EAST ASIAN OBSERVER

Regulating Ballistic Missile Usage for Ensuring Civil Aviation Safety: As a Matter of Urgency

Amad Sudiro*

The increasing use of ballistic missiles as a means of delivering weapons of mass destruction in the course of military activities constitutes a new threat to civil aviation safety. Ballistic missiles are considered as a new form of offense and defense. These challenges may come in the form of warheads, carried by the missiles, with the possibility to explode at any time in air, or the long ranges of the missiles that bring them close to flight routes, which may endanger civil passengers. The multilateral treaty on ballistic missile prohibition is non-binding in nature, voluntary and has a limited duration puts civil aviation safety at risk. Therefore, regulating ballistic missile in a binding manner are urgently needed to ensure civil aviation safety.

Keywords
Ballistic Missile, Civil Aviation Safety, Regulation, ICAO, Chicago Convention

1. Introduction

A missile is a self-propelled guided weapon system. It is different from unguided self-propelled munitions, referred to as rocket. Missiles have four system components: targeting and/or guidance system, flight system, engine, and warhead. Missiles come in various types adapted for different purposes: surface-to-surface and air-to-surface missiles (ballistic, cruise, anti-ship, anti-tank, etc.), surface-to-air missiles (anti-aircraft and anti-ballistic), air-to-air missiles, and anti-satellite missiles. All known existing missiles are designed to be propelled during powered flight by chemical reactions

* Dean of Law Faculty at Tarumanagara University, Jakarta, Indonesia. LL.B.(Trisakti Univ.), LL.M.(Tarumanagara Univ.), Ph.D.(Indonesia). ORCID: http://orcid.org/0000-0002-9481-8983. The author may be contacted at: sudiroamad@gmail.com /Address: Jl. Letjen. S. Parman No. 1, Grogol, Jakarta Barat 11440 Indonesia.
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inside a rocket engine, jet engine, or other types of engines. Non-self-propelled airborne explosive devices are generally referred to as shells and usually have a shorter range than missiles.[1] For defense and offense purposes, many countries have developed ballistic missiles, which follows a ballistic trajectory with the objective of delivering one or more warheads to a predetermined target. It has various ranges, commonly with respect to the surface to air concept. Ballistic missile ranges are generally divided into the following:

a. Short-range ballistic missiles ("SRBM") with ranges of up to 1,000 kilometers.
b. Medium-range ballistic missiles ("MRBM") with a range of between 1,000 km and 3,500 km.
c. Intermediate-range ballistic missiles ("IRBM") or long-range ballistic missiles ("LRBM") with a range of between 3,500 km and 5,500 km.
d. Intercontinental ballistic missiles ("ICBM") with a range greater than 5,500 km from its launch site.

The world's first operational ballistic missile was created by German army scientists with the use of concentration-camp laborers.[2] This effort culminated in the launch of 3,255 V-2 ballistic missiles in anger against Allied cities and other targets.[3] V-2 was an internally guided ballistic missile, whose supersonic speed made it invulnerable to antiaircraft guns and fighter planes.[4] Ballistic missile development was continued post-World War II by Soviet Union and the US through the launch of their operational ballistic missiles throughout the Cold War. As the strategic deterrence was the primary goal of the US and Soviet military planners, the ballistic missile became the only viable means to deliver nuclear ordinance over inter-continental ranges given the vast distance between the US and Soviet heartland.[5]

There are several regulations and regimes of ballistic missile, such as the Missile Technology Control Regime 1987,[6] Anti-Ballistic Missile Treaty 1972,[7] the Offensive

1 A. Rupesh, *Conceptual Design of virtual Missiles Using Recent Trends in Artificial Intelligence and Nanotechnology*, 21:7 Int'l J. Sci. & Tech. 94 (2014).

2 M. Neufeld, *A Combat History of the First Ballistic Missile*, 70 J. Mil. Hist. 548 (2006).

3 C. Chun Thunder Over the Horizon: From V-2 Rockets to Ballistic Missiles 54 (2006).

4 A. Bell, *Landscapes of Fear: Wartime London, 1936-1945*, 48 J. Brit. Stud. 162 (2009).

5 Z. Singh, *Cruise Missiles: Evolution, Proliferation and Future*, 6 J. Defense Stud. 139 (2011).

6 S. Dasgupta, *India's Inclusion in The Missile Technology Control Regime* (*MTCR*)*-Its Economic Impact and Legal Obligations from An International Perspectives*, 3 S. Asian J. Multidisciplinary Stud. 110 (2016). *See also* Missile Technology Control Regime, *available at* http://www.nti.org/learn/treaties-and-regimes/missile-technology-control-regime-mtcr (last visited on Oct. 17, 2018).

7 C. Bradley, *Treaty Termination and Historical Gloss*, 92 Texas L. Rev. 784 (2014).

Strategic Weapon Agreements or Strategic Arms Limitation Task ("SALT I") 1968-1972,[8] Intermediate-Range Nuclear Forces Treaty 1987, and International Code of Conduct against Ballistic Missile Proliferation 2002.[9] Yet, they have been unable to overcome the threats posed by ballistic missiles to civil aviation safety due to several limitations. My research is to thus analyze how to regulate ballistic missile use for the purpose of ensuring civil aviation safety. This paper is composed of six parts including Introduction and Conclusion. Part two will review increasing vulnerability of civil aviation. Part three will carry out the case studies of military activities affecting civil aviation. Part four will discuss current measures to deal with the missile threat against civil aviation. Part five will suggest the urgency of ballistic missile regulation for civil aviation safety.

2. Increasing Vulnerability of Civil Aviation

International law recognizes that the airspace is no longer limited to military purposes.[10] In 1944, representatives from fifty-four nations gathered in Chicago to design a blueprint for the worldwide regulation of post-war international civil aviation. They adopted the Convention on International Civil Aviation (hereinafter Chicago