



NOTA DE ESTUDIO

COMITÉ JURÍDICO – 38º PERÍODO DE SESIONES

(Reunión virtual, 22 – 25 de marzo de 2022)

Cuestión 2: Consideración del programa general de trabajo del Comité Jurídico

CONSIDERACIÓN DE LA SUFICIENCIA DE LOS INSTRUMENTOS DE DERECHO AERONÁUTICO INTERNACIONAL EXISTENTES FRENTE A LAS CIBERAMENAZAS A LA AVIACIÓN CIVIL

(Nota presentada por la Secretaría)

1. ANTECEDENTES

1.1 En ocasión de su 37º período de sesiones (Montreal 4 – 7 de septiembre de 2018), el Comité Jurídico decidió incluir el tema de las ciberamenazas a la aviación civil en su programa de trabajo y adoptó una nueva cuestión titulada “Consideración de la suficiencia de los instrumentos de derecho aeronáutico internacional existentes frente a las ciberamenazas a la aviación civil” que agregaría a dicho programa.

1.2 Durante el 40º período de sesiones de la Asamblea (Montreal, 24 de septiembre-4 de octubre de 2019), la Comisión Jurídica fue informada de la asistencia que proporcionara la Dirección de Asuntos Jurídicos y Relaciones Exteriores (LEB) al trabajo que estaba llevando a cabo el Grupo de Estudio de la Secretaría sobre Ciberseguridad (SSGC) por intermedio de su Subgrupo de Investigación sobre Aspectos Jurídicos (RSGLEG). Se hizo notar a la Comisión que la labor en torno a este tema exigía la adopción de un enfoque transversal que reuniera los conocimientos especializados de diversas disciplinas de la aviación, como se prevé en la Resolución A39-19 de la Asamblea. La Comisión aceptó la propuesta de la Secretaría de combinar las cuestiones 4 (“Consideración de la suficiencia de los instrumentos de derecho aeronáutico internacional existentes frente a las ciberamenazas a la aviación civil”) y la cuestión 5 (Actos o infracciones que atañen a la comunidad de la aviación civil internacional y que no están previstos en los instrumentos de derecho aeronáutico actuales) del programa de trabajo en una sola cuestión titulada: “Actos o infracciones que atañen a la comunidad de la aviación civil internacional, incluidas las ciberamenazas, que pudieran no estar adecuadamente previstos en los instrumentos de derecho aeronáutico en vigor”. Además, el trabajo realizado en el contexto de la cuestión 4 del programa de trabajo del Comité es cónsono con las conclusiones y recomendaciones más recientes del *Grupo de Expertos Gubernamentales sobre la Promoción del Comportamiento Responsable de los Estados en el Ciberespacio en el Contexto de la Seguridad Internacional*, establecido por la Asamblea General de las Naciones Unidas¹.

¹ Informe del Grupo de Expertos Gubernamentales sobre la Promoción del Comportamiento Responsable de los Estados en el Ciberespacio en el Contexto de la Seguridad Internacional, A/76/135, 14 de julio de 2021.

1.3 Por otra parte, durante su 40º período de sesiones, la Asamblea reiteró la importancia y urgencia de proteger los sistemas de infraestructura y los datos que son de importancia crítica para la aviación civil contra los ciberataques y de conseguir que la OACI, sus Estados miembros y las partes interesadas de la industria se comprometan a escala mundial a tomar medidas al respecto, con la intención de ocuparse de la ciberseguridad de la aviación civil de manera colaborativa y sistémica y de mitigar amenazas y riesgos conexos. En tal contexto, la Asamblea adoptó la Resolución A40-10, *Formas de abordar la ciberseguridad en la aviación civil*, en la cual se pidió la formulación de un plan de acción que ayude a los Estados y la industria a aplicar la Estrategia de Ciberseguridad de la Aviación de la OACI. Dicha estrategia contempla el análisis de los instrumentos jurídicos internacionales pertinentes a fin de determinar cuáles son las disposiciones jurídicas que existen o faltan en el derecho aeronáutico para la prevención, el enjuiciamiento y la reacción oportuna ante los ciberincidentes. Posteriormente, en la segunda sesión de su 219º período de sesiones (4 de marzo de 2020), el Consejo aprobó el Plan de Acción en Ciberseguridad para la implantación de la Estrategia de Ciberseguridad de la Aviación Civil de la OACI.

1.4 Durante la decimoprimer sesión de su 222º período de sesiones (15 de marzo de 2021), el Consejo de la OACI aprobó la nueva estructura de gobernanza de la OACI en materia de ciberseguridad. Como parte de esta nueva estructura, durante el 225º período de sesiones del Consejo, el Comité de Seguridad de la Aviación – ASC (antiguamente conocido como el Comité sobre Interferencia Ilícita – UIC) establecerá oficialmente un Grupo Experto en Ciberseguridad (CYSECP), el cual habrá de rendir cuentas al ASC. Dado que la intención es transferir al CYSECP las tareas del SSGC, este último y sus grupos de trabajo, incluido el RSGLEG, se disolverán.

2. ESTABLECIMIENTO DEL RSGLEG

2.1 De conformidad con su mandato, el SSGC debería establecer un grupo de trabajo que se ocuparía de examinar las obligaciones legales de disuadir a personas y entidades de manipular infraestructura, datos e información de importancia crítica de la aviación civil, así como los sistemas de tecnologías de la comunicación. En consecuencia, en ocasión de su cuarta reunión (Montreal, 5 de septiembre de 2018), el SSGC decidió que debería formularse un mandato para su grupo de trabajo sobre aspectos jurídicos, el cual se convirtió en el RSGLEG.

2.2 En su primera reunión (Montreal, 22 de noviembre de 2018), el RSGLEG decidió que, para las etapas posteriores de su labor, debía ampliarse la membresía para asegurar una mayor representación geográfica, habida cuenta de la diversidad de sistemas jurídicos. A tal efecto, representantes de 15 Estados (Brasil, Canadá, China, Estados Unidos, Federación de Rusia, Francia, Israel, Kenya, Malta, Omán, Países Bajos, Sudáfrica, Singapur, Suiza y Turquía), así como cuatro organizaciones internacionales (CANSO, EDA, IATA y ICCAIA)², participaron en una o más de las reuniones del RSGLEG.

2.3 Para vigilar la coordinación de los trabajos, se designaron a la Sra. Helena Hallauer (Suiza) y la Dra. Rebekah Tanti-Dougall (Malta) como correlatoras.

3. ALCANCE DE LA LABOR DEL RSGLEG

3.1 Durante su primera reunión (Montreal, 22 de noviembre de 2018), el RSGLEG decidió delimitar el alcance de su trabajo en torno a las siguientes cuestiones:

- a) categorizar y/o analizar las ciberamenazas y vulnerabilidades de la aviación civil y los riesgos conexos definidos por grupos expertos de la OACI a fin de determinar en qué medida están ya previstos en el marco jurídico internacional;

² Organización de Servicios de Navegación Aérea Civil, Agencia de Defensa Europea, Asociación del Transporte Aéreo Internacional y Consejo Coordinador Internacional de Asociaciones de Industrias Aeroespaciales.

