reflections

This last chapter presents the final conclusions and reflections regarding the investigated problem and beyond. As every research the present one has its limitations, therefore possible improvements and suggestions for further studies on the topic are discussed.

This paper attempted at providing an explanation to the question of how has the Eyjafjallajökull volcanic ash been tackled.

It showed that the Eyjafjallajökull eruption put in evidence certain incompatibility between the two aviation regimes- the ICAO and the EU. It is observed, that the EU's powers in air transport were characterized by a discrepancy between on the one hand its competences regarding external air transport policy and the single market in air transport services, and the still prevalent principle of airspace sovereignty to which member states adhered in the event of crisis on the other hand. Nevertheless, the event of the crisis contributed to further integration on the European skies, showing that a regional crisis needs Europe-wide or even global response.

According to the findings derived from the analysis, the solution for the volcanic ash crisis was only possible through a synergistic interaction between the EU and the ICAO. The EU first adopted its new approach, established in cooperation and advice of the European expert bodies, and then addressed the need for the ICAO to adopt similar approach. The new approach was better suited to tackle the European crisis. It is interpreted that the EU's membership being 'nested' in the ICAO facilitated rapid inclusion of the new approach into its volcanic ash procedures. And thus the EU influenced the ICAO through 'commitment'.

As in case of most studies, this research has been facing a number of challenges. On the one hand the literature available to the author was scarce so that parts of the text rely on relatively few sources. On the other hand the primary sources were abundant and easy to access what to an extent compensated the insufficient secondary sources.

Due to time and space constrains the author decided to conduct a macro-study of a single case of interaction between two actors. In reality more actors and probably more causal paths and causal mechanisms have been involved. The case study here was

however disaggregated. According to the Oberthür and Gehring (2003; 2009) one independent variable, one dependent variable and the causal pathway leading from the former to the latter one should be studied at once. Considering that, as well as that the author did not have a sound theory at her disposal, the case explanations are rather provisional. The lack of an established theory of institutional interaction was another challenge that made it impossible to choose a theory testing objective for this research. At the same time the thesis could not develop a new theory itself, due to its single-case study methodology. Yet it does not mean that this research provides null contribution to the academic discourse. Its contribution is modest, especially in regard to the theory building objective. It does explain however the recent event of the volcanic ash crisis. The scope of the research is very limited, nevertheless further research could allow making generalizations.

Even though the research objective of this thesis seems to be accomplished, there is still a number of questions that could be further investigated.

The first important question is, whether and to what extent the other actors e.g. the airlines, having a strong interest in continuing flight operations, have also influenced (directly or indirectly) the adoption of the new approach to volcanic ash? Or: has the EU itself been influenced by other actors (e.g. airlines)? The present research focused on the two actors: the EU and ICAO, nevertheless many more actors were involved. The airlines were the most disadvantaged actors in the light if the crisis. The air transport industry complained about the poor crisis management and supported the amendment of the procedures. The EU shared the opinion of the industry. But deriving from the present research it is impossible to establish more than that.

Second, the present case of the EU-ICAO institutional interaction in the context of the Eyjafjallajökull volcanic ash crisis raises questions of normative character. If it can be established that the EU's approach, and eventually the new Volcanic Ash Contingency Plan reflects the interest of the airlines- is it a right balance between efficiency and safety?

Third, the present study could be complemented with interviews with representatives for instance from national aviation authorities and by discourse analysis of the documents used for the purposes of the present analysis. This would provide the study with valuable insights and could be useful in uncovering of new variables etc.

It is also important to point out that the present case study involved an investigation of interaction in a specific, critical situation- a crisis. It would be worth to investigate EU-ICAO interaction in the issue area of aviation in 'normal' period of time.

Finally, investigating institutional interaction between the EU and ICAO in tackling the volcanic ash crisis has a very practical dimension. The EU in all areas of its competences, including aviation, is also responsible for managing crisis situations. Additionally, events such as the investigated volcanic ash crisis generate a need to cooperate with other institutions, due to an overlap of competences between the EU and other international institutions. Learning how to influence other international bodies and create synergies may be one of the crucial tasks for the EU in coming years. This has been expressed by the European Commissioner responsible for transport, Siim Kallas:

> The question is not if but when this kind of crisis will happen again. It could be next month; it could be in 50 years' time. But volcano eruptions and other crisis events do not respect any rules, so we need to be more flexible and agile in our response (…)
> [W]e need to do everything possible so people never have to re-live this kind of situation again. For that, we need to break new ground (...)
> (European Commission web page).