- b) fijar una interpretación y terminología comunes del lenguaje de la ciberseguridad, incluidos aspectos como “ciberseguridad en relación con la aviación”, “computadoras”, “acceso no autorizado”, “vulnerabilidades”, “amenazas” y “armas”;
- c) revisar y analizar (en relación con las amenazas, riesgos y actores identificados) la suficiencia del marco jurídico internacional actual y evaluar la necesidad de reinterpretar (conscientes de que el poder judicial puede mostrarse renuente a hacerlo) o enmendar los instrumentos de derecho aeronáutico internacional existentes que se ocupan de las ciberamenazas, o la adopción de nuevos instrumentos o SARPS;
- d) analizar las respuestas de los Estados a la comunicación AS 8/22-17/3 de la OACI, “Resolución A39-19 - Formas de abordar la ciberseguridad en la aviación civil”, por la que se solicitaba a los Estados indicar sus disposiciones jurídicas sobre ciberseguridad a fin de establecer su alcance y determinar posibles mejores prácticas o disposiciones nacionales que podrían constituir la base para una normativa internacional;
- e) analizar los instrumentos internacionales sobre ciberseguridad elaborados en otros ámbitos de transporte internacional y las comunicaciones, como en el transporte marítimo y ferroviario o las telecomunicaciones, a fin de determinar si algunas de dichas disposiciones podrían servir de referencia para el marco jurídico de la aviación internacional; y
- f) a partir de la revisión y el análisis mencionados, definir los aspectos o asuntos que pudieran tener que remitirse al Comité Jurídico de la OACI, el Grupo Experto AVSEC u otros órganos de la OACI para considerarlos más exhaustivamente y adoptar medidas.

3.2 Durante su segunda reunión, el RSGLEG consideró un análisis detallado que preparó LEB de las respuestas a la comunicación AS 8/22-17/3 de parte de 62 Estados de todas las regiones de la OACI. Debido a la naturaleza general de la comunicación, se resaltaron las dificultades enfrentadas para hacer un análisis exhaustivo de los datos. Dado que las respuestas no estaban armonizadas, surgieron problemas a la hora de consolidar la información proporcionada en respuesta a la mencionada comunicación. En consecuencia, el RSGLEG acordó comenzar a examinar los instrumentos internacionales pertinentes para evaluar si son adecuados y detectar posibles brechas. En su sexta reunión (Beer Sheva, Israel – Dirección Nacional Israelí de Ciberseguridad, 21 de marzo de 2021), el SSGC tomó nota y aprobó la recomendación del RSGLEG en la inteligencia de que los resultados del examen se informarán al Comité Jurídico.

4. ANÁLISIS DE LOS INSTRUMENTOS DE DERECHO AERONÁUTICO INTERNACIONAL

4.1 El RSGLEG se ha reunido en diez ocasiones desde su creación: Primera reunión, Montreal, 22 de noviembre de 2018; Segunda reunión, Tel Aviv, Israel – CAAI, 19-20 de marzo de 2019; Tercera reunión (virtual), 2 de diciembre de 2019; Cuarta reunión (virtual), 6-8 de abril de 2020; Quinta reunión (virtual), 10 de diciembre de 2020; Sexta reunión (virtual), 29-30 de marzo de 2021; Séptima reunión (virtual), 2 de julio de 2021; Octava reunión (virtual), 8 de octubre de 2021; Novena reunión (virtual), 2 de diciembre de 2021; y Décima reunión (virtual), 21 de enero de 2022.

4.2 El RSGLEG sostuvo reuniones plenarias para considerar el trabajo realizado en torno al estudio sobre el examen de los instrumentos de derecho aeronáutico internacional³ y su aplicabilidad a las ciberamenazas contra la aviación civil, que las correlatoras presentaron por primera vez en diciembre de 2020. Se celebraron otras reuniones de subgrupos expertos que complementaron la labor sobre cuestiones específicas abordadas en el estudio, como: la formulación y análisis de ejemplos de escenarios de ciberataques (contra aeronaves, sistemas ATM y aeropuertos); consideraciones de la intención, los efectos y criterios jurisdiccionales; y la aplicación del Artículo 3 bis. En general, el análisis de la suficiencia de los instrumentos analizados frente a los ciberataques contra la aviación civil se basó en la identificación de los criterios de aplicabilidad de cada instrumento, la evaluación de su pertinencia a la luz de los escenarios y, posteriormente, la determinación de la existencia de cualquier posible vacío jurídico.

4.3 En su novena reunión, el RSGLEG acordó informar de sus conclusiones preliminares a la décima reunión del SSGC (virtual, 14 de diciembre de 2021), el cual delegó en el RSGLEG la autoridad para aprobar el estudio a fin de presentarlo durante el 38º período de sesiones del Comité Jurídico (LC/38). Además, en su décima reunión (virtual, 21 de enero de 2022), el RSGLEG no llegó a conclusión alguna sobre la finalización del estudio. En su lugar, decidió que la Secretaría presentase ante el LC/38 un informe sobre la base de las deliberaciones en torno al proyecto de estudio⁴ que sostuvieron especialistas tanto en el RSGLEG como en el SSGC (**apéndice A**).

4.4 En el estudio se concluye que el marco actual de derecho aeronáutico internacional es parcialmente adecuado para enfrentar las ciberamenazas contra la aviación civil, ya que se han detectado ciertas carencias, como: la fragmentación del marco de derecho aeronáutico internacional (es decir, distintas situaciones de los Estados en cuanto a la ratificación de los instrumentos); las posibles disparidades en la interpretación de ciertos términos específicos y si estos abarcan las ciberamenazas (p. ej., “arma”, “dispositivo”, “uso de la fuerza”); requisitos de instrumentos más antiguos que resultan menos pertinentes respecto de las ciberamenazas (p. ej., el perpetrador debe estar a bordo de la aeronave); y la circunscripción de los instrumentos a la seguridad operacional y la seguridad de la aviación. Sin embargo, y aunque quizá siga siendo necesario aclarar la interpretación de ciertos términos en virtud del *Convenio para la represión de actos ilícitos de aeronaves con la aviación civil internacional* y el *Protocolo complementario del Convenio para la represión del apoderamiento ilícito de aeronaves*, ambos hechos en Beijing el 10 de septiembre de 2010, sus alcances parecen ofrecer a los Estados una base suficiente para enjuiciar a las personas y entidades que lleven a cabo ciberataques contra la aviación civil. En su Resolución A40-10, la Asamblea de la OACI insta a la ratificación universal de estos tratados como instrumentos para hacer frente a los ciberataques contra la aviación civil. En el **apéndice B** figura la lista de Estados que son parte en los instrumentos anteriormente mencionados.

5. MEDIDAS PROPUESTAS AL COMITÉ

5.1 Se invita al Comité Jurídico a considerar lo expuesto en esta nota de estudio y a tomar las medidas que estime necesarias.

³ Se consideraron los siguientes instrumentos de derecho aeronáutico internacional: *Convenio sobre Aviación Civil Internacional* (Chicago, 1944); Anexo 17 – Seguridad — *Protección de la aviación civil internacional contra los actos de interferencia ilícita*; *Protocolo relativo a una enmienda al Convenio sobre Aviación Civil Internacional [Art 3 bis]* (Montreal, 1984); *Convenio sobre las infracciones y ciertos otros actos cometidos a bordo de las aeronaves* (Tokio, 1963); *Protocolo que modifica el Convenio sobre las infracciones y ciertos otros actos cometidos a bordo de las aeronaves* (Montreal, 2014); *Convenio para la represión del apoderamiento ilícito de aeronaves* (Haya, 1970); *Protocolo complementario del Convenio para la represión del apoderamiento ilícito de aeronaves* (Beijing, 2010); *Convenio para la represión de actos ilícitos contra la seguridad de la aviación civil* (Montreal, 1971); *Protocolo para la represión de actos ilícitos de violencia en los aeropuertos que presten servicios a la aviación civil internacional, complementario del Convenio para la represión de actos ilícitos contra la seguridad de la aviación civil hecho en Montreal el 23 de septiembre de 1971* (Montreal, 1988); y el *Convenio para la represión de actos ilícitos relacionados con la aviación civil internacional* (Beijing, 2010).

⁴ <https://www.icao.int/Meetings/LC38/Pages/References.aspx>

APPENDIX A to LC/38-WP/2-2

**Report of the Secretariat on the RSGLEG Study on the Applicability of
International Air Law Instruments to Cyber Threats against Civil Aviation**

Note: This report presents key elements of the discussions by the experts in the RSGLEG on the draft study. The draft study maybe consulted for Definitions and additional material.

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1. INTRODUCTION

1.1 The study on the applicability of international air law instruments to cyber threats against civil aviation was undertaken by the Research Subgroup on Legal Aspects (“RSGLEG”) of the Secretariat Study Group on Cybersecurity (“SSGC”). The RSGLEG developed and reviewed the draft study on this topic over 10 meetings from November 2018 and reported its progress periodically to the SSGC. Experts from 15 States¹ and 4 organizations² participated in one or more meetings of the group. This report presents key elements of the discussions and outcomes of the study by the RSGLEG.

2. BACKGROUND

2.1 The cybersecurity environment for civil aviation

2.1.1 Civil aviation transports passengers and goods around the world. It is a highly interconnected and valuable sector that has been challenged time and time again by various types of threats. The entire aviation sector consists of interconnected networks and systems creating a complex ecosystem that requires a holistic approach when assessing, preventing threats and prosecuting cyber-attacks.

2.1.2 The threats and risks to the aviation ecosystem have led to the creation of a strong and universal international air law framework. There is an urgent need at this point in time, as technology and cyber threats are rapidly evolving, to ensure that civil aviation is adequately protected by a strong legal framework that addresses and incriminates cyber intrusions threatening aviation safety and/or security.

2.1.3 The cyber threats to the civil aviation sector may be posed by malicious actors who could target information assets (including systems, data and information) of stakeholders such as airports, air carriers, and air navigation service providers, and could cause disruption or damage aircraft in service, potentially leading to injury or loss of life. Such attacks could also target manufacturers of aircraft and aircraft parts, their suppliers or maintenance, repair and overhaul facilities, and any other supply chain actor. It should be noted that, up until late 2021, while there were no known cyber-attacks on civil aviation leading to an accident,³ the consequences of a cyber-attack could be significant and should be taken into consideration when conducting the analysis of the applicable legal framework to cyber-attacks.

2.1.4 According to ICAO guidance material, particularly ICAO Doc 10108, *Aviation Security Global Risk Context Statement*, 2nd Ed., 2019 (Restricted), Appendix C and *Updated overview of threats and risks to civil aviation, September 2020 (Restricted)*, the overall likelihood of a terrorist cyber-attack on civil aviation is currently assessed to be low,⁴ but with high potential consequences.

2.2 ICAO’s cybersecurity work

2.2.1 The SSGC was established in 2017 following the 39th Session of the ICAO Assembly (Montréal, 27 September – 6 October 2016). During the fourth meeting of the SSGC (Montréal, 5 September 2018), the RSGLEG was established, with the aim of reviewing and analyzing (in relation to the identified threats, risks and actors) the adequacy of the current international air law framework in addressing cyber threats in civil aviation.

¹ Brazil, Canada, China, France, Israel, Kenya, Malta, Netherlands, Oman, Russian Federation, Singapore, South Africa, Switzerland, Turkey, and the United States.

² Civil Air Navigation Services Organisation (CANSO), European Defence Agency (EDA), International Air Transport Association (IATA) and the International Coordinating Council of Aerospace Industries Associations (ICCAIA).

³ Incidents causing operational disruption have been reported.

⁴ The Aviation Security Panel is in the process of considering the latest updates to the risk assessment which should be published in 2022. This update may change the overall risk from low to medium.

2.2.2 The issue of addressing cyber threats to civil aviation was introduced in the Work Programme of the ICAO Legal Committee during its 37th Session (Montréal, 4 – 7 September 2018). At the Fifth Meeting of its 215th Session (7 November 2018), the ICAO Council approved the addition of the item “Consideration of the adequacy of existing international air law instruments in addressing cyber threats against civil aviation” to the programme of the Legal Committee. The ICAO Assembly, during its 40th Session (Montréal, 24 September – 4 October 2019) further agreed to maintain this item on the Work Programme of the Legal Committee.

2.2.3 Furthermore, during its 40th Session, the ICAO Assembly adopted the ICAO Aviation Cybersecurity Strategy (Assembly Resolution A40-10) which provides that the relevant international legal instruments should be analysed to identify existing or missing key legal provisions in air law for the prevention, prosecution, and timely reaction to cyber incidents in order to form the basis for consistent and coherent implementation of cybersecurity legislation and regulations throughout the global aviation sector.

2.2.4 Following the adoption of the ICAO Aviation Cybersecurity Strategy by the Assembly, the ICAO Council adopted the ICAO Cybersecurity Action Plan (C-DEC 219/2 refers), focusing, among other actions, on the need to analyse the existing international air law framework to determine its adequacy in addressing cyber-attacks, as well as analyse and update or adopt, as necessary to allow for the deterrence, investigation, and prosecution of cyber-attacks that impact the safety, security, efficiency, and/or continuity of civil aviation.

2.2.5 The analysis of the existing international air law instruments with respect to their applicability to cyber threats or cyber-attacks against civil aviation carried out within the RSGLEG is also timely in view of the “Group of Governmental Experts on Advancing Responsible State Behaviour in Cyberspace in the Context of International Security” established under the United Nations General Assembly (UNGA) which issued its conclusions and recommendations for future work in July 2021.⁵ One of these recommendations is the following:

"95. The Group also identified potential areas for future work, which include but are not limited to: [...] c) Further sharing and exchanging of views on norms, rules and principles for responsible State behaviour and national and regional practices in norm and CBM implementation; and on how international law applies to the use of ICTs by States, including by identifying specific topics of international law for further in-depth discussion."

3. OBJECTIVE AND SCOPE OF THE WORK

3.1.1 The objective of this work is to examine the adequacy of international air law instruments with regards to the prosecution of cyber-attacks against civil aviation and provide information and analysis on:

- a) the interpretation of the existing international air law framework as it pertains to cyber threats against civil aviation;
- b) the identification of potential gaps and possible options/solutions to address them;
- c) the need for specific further study in order to propose solutions for the identified gaps; and
- d) the best way to further promote the results thereof.

⁵ Report of the Group of Governmental Experts on Advancing Responsible State Behaviour in Cyberspace in the Context of International Security, A/76/135, 14 July 2021, [A_76_135-2104030E-1.pdf \(un-arm.org\)](#), last retrieved on 2 January 2022.

3.1.2 The general absence of explicit references to cyber threats in the framework requires analyzing whether the existing international air law instruments could be interpreted to cover such cyber threats or whether the instruments could be considered inapplicable. The following international air law instruments were discussed and analyzed in the study:

- a) *Convention on International Civil Aviation* (Chicago, 1944 – “Chicago Convention”);
- b) *Protocol Relating to an Amendment to the Convention on International Civil Aviation [Article 3 bis]* (Montreal, 1984 – “Protocol on Article 3 bis”);
- c) *Convention on Offences and Certain Other Acts Committed on Board Aircraft* (Tokyo Convention 1963) (Tokyo, 1963 – “Tokyo Convention 1963”);
- d) *Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft* (Montréal, 2014 – “Montréal Protocol 2014”);
- e) *Convention for the Suppression of Unlawful Seizure of Aircraft* (Hague, 1970 – “Hague Convention 1970”);
- f) *Protocol Supplementary to the Convention for the Suppression of Unlawful Seizure of Aircraft* (Beijing, 2010 – “Beijing Protocol 2010”);
- g) *Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation* (Montreal, 1971 – “Montreal Convention 1971”);
- h) *Protocol for the Suppression of Unlawful Acts of Violence at Airports Serving International Civil Aviation, Supplementary to the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation done at Montreal on 23 September 1971* (Montreal, 1988 – “VIA Protocol 1988”); and
- i) *Convention on the Suppression of Unlawful Acts Relating to International Civil Aviation* (Beijing, 2010 – “Beijing Convention 2010”).