Indeed it seems that aviation, the European Union and ICAO soon will be faced with another difficult challenge. Volcanic eruptions in Iceland happen on average every three years (ECAC news), but they are not the only phenomena capable of seriously disrupting the air traffic. The sun is now approaching the peak of its activity cycle causing production of solar storms high in magnetism and radiation (NASA, 2011; The New York Times, 2011). According to the scientists[11] these storms may affect the communications systems on Earth, such as GPS- indispensable for planes and ships navigation…

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[11] See: <http://science.nasa.gov/science-news/science-at-nasa/2011/22jun_swef2011/> or <http://www.nytimes.com/2011/06/17/opinion/17baker.html?_r=3>.

7   Executive Summary

The ambition of this thesis is to fill the gap in the academic literature regarding the recent Eyjafjallajökull volcanic ash crisis. The paper focuses on the institutional aspects of the crisis. It examines its origin, development and the way it was tackled.

The eruption of the Icelandic volcano created conditions for the institutional interaction between the European Union (EU) and the International Civil Aviation Organization (ICAO) to emerge. The problem investigated here is how the volcanic ash crisis have been tackled and whether the EU exerted causal influence on the ICAO in its context.

The growing number of institutions worldwide and their increasingly complex character make it of great relevance to study institutional interactions and how to create synergies in international governance.

A densely regulated issue-area of international aviation is still relatively unexplored by the political scientists. This and other specific features of international aviation make it a particularly interesting subject to study.

In order to understand the analysis of the interaction between the EU and ICAO it is necessary to first get familiar with the mosaic of international and European aviation institutions, their competences and the relationships between them. Therefore Chapter 2 presents a brief history of the international aviation regime.

The International Civil Aviation Conference in Chicago in 1944 gave origin to the international aviation regime and its fundamental elements: the International Civil Aviation Organization (ICAO) and the International Air Traffic Association (IATA). The ICAO was created on the basis of the Chicago Convention from 1944 that also established the principle of the airspace sovereignty in the international aviation. This in turn determined the bilateral character of the international aviation relations. Due to absence of a multilateral framework of air traffic rights ('The Freedoms of the Air'), the 'freedoms' were subject to bilateral bargaining between the states creating a global patchwork of agreements.

Both ICAO and IATA are international institutions of a global membership. Most of the states in the world are members of ICAO (190 members). Similarly, IATA's members (230 airlines from around the globe) represent 93% of the world's international scheduled air traffic (IATA web page). IATA is a forum of intensive cooperation between world airlines and a defender of the interests of the airline industry.

The ICAO's main mission is to regulate the technical aspects of the air industry through facilitating international cooperation in matters of safety, navigation and standardization (Jönsson, 1987). ICAO is responsible for adopting the Standards and Recommended Practices (SARPS) covering all technical aspects of international civil aviation, e.g.: safety, personnel licensing, operations of aircraft, air traffic services, etc. The SARPS have a clearly regulatory character and their adoption is mandatory for the ICAO members.

The EU having completed the single market in air services (1997) has created a new type of aviation relations. The EU's responsibilities in the air transport are vast and cover roughly all aspects of civil aviation. The EU has created a single market in air services as well as it developed its external competences in air transport. It concludes 'horizontal' air traffic agreements with third countries. What is more it seeks to conclude agreements with the global partners, such as the US or Australia. The EU has also created the European Common Aviation Area (ECAA) with its neighbours. Finally, the EU each year adopts a 'blacklist' of the unsafe airlines banned within the EU.

The EU works closely with the European Organization for the Safety of Air Navigation (Eurocontrol), the European Civil Aviation Conference (ECAC) and the European Aviation Safety Agency (EASA). In fact, the EU's aviation regulatory framework was developed relying on expertise of these bodies.

Considering its extraordinary powers in civil aviation the EU expressed intention of becoming ICAO's member. However, only states can adhere to the Organization. Instead the EU was granted an observed status and is regarded as an important partner by the ICAO.

Chapter 3 presents a theoretical framework that will help in interpretation of the analysis. Due to a lack of an established theory on institutional interaction, the fundamental findings of mutually compatible theories are presented: regime theory, epistemic communities, and new institutionalism. Moreover, the conceptual framework of institutional interaction by Gehring and Oberthür (2006; 2009) is adopted in order to guide the case analysis.

The cognitivist approach within the regime theory may be especially useful in analyzing the international aviation regime. Ruggie and Haas, who later developed the epistemic communities approach, saw regimes as results of distribution of knowledge. For Young regimes are social institutions and 'recognized patterns of practice around which expectations converge' (Young, 1980). They are based on rights and rules that guide the action.

Peter Haas elaborated on the epistemic communities approach to the study of policy coordination. This approach departs from the concept of knowledge as power. An epistemic community is a network of professionals with expertise and competence in a particular domain. Epistemic communities are often providers of scientific or technical expertise and advice to the decision makers (Haas, 1992).