4. METHODOLOGY

4.1 General considerations

4.1.1 Cyber-attacks and their possible effects cover a vast range of possibilities that remain ever evolving with new systems and technologies, which present different concerns than those of traditional aviation security (e.g., bomb threats, unruly passenger, etc.). As it is not possible to define cyber threats within a limited scope of potential scenarios, the analysis cannot simply assess whether all cyber threat scenarios would be covered by each instrument. Therefore, the analysis also considered the general applicability criteria of the air law instruments in order to circumscribe the extent of their coverage, highlight their limits and subsequently allow the analysis of whether any cyber threat situation could fall outside the scope of each instrument.

4.1.2 As methods of conducting cyber-attacks evolve over time and can be carried out with various technical means, this analysis takes a “technology neutral” approach. As such, the technology used in conducting cyber-attacks will not be analyzed herein.

4.2 Applicability criteria - Actor

4.2.1 Various types of actors may be at the origin of a cyber-attack such as: individuals, State actors, groups, and legal entities. The type of actor requires to be analyzed as instruments are not equally applicable to all (e.g., Article 3 bis of the Chicago Convention only applies to State actors). The analysis below will therefore identify the actors for which they are applicable.

4.2.2 It will be appreciated that the actor criteria detailed herein is taken separately from any motive consideration which may be present in national laws and which may lead to different regimes being applicable. For example, certain national laws may provide different regimes for ethical hackers (e.g., “white hats” or security researchers) than illicit hackers, even if they each fall within the “individual” type of actors. Such considerations were not addressed in this analysis.

4.3 **Applicability criteria - Intent (*mens rea*)**

4.3.1 The various motives to attack aviation using cyber means imply different levels of intent to harm civil aviation. Whether the intent behind a certain cyber-attack is to harm (such as affect safety or security or cause disruption and/or damage) civil aviation depends on each specific situation and relies on a factual assessment of the situation by the court. Providing an in-depth discussion of this topic is therefore beyond the scope of this study, which is limited to identifying whether an instrument requires intent or not.

4.4 **Applicability criteria - Act (*actus reus*)**

4.4.1 The cyber-attack methods used by cyber criminals vary depending on their motives, the effect they wish to cause, as well as their capability to circumvent existing mitigation measures. Furthermore, methods will vary over time as new capabilities and technologies are developed, rendering the analysis of specific acts less relevant for this study. As such, the applicability of international air law instruments, in terms of the act, will be herein analyzed by identifying all necessary elements, whether they are related to the impact on the safety of civil aviation, the location of the perpetrator, the timing of the attack or the effect of such attack.

4.5 **Applicability criteria - Jurisdiction**

4.5.1 The final air law instrument applicability criteria, necessary to ensure that alleged perpetrators are prosecuted, pertains to the jurisdiction provisions. The analysis will cover the bases for jurisdiction provided in each instrument, so as to allow the assessment of any potential gaps considering the particularities of cyber threat scenarios (e.g., perpetrator may act from a remote location in a different State that is otherwise not tied to a flight being attacked). While these particularities of cyber scenarios complicate, the analysis, compared to traditional attack scenarios, and prevent it from being exhaustive, it remains useful to identify any already existing potential gaps.

5. **OVERVIEW OF THE INTERNATIONAL AIR LAW INSTRUMENTS**

5.1 **Chicago Convention, Article 3 *bis* and Annex 17**

5.1.1 The present analysis is carried out within the context, object and purpose of the legal regime created by the Chicago Convention. The principles enshrined in the Preamble of the said Convention, which have proven to remain relevant in today’s context, serve as cornerstones for the analysis, the following provisions being particularly applicable:

"WHEREAS the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security; and

WHEREAS it is desirable to avoid friction and to promote that cooperation between nations and peoples upon which the peace of the world depends;"

5.1.2 The Chicago Convention and its Annexes provide a framework applicable to States that focuses on prevention and deterrence which sets the framework for the governance of international civil aviation with the objective to ensure safety and security. As it complements the offence-creating air law instruments with certain obligations for States, such as the provisions of Article 3 *bis* of the Chicago Convention, their analysis is of interest for the scope of the study.

5.1.3 Historically, Article 3 *bis* was introduced in the Chicago Convention by the *Protocol Relating to an Amendment to the Convention on International Civil Aviation [Article 3 bis]*, signed at Montreal on 10 May 1984 (Doc 9436), following the outcomes of the KAL007 event. However, while the drafting and adoption of this provision was heavily influenced by this accident, its scope has been recognized as broader than simply providing obligations relating to the interception of civil flights. Specifically, the first paragraph of Article 3 *bis* includes the obligation that “every State must refrain from resorting to the use of weapons against civil aircraft in flight”.

5.1.4 While not all ICAO Member States are party to the Protocol introducing Article 3 *bis*, the obligations provisioned therein may nevertheless enjoy a broad applicability. As a matter of fact, eminent air law experts, such as Judge Guillaume and Professor Milde, have opined that Article 3 *bis* was declaratory of existing customary international law and recognized the principle of non-utilization of weapons against civil aircraft.⁶ Moreover, the declaratory nature of the provision was further recognized by the ICAO Council in its Resolution adopted on 27 June 1996 in which it condemns “the use of weapons against civil aircraft in flight as being incompatible with elementary considerations of humanity, the rules of customary international law as codified in Article 3 *bis* of the *Convention on International Civil Aviation*, and the Standards and Recommended Practices set out in the Annexes to the Convention”. Similarly, Resolution 1067 of the United Nations Security Council (26 July 1996) has condemned “the use of weapons against civil aircraft in flight as being incompatible with elementary considerations of humanity, the rules of customary international law as codified in article 3 bis of the Chicago Convention, and the standards and recommended practices set out in the annexes of the Convention”.

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
States	<ul style="list-style-type: none"> - Use of a weapon against civil aircraft - aircraft in flight 	Not required	N/A

5.1.5 As for Annex 17 to the Chicago Convention, it includes Standards and Recommended Practices (SARPs) on preventive aviation security measures and more specifically includes a definition of acts of unlawful interference which is relevant for this study.⁷ This definition focuses on the effects and consequences of such acts or attempts thereof to jeopardize the safety of civil aviation, rather than the means and methods of such unlawful interference. Contracting States are required to develop and implement regulations to safeguard civil aviation against acts of unlawful interference, which could include cyber threats.

5.2 Tokyo Convention 1963 and Montréal Protocol 2014

5.2.1 The Tokyo Convention 1963 is applicable to offences against penal law and any acts that may or do jeopardize the safety of the aircraft, of the persons or property on board, or any acts that jeopardize good order and discipline on board.⁸ The Convention was mainly adopted to provide jurisdiction to States of Registration for offences perpetrated on board aircraft while the flight is over international territory.⁹

⁶ G. Guillaume, “The Destruction on 1 September 1983 of the Korean Airlines Boeing (Flight KE 007)” ITA Magazine No. 0-18, September 1984, 27, at 34; and M. Milde, “Interception of Civil Aircraft vs. Misuse of Civil Aviation (Background of Amendment 27 to Annex 2)” (1986) XI Annals of Air and Space Law 105, at 113.

⁷ Annex 17 to the Chicago Convention, “Security”, Eleventh Edition, 2020, Chapter 1 - Definitions.

⁸ Convention on Offences and Certain Other Acts Committed on Board Aircraft, signed at Tokyo on 14 September 1963 [Tokyo Convention], Article 1(1).

⁹ Tokyo Convention, Article 3.

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - offences against penal law, acts which may or do jeopardize safety of the aircraft/person/property or acts which jeopardize good order and discipline on board; - committed by a person on board the aircraft; - aircraft registered in a contracting State; - during flight (from power application for takeoff until the landing run ends) or in an area outside the territory of any State. 	Not required	<ul style="list-style-type: none"> - State of Registration; - criminal jurisdiction in accordance with national law.

5.2.2 The Montréal Protocol 2014 expands the grounds of jurisdiction of the Tokyo Convention by recognizing, under certain conditions, the competence of the State of landing and the State of the operator to exercise jurisdiction over offences and acts on board aircraft.¹⁰

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - offences against penal law, acts which may or do jeopardize safety of the aircraft/person/property or acts which jeopardize good order and discipline on board; - committed by a person on board the aircraft; - aircraft registered in a contracting State; - during flight (from external door closes after embarkation until such door opens for disembarkation) or in an area outside the territory of any State. 	Not required	<ul style="list-style-type: none"> - State of Registration, State of Landing (alleged offender on board) or State of Operator (dry lease); - State of landing when safety/discipline is jeopardized - criminal jurisdiction in accordance with national law

5.3 Hague Convention 1970 and Beijing Protocol 2010

5.3.1 The Hague Convention 1970 was adopted to combat aircraft hijacking and provides for the criminalization of offences committed on board an aircraft in flight whereby a person seizes or exercises control of the aircraft.¹¹ In addition to establishing the legal principle of “extradite or prosecute”,¹² which obliges the State in which the alleged offender is found to either subject such person to prosecution or extradite such person to another State for prosecution, the Hague Convention sets out the jurisdiction of the State of the operator and of the State of landing in addition to the traditional jurisdiction of the State of registration.¹³

¹⁰ Montréal Protocol 2014, Article IV.

¹¹ Hague Convention, Article 1.

¹² Hague Convention, Article 7.

¹³ Hague Convention, Article 4.

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - committed by a person on board the aircraft; - aircraft in flight (from external door closes after embarkation until such door opens for disembarkation); - unlawful use of force, threat or intimidation to exercise control of the aircraft. 	Not required	<ul style="list-style-type: none"> - State of registration (or designated State of registration under Art. 5); - State of Landing or State of Operation (dry lease); - offender on territory and no extradition; - criminal jurisdiction in accordance with national law.

5.3.2 The Beijing Protocol 2010 modernizes many aspects of the Hague Convention by adding concepts that reflect the evolution and state of technology that may be used against aviation. It directly refers to the exercise of control of an aircraft “by any technological means”, and therefore broadens the type of attack methods that fall within its scope, and removes the requirement that the offender must be on board the aircraft during the perpetration of the offence.¹⁴ In addition, it redefines the notion of aircraft “in-service” as being “from the beginning of the pre-flight preparation of the aircraft until twenty-four hours after any landing”. In addition, two additional grounds of mandatory jurisdiction are included in the Beijing Protocol: when the offence is committed in the territory of that State or when committed by a national of that State.¹⁵ Two optional bases are also included, when the offence is committed against a national or by a stateless person habitually resident in that State.¹⁶ Both instruments require States to impose severe penalties for the offences.¹⁷

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified, except addition of legal entities (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - unlawful act seizing or exercising control of an aircraft; - aircraft in service (from pre-flight preparations for a specific flight until 24h after landing); - perpetrated by any technological means. 	Required	<ul style="list-style-type: none"> - on the State's territory; - State of Registration, State of Landing (alleged offender on board), State of Operator (dry lease); - offender is a national of that State; - offender on territory and no extradition; - criminal jurisdiction in accordance with national law. <u>Non mandatory:</u> - against a national of that State; - stateless offender residing on the territory of the State

¹⁴ Beijing Protocol, Article II.

¹⁵ Beijing Protocol, Article VII.

¹⁶ Beijing Protocol, Article VII.

¹⁷ Hague Convention Article 2 and Beijing Protocol, Article III.

5.4 Montréal Convention 1971 and VIA Protocol 1988

5.4.1 The Montreal Convention 1971 takes an effect-based approach to determine the offences, which shall have the following in common: the acts are unlawful, intentional and likely to endanger the safety of aircraft in flight.¹⁸ Compared to the provisions under the Hague Convention 1970, the Montreal Convention 1971 does not require an offender to be on board an aircraft while committing the unlawful act. Furthermore, jurisdictional bases also include jurisdiction for offences committed “against or on board an aircraft registered in that State”.

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - unlawful act likely to endanger the safety of aircraft in flight; - causes damage to the aircraft, places or causes to be placed a device, destroys/damages/interferes with operations of air navigation facilities or communicates false information (knowingly). 	Required	<ul style="list-style-type: none"> - on the State's territory; - State of Registration, State of Landing (alleged offender on board) or State of Operation (dry lease); - offender on territory and no extradition; - criminal jurisdiction in accordance with national law.

5.4.2 The Montreal Convention 1971 was amended by the VIA Protocol 1988 to broaden the offences by including acts of violence or of disruption of services at international airports.¹⁹ The coverage of cybersecurity situations is similar to that of the Montreal Convention 1971, but the scope is expanded to attacks that would target airports. This could include situations such as the tampering of flight scheduling systems or of passengers checking and boarding systems with a disruptive effect to airport operations while endangering safety.

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - unlawful act likely to endanger safety at the airport; - using any device/substance/weapon; - seriously damages airport facilities, seriously damages an aircraft not in service located at the airport or disrupts the services of the airport. 	Required	<ul style="list-style-type: none"> - on the State's territory; - State of Registration, State of Landing (alleged offender on board) or State of Operation (dry lease); - offender on territory and no extradition; - criminal jurisdiction in accordance with national law.

¹⁸ Montreal Convention 1971, Article 1.

¹⁹ VIA Protocol, Article II.

5.5 Beijing Convention 2010

5.5.1 The Beijing Convention 2010 is designed to consolidate the provisions of the Montreal Convention 1971 and the provisions of the Airport Protocol 1988. In addition to repeating the offences found in the Montreal Convention and its Airport Protocol, the Beijing Convention further expands the scope of protection against attacks to air navigation services.²⁰ Additionally, the Beijing Convention 2010 establishes new forms of criminal participation. Unlike the Hague Convention 1970, the Montreal Convention 1971 and its VIA Protocol 1988, the Beijing Convention 2010 now makes it an offence to threaten to commit most of the offences listed.²¹ Furthermore, the Beijing Convention also broadens the scope of criminal liability to cover attempts, organizing, participating as accomplice, and conspiracy to commit,²² and incorporates broader jurisdictional bases, including offences committed in the territory of that State or by a national of that State. The instrument also requires States to impose severe penalties for the offences.²³

Applicability Criteria			
Actors	Act	Intent	Jurisdiction
Not specified, except addition of legal entities (applies to individuals and other non-State actors)	<ul style="list-style-type: none"> - unlawful act likely to endanger the safety of aircraft in flight, to cause serious injury/death or likely to endanger safety at an airport serving international civil aviation; - causes damages to the aircraft, places or causes to be placed a device, destroys/damages/interferes with operations of air navigation facilities, communicates false information (knowingly), uses an aircraft in service to cause death/injury, causes serious damage to property or the environment, seriously damages airport facilities, seriously damages an aircraft not in service located at the airport or disrupts the services of the airport. 	Required	<ul style="list-style-type: none"> - on the State's territory - State of Registration, State of Landing (alleged offender on board) or State of Operation (dry lease); - offender is a national of that State; - offender on territory and no extradition; - criminal jurisdiction in accordance with national law. <p><u>Non mandatory:</u></p> <ul style="list-style-type: none"> - against a national of that State; - stateless offender residing on the territory of the State.

6. ANALYSIS

6.1 Analysis of the applicability of the international air law instruments to cyber threats

6.1.1 As presented in the overview of the instruments section, the applicability requirements of each instrument were highlighted and summarized. The following section presents the analysis made of the particularities of each instrument, in relation to the aforementioned criteria and their relevance to cyber threats and attacks, in the same order as presented in the earlier sections.

6.1.2 **Article 3 bis of the Chicago Convention**, which only applies to State actors, requires the cyber means to undertake an attack to be considered as “weapons”. As the term “weapon” is not defined within the Chicago Convention, an interpretation of the extent of what is covered under the term must be made. As principles of international law apply, the *Vienna Convention on the Law of*

²⁰ Beijing Convention, Article 1(1).

²¹ Beijing Convention, Article 1(3).

²² Beijing Convention, Article 1(4).

²³ Beijing Convention, Article 3.

Treaties (Vienna, 1969), notably its Articles 31 and 32, is relevant. As such, the term “weapon” must be given its ordinary meaning considering the context in which it is used.

6.1.3 The circumstances under which an attack conducted by cyber means meets the threshold of being the use of a “weapon” in terms of scale and effect (i.e., serious injury to persons and/or extensive damage to objects) is currently a subject of international debate between cybersecurity legal experts. Within the context of cyber threats, the term “weapon” is being discussed, in current literature, as follows: “Whether malicious cyber activities constitute a weapon depends on the actual outcome, and they cannot be classified without looking at the specific circumstances of each case”.²⁴

6.1.4 In addition to this specific discussion regarding the applicability of Article 3 *bis* of the Chicago Convention, a recent Report of the “Group of Governmental Experts on Advancing Responsible State Behavior in Cyberspace in the Context of International Security”, a Group set up under the UNGA, indicated the following regarding general State behavior in its Norm 13 (f) “A State should not conduct or knowingly support ICT activity contrary to its obligations under international law that intentionally damages critical infrastructure or otherwise impairs the use and operation of critical infrastructure to provide services to the public”.²⁵

6.1.5 **Annex 17 of the Chicago Convention** pertains to acts of unlawful interference as defined in Chapter 1 of the Annex, which may cover cyber-attacks when considered to have the effect of jeopardizing the safety of civil aviation. Furthermore, a Standard has been included in Annex 17 (4.9.1 Measures relating to cyber threats) which requires States to develop and implement, in line with risk assessment, measures to protect their critical information, communications technology systems and data used for civil aviation purposes from unlawful interference, which reinforces the interpretation that Annex 17 can be applied to cyber threats.

6.1.6 The **Tokyo Convention of 1963** could be applicable to cyber threats in cases where a cyber-attack is considered to be an act that is an offence (under national penal law) or a cyber-attack that, whether or not it is an offence, may or does jeopardize the safety of the aircraft, or of the persons or property on board an aircraft. As such, the scope of application of the Tokyo Convention would appear to be more general than that of the other instruments presented herein. Unlike the instruments developed after it, the Tokyo Convention does not specify offences, but creates a cross-reference to existing offences in each Contracting State. However, as one of the applicability criteria requires the perpetrator to be on board the aircraft, the overall usefulness of the Tokyo Convention in addressing cyber threats may be limited, given that cyber threats can be carried out remotely.

6.1.7 The **Montreal Protocol 2014** may improve the possibility of prosecuting a cyber-attack, in comparison to the Tokyo Convention of 1963, as it widens the scope of application of the Convention to include the State of landing as a valid jurisdiction. This new jurisdiction may help prosecuting the perpetrator of a cyber-attack that would be on board the flight.

6.1.8 The **Hague Convention of 1970** requires that the specific effect of the cyber-attack be assessed, which necessitates a factual assessment that may be hard to conduct. As a matter of fact, to successfully apply the Hague Convention, it would need to be proven that the cyber-attack, effected by a person on board the aircraft, effectively resulted in the control of the aircraft. Additionally, the cyber-attack would need to be considered as a “use of force”, which could be interpreted differently depending on the jurisdiction in which a case is being prosecuted. Therefore, while remaining possible, it may be harder to prosecute a cyber-attack under the provisions of the Hague Convention than other instruments, for instance the Beijing Protocol.

²⁴ Federico Bergamasco, Roberto Cassar, Rada Popova and Benjamyn I. Scott, *Cybersecurity, Key Legal Considerations for the Aviation and Space Sectors* (Wolters Kluwer: 2020) at p. 52.

²⁵ [A_76_135-2104030E-1.pdf \(un-arm.org\)](#), retrieved on 28 December 2021

6.1.9 The **Beijing Protocol of 2010**, amending the Hague Convention of 1970, broadens the timeframe for which unlawful acts are covered. This is relevant to scenarios where cyber-attacks are conducted during the important pre-flight preparations, such as safety-critical flight calculations and documentation, or cyber-attack scenarios that happen during the defined post-flight phase, such as certain (limited) maintenance activities. Moreover, the Beijing Protocol adds the terms “or by any technological means” to Article 1, which seems indicative of the intent to clarify that the instrument does cover cyber acts. As such, the Beijing Protocol expands the scope of acts contemplated under the Hague Convention with broader application which could more directly cover cyber-attacks, however it remains necessary to prove that the cyber-attack amounts to “seizing” or “exercising” control of an aircraft.

6.1.10 As for the **Montreal Convention of 1971** and its amending **VIA Protocol of 1988**, their scopes of application are broader, compared to the Hague Convention, that may provide easier prosecution of cyber-attacks. There is no requirement for the perpetrator to be on board the aircraft which allows the coverage of remote cyber-attacks, the effect of the cyber-attack is limited to endangering the flight or the airport, and the cyber-attack can be covered not only when affecting an aircraft but also air navigation facilities, providers of critical flight information, or airport facilities.

6.1.11 Finally, the **Beijing Convention of 2010** introduces detailed provisions that facilitate the application of the instrument to cyber-attack scenarios, more so than any of the previous instruments. As such, the Convention includes a specific definition for “air navigation facilities” which incorporates signals, data, information or systems necessary for the navigation of the aircraft.²⁶ This provides further clarity to the scope of acts that could cover attacks to such facilities and aircraft by cyber means.

6.1.12 In general, some additional considerations relevant to the applicability criteria and affecting all instruments should be noted. In the factual assessment of the intent, which may impact the prosecution of the cyber-attack perpetrator, the analysis does not include whether the attacker intended “only” the element of the attack with an impact on information security parameters, such as confidentiality, integrity, and availability (e.g., the effect on the information system and/or information/data), or whether the attacker intended the ultimate outcome of the cyber-attack (e.g., the grounding of aircraft due to non-reliable software, loss of life and aircraft, etc.).

6.1.13 Due to the interconnectivity of systems, an intended cyber-attack could have consequences unintended by the attacker, which may create cascading effects. For example, while the original intent of an attack might have been to access passenger information, this could lead to severe aviation disruption (e.g., through the sudden non-availability of passenger databases). Another situation may see civil aviation affected by a more general, unspecific cyber-attack threat scenario that, while not targeted at civil aviation itself, may nevertheless have significant effects on civil aviation, ranging from disruption to potential consequences on safety (e.g., cyber-attack on the operating system of tablets used as electronic flight bags).

6.1.14 Additionally, the various cyber-attack methods used also imply different locations of the attacker and/or different paths. Some may be carried out from within the aircraft itself, others will be initiated from remote locations outside the aircraft or even from a different country from where the attack took place. Locating where the attack was initiated can be challenging in itself, as the international nature of the internet allows for the masking of attack paths. In addition, there may be further difficulties in identifying which act is considered the attack and how this may affect the location of the attack (i.e., location of the origin of the attack versus the location of the occurrence of the attack).

6.1.15 Furthermore, a cyber-attack could have origins and effects in multiple locations throughout its duration. Therefore, not only would this potentially raise issues in the application of certain international air law instruments (e.g., requiring the physical presence of the perpetrator on board), but it would also lead to multiple bases for jurisdiction. It is thus important to define the requirements for which an act could be considered as covered by the air law instruments.

²⁶ Beijing Convention, Article 2(c).

6.1.16 A key characteristic of a cyber-attack is its lack of physicality (by the perpetrator at the time and location of the effect), which raises a series of issues as the existing air law instruments typically determine jurisdiction by several factors such as location of the act/offence, identity of the parties involved and other relevant ties to the act. Due to the lack of physicality of the cyber-attack, the cyber-attacker may be located in one jurisdiction, while the act/attack or the intended effect takes place in another jurisdiction. This makes cyber-attacks different from many traditional acts/crimes.

6.1.17 Several jurisdictional questions and issues need to be addressed, such as the potential existence of a gap in the air law treaties insofar as the existing treaties might not currently provide for jurisdiction on the basis of the location where the cyber-attack originated. One way this could be addressed in some scenarios is through accessory/accomplice/conspiracy liability as provided for in certain instruments (e.g., Articles 1(4) and 1(5) of the Beijing Convention 2010). That being said, the general principle of “prosecute or extradite” remains present in the instruments, same as the criminal jurisdiction exercised in accordance with national laws.

6.1.18 Moreover, many instruments include terms that need to be interpreted broadly if the instrument is to be applied to cyber-attack scenarios. This may be an issue which applies differently in different jurisdictions, further causing a fragmentation of the application of the instruments. For example, while arguably being the easiest instrument to apply to cyber-attacks, the Beijing Convention of 2010 may require the interpretation of the following:

- a) Article 1(1)(b): Destroying or causing damage to an aircraft in service – Did the cyber-attack in question “destroy”, or “cause damage” to the aircraft?
- b) For Article 1(1)(c): Placing a device or substance on an aircraft likely to destroy it, cause damage, or endanger safety – Did the cyber-attack amount to a placement of a “device or substance” on an aircraft?
- c) For Article 1(1)(d): Destroying or damaging, or interfering with the operation of, air navigation facilities which is likely to endanger safety – Did the cyber-attack destroy or damage air navigation facilities, or interfere with their operation, in a way which is likely to endanger aircraft safety?
- d) For Article 1(1)(e): Communicating false information which endangers the safety of aircraft in flight – Did the cyber-attack amount to communication of false information, which thereby endangers safety of an aircraft in flight? and
- e) For Article 1(2)(b): Destroying or seriously damaging airport facilities or aircraft not in service, or disrupting airport services – Did the cyber-attack result in such destruction, damage, or disruption, which then endangers or is likely to endanger safety?

6.1.19 For non-parties to the Beijing Convention (such that only the Montreal Convention 1971 and/or VIA Protocol 1988 applies), the same analysis as Articles 1(1) and 1(2) of the Beijing Convention applies. However, the definition of “air navigation facilities” in those earlier treaties is not as expansive as the definition in Beijing Convention, which expressly includes “signals, data, information or systems necessary for the navigation of the aircraft”. Because of this, an argument could be made that cyber-attacks on an air navigation facility therefore does not fall within the scope of the Montreal Convention 1971. However, possible counter-argument is that the Montreal Convention 1971 must be read in the light of the current state of technology, and that the expanded definition in the Beijing Convention merely recognizes this fact.

6.2 Analysis of three sample cyber threat scenarios

6.2.1 In addition to the analysis of the air law instruments according to the abovementioned parameters, three hypothetical scenarios were developed to aid the structured review by providing detailed examples of situations where the air law instruments may be applicable (see Appendix 3 of the draft study for the detailed scenarios and their analyses).

6.2.2 For the purpose of the scenario analysis, it was concluded that the hypothetical cyber-attack scenarios could be categorized in four categories²⁷, as follows:

Category 1: Acts/Threats relating to Air Traffic Management (ATM) Systems – Acts/attacks aimed at communications, navigation and surveillance systems.

Category 2: Acts/Threats relating to Aircraft Systems – Acts/attacks aimed at aircraft control systems, cabin operational systems, and cabin passenger systems.

Category 3: Acts/Threats relating to Airport or Airline Operations – Acts/attacks which, although not directly aimed at aircraft, could nevertheless facilitate a conventional hostile act/attack by degrading aviation security measures (e.g., screening, access control); and attacks intended to disrupt airport or airline operations, principally around passenger facilitation (e.g., departure control, baggage handling).

Category 4: Acts/Threats relating to other aviation systems or information/data – Acts/attacks which, although not directly aimed at aircraft, airports or airline daily operations, could nevertheless degrade aviation safety or security (e.g., maintenance information, leak of confidential information) including attacks which facilitate a further conventional/physical attack; attacks intended to disrupt airport/airline operations; and attacks intended to facilitate criminal activity (e.g., stealing of data).

6.2.3 While categorizing cyber-attack scenarios in the aforementioned categories is not an easy task, as cyber-attacks could present elements of multiple categories or systems and therefore be a combination of elements, factors, systems and not fitting precisely in one of the identified categories. However, the categories were considered useful for the analysis of the scenarios.

6.2.4 In discussions, it was also pointed out that there is a need to understand and integrate the physical security component in the analysis. When looking at cyber-attacks, whilst on the one hand there are cyber-attacks that envisage only the cyber component, on the other hand, there are cyberattacks that are a combination of a physical component with a cyber component (example – cyber-attack leading to breach of access control).

6.2.5 The scenarios provided were analyzed using a two-prong approach. The first prong consisted of the prosecution aspect, referring to the analysis needed to ensure that the perpetrator of the cyber-attack against aviation could be prosecuted under the current air law instruments. In this regard, the facts of the scenarios were analyzed against the legal aspects, including the type of actor, the act itself, the intention and the jurisdictional basis for prosecution.

6.2.6 Once all applicable instruments and provisions were identified, the second prong was then to analyze any potential gaps in the identified instruments and provisions. One such example is the Tokyo and Hague Conventions that require the person to be on board the aircraft, which in a scenario where the perpetrator would not be on board, would render these two Conventions inapplicable. Similarly, the terms ‘weapon’ and ‘device’, which required an interpretation thereof in order to examine whether the relative provisions would apply, could suffer different interpretations in different jurisdictions.

6.3 Results of the review of instruments and analysis of scenarios

6.3.1 The analysis of the current international air law instruments demonstrates that while cyber threats might not be explicitly mentioned in every instrument, the object and purpose of the international air law instruments is to safeguard civil aviation and could therefore cover cyber threat scenarios.

²⁷ Source Reference for categories 1-3: *Aviation Security Global Risk Context Statement*, 2nd Ed., 2019 (Doc 10108) (Restricted), Appendix E

6.3.2 Each of the instruments provides some useful basis to address cyber threat scenarios and their potential effects on civil aviation. However, certain more recent instruments, such as the Beijing instruments, provide clearer applicability or broader coverage, making them easier to address cyber threats. However, while these newer instruments might be easier to apply and require less judicial interpretation, all instruments could be found applicable in certain cases.

7. POTENTIAL GAPS IN THE APPLICATION OF INTERNATIONAL AIR LAW INSTRUMENTS TO CYBERSECURITY

7.1.1 As detailed throughout this study, the applicability of international air law instruments to cyber threats is complex and may therefore introduce gaps which could prevent the prosecution of the perpetrator of a cyber-attack. While the instruments identified in this study may be said to apply depending on the scenario and interpretation to some extent to cybersecurity, a number of the recent aviation security instruments have a broader and more direct application.

7.1.2 A first potential gap could thus be inferred from the fragmentation of the international air law framework itself. While certain States may be parties to recent security instruments, others may only be party to some of the older instruments. As mentioned herein, the actors, attack and effects of a cyber-attack may include multiple jurisdictions, with different legal regimes, potentially creating situations in which prosecution may be difficult or impossible. It should however be noted that the principle of “prosecute or extradite” may apply in some situations, diminishing the possible exploit of this gap.

7.1.3 A second potential gap lies with the interpretative issues of certain terms used in some of the instruments. As further explored in other sections of this study, a number of instruments include broad terms (such as “weapon”, “device”, “air navigation facilities”, and “use of force”) that could be interpreted to cover cyber threats. However, the interpretation of such terms could suffer from being applied differently in different situations and jurisdictions, which may lead to disparities in the application of instruments between States.

7.1.4 A third potential gap in the application of the international air law framework to cybersecurity is the applicability criteria of older instruments that are less applicable to cyber threats than the criteria of newer security instruments. As a matter of fact, earlier instruments may require, for example, that the perpetrator be on-board the aircraft, that the aircraft is in flight, or that the attack results in the control of the aircraft. As cyber-attacks could be performed remotely, and initiated at any time prior to a flight, their prosecution on those bases may be difficult. Similarly, the consideration on whether a cyber-attack resulted in the control of the aircraft may be arduous depending on the means of the attack.

7.1.5 A fourth potential gap could be based on the fact that the international air law instruments generally cover safety and security of civil aviation. However, cyber threats may include numerous types of attacks that would not necessarily be considered as endangering the safety and security of a flight. For example, a cyber-attack could target passenger information databases which may not amount to safety or security risks as commonly understood. It should be noted that while such cyber threats would not presently be covered by the air law instruments, they may nevertheless be covered in cyber-specific instruments.

7.1.6 As presented herein, the international air law regime suffers from potential gaps in its applicability to cybersecurity. Although some interpretative issues may arise during prosecution, the Beijing instruments of 2010 are a good basis for dealing with cyber-attacks against civil aviation. As such, it could be said that the current international air law framework is partially adequate to cover cyber threats.

8. CONCLUSIONS

8.1.1 Cyber-attacks are different from traditional attacks: lack of physicality of the attack method/means (as physical presence of the attacker is often not associated with a cyber-attack) and lack of awareness (airport operator or systems operators may not be aware that a cyber-attack is happening).

8.1.2 It has been concluded that the analysis of the adequacy of international air law instruments in addressing cyber threats should focus on the intent, effects or consequences of the cyber threats on civil aviation as these are generally necessary in providing awareness of the cyber threats (due to the fact that there are various types of cyber threats, carried out by actors with various intent and methods, leading to various technical impacts on confidentiality, integrity and/or availability of civil aviation systems, information or data). Those technical impacts could in turn lead to effects ranging from simple nuisance to large scale disruption and/or potential consequences on civil aviation safety and security.

8.1.3 Four broad categories of cyber-attacks were used:

- i. Cat 1 – cyber threats/attacks against ATM systems;
- ii. Cat 2 – cyber threats/attacks against aircraft systems;
- iii. Cat 3 – cyber threats/attacks against airport/airline systems; and
- iv. Cat 4 – cyber - threats/attacks relating to other aviation systems or information/data.

8.1.4 The analysis of the offence-creating international air law instruments as they exist today, demonstrates that while scenarios involving cyber-attacks might not be explicitly covered by each air law instrument, the object and purpose of the international air law instruments is to safeguard civil aviation. In this sense, depending on the nature of the attack, each of the instruments may be said to provide for certain offences that may be useful to address some cyber threat scenarios, notably those that have serious effects on civil aviation, such as e.g. effects on the safety of aircraft in flight. However, such an analysis would need to be done on a case-by-case basis.

8.1.5 Cyber-attacks may potentially amount to various offences under the existing international air law instruments, however, special consideration needs to be given to the nature of the attacks and where the attacks, including their effects, have potentially taken place or are regarded to have taken place (e.g., on board the aircraft).

8.1.6 Questions of interpretation may arise when analysing the application of older air law instruments to cybersecurity situations. For example, under the Hague Convention of 1970, a cyber-attack would need to be considered as a “use of force or threat thereof, or by any other form of intimidation” to enable its application. Similarly, the extent of what is covered by “air navigation facilities” and “device” in the Montreal Convention of 1971 or the Airport Protocol of 1988 could lead to different answers regarding the applicability of these instruments.

8.1.7 Through the detailed study of each instrument and their applicability criteria, it became apparent that newer instruments such as the Beijing Convention of 2010 and the Beijing Protocol of 2010 contain provisions that can be more specifically applied to cyber threats and cyber-attacks. Some of the reasons being that the newer instruments introduced the broader “aircraft in service” requirement, removed the requirement of the perpetrator being on board the aircraft, specifically defined relevant terms such as “air navigation facilities”, and also made reference to attacks by “any technological means”.

8.1.8 The existing international air law instruments are considered partially adequate for identified cyber threat/attack scenarios, based on a case by case analysis. Although there may still be a need for further interpretation of certain terms under the Beijing instruments of 2010 (e.g., “device”, etc.), it would seem their scope provides a good basis for States to successfully prosecute individuals and entities conducting cyber-attacks against civil aviation. In accordance with ICAO Assembly Resolution A40-10, a wider ratification of these treaties is strongly encouraged.

8.1.9 When considering the application/implications of Article 3 *bis* of the Chicago Convention, it was concluded that, due to the customary law nature of the provision, as well as the various potential definitions of the term “weapon” in the context of a cyber-attack (still under debate by cybersecurity legal experts), if a “weapon” may be interpreted to also refer to a cyber means for attack or the effects of the cyber-attack might be considered crossing the threshold of the term “weapon”, Article 3 *bis* would be deemed applicable, on the understanding however that its scope is limited to States.

8.1.10 In terms of jurisdiction, the location where the cyber-attack originated and the location where the effect of the attack is felt may be different and therefore, it must be ensured that the international aviation legal framework provides for jurisdiction upon which a State may prosecute in order to avoid any gaps in this regard. As such, international cooperation is crucial in overcoming jurisdiction matters when it comes to cyber-attacks.

8.1.11 It was further identified that as for all offences, gaps could exist in the application of air law instruments depending on which States are party to which instruments.

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APPENDIX B

List of States Parties to the 2010 Beijing Convention and Protocol

Beijing Convention 2010
Angola
Bahrain
Benin
Botswana
Burkina Faso
Cabo Verde
Congo
Côte d'Ivoire
Cuba
Cyprus
Czech Republic
Dominican Republic
Eswatini
Finland
France
Gabon
Gambia
Ghana
Guyana
Honduras
Kazakhstan
Kuwait
Luxembourg
Mali
Malta
Mozambique
Myanmar
Netherlands
Panama
Paraguay
Portugal
Romania
Rwanda
Saint Lucia
Seychelles
Sierra Leone
Sweden
Switzerland
Turkey
Turkmenistan
Uganda
Uruguay

Beijing Protocol 2010
Bahrain
Benin
Botswana
Burkina Faso
Cabo Verde
Congo
Côte d'Ivoire
Cuba
Cyprus
Czech Republic
Dominican Republic
Eswatini
Finland
France
Gabon
Gambia
Ghana
Guyana
Honduras
India
Kazakhstan
Kuwait
Luxembourg
Mali
Malta
Mozambique
Myanmar
Netherlands
Panama
Paraguay
Portugal
Romania
Rwanda
Saint Lucia
Saudi Arabia
Seychelles
Sierra Leone
Sweden
Switzerland
Turkey
Turkmenistan
Uganda