The normative institutionalism approach is strongly related to the concept of 'logic of appropriateness' by March and Olsen. According to this approach institutions can influence other actors through the power of norms. Institutions also evolve and adapt especially when faced with critical situations.

Finally, the conceptual framework of institutional interaction is introduced. With its help the interaction between the EU and ICAO will be analyzed. According to the framework, the EU will be the source institution (independent variable) and the ICAO will be the target institution (dependent variable). The causal mechanism that allows the causal influence to travel from source to target institution will be investigated. It is hypothesized that the causal mechanism in the EU-ICAO interaction will be based on commitment. It means that the new obligations created under one institution may have influence on the actor's preferences and behaviour regarding another institution. What is more the interaction between the EU and ICAO may be classified as the interaction through commitment among 'nested institutions'. The EU's and ICAO's competences are significantly overlapping. The EU is a smaller (regional) institution what makes it 'nested' in the ICAO- an institution of a global membership.

Chapter 4 presents the methodology adopted in the research. Given that the aim of the thesis is to explain the Eyjafjallajökull crisis and to investigate the EU-ICAO interaction in its context, the single-case study method has been chosen as the most appropriate. The research questions formulated for the purpose of this research are as follows: *How has the volcanic ash crisis been tackled? Has the adoption of a new volcanic ash approach by ICAO been influenced by the EU?* If so: *How has the EU influenced ICAO?*

The case study method is particularly helpful in answering whether a variable mattered to the outcome and in exploring causal mechanisms. The technique of process-tracing is also employed in order to analyze all developments by the EU and ICAO in their efforts to tackle the volcanic ash crisis. Process-tracing aims at uncovering all signs of interaction between the two institutions. The material analyzed for this purpose embraces all documents published by the EU and ICAO in the context of the Eyjafjallajökull eruption.

Chapter 5 presents the analysis of the EU-ICAO interaction in tackling the volcanic ash crisis. The first section provides the introductory information on the origin and the character of the crisis. The eruption of Eyjafjallajökull on the 14th April 2010 was accompanied by the creation of an enormous cloud of volcanic ash that soon spread across the continent. It must be highlighted that volcanic ash is commonly considered as a serious hazard to aviation. Most European states decided to follow the ICAO's guidelines for this sort of events and to close their airspace. The degree of uncertainty and threat caused by this natural phenomenon created a critical situation. The air traffic was grounded and the airlines were facing a tremendous economic loss. After the 8-days crisis the total revenue loss of the airline industry was estimated at €1.7 billion (Keilir Aviation Academy, 2010). The EU soon realised that the strict avoidance of the volcanic ash recommended by the ICAO was not the right solution for Europe in the light of the Eyjafjallajökull crisis. The European Commission together with Eurocontrol took an initiative to gradually re-open the European airspace. The new procedures establishing three zones of airspace on the basis of ash concentration levels allowed gradual resuming of flight operations in Europe. The procedures were further improved as a result of cooperation between the Commission, Eurocontrol, EASA and aircraft manufacturers. In the aftermath of the crisis the EU addressed the need for the ICAO volcanic ash procedures (Volcanic Ash Contingency Plan) to be amended according to the new procedures adopted in Europe. The EU again directed its recommendations to ICAO at the 37th session of the ICAO Assembly in September 2010. During and in aftermath of the crisis the ICAO closely cooperated with the EU and other aviation bodies. In July 2010 ICAO presented the updated version of its Volcanic Ash Contingency Plan reflecting the three zones of different level of ash concentrations previously endorsed by the EU.

The volcanic ash crisis was followed by expert group conferences and reports assessing its impact on aviation and generating recommendations. In this light the European

Commission presented a proposal of the new guiding principles letting the airlines decide, based on a risk assessment framework approved by the authorities, whether to operate a flight or not. This approach was also subsequently adopted by the ICAO.

One year after the Eyjafjallajökull eruption the ICAO together with its partners organised a volcanic ash exercise VOLCEX 11/01 in order to test the new ash crisis procedures. Overall the exercise was a success. It showed that Europe was much better prepared to deal with such an extraordinary situation but it also generated further recommendations.

It is concluded, that the EU having adopted new approach to volcanic ash influenced adoption of the identical procedures within ICAO. According to the conceptual framework of institutional interaction (interaction through commitment) new norms created under smaller, source institution (EU) may provoke their members to seek to wider expand (ICAO) the new norms or obligations. Adoption of certain norms within a smaller institution (EU) facilitates their adoption within a larger institution (ICAO).

Considering the limitations of the present research, the final chapter presents final reflections on investigated problem and suggestions for future research.

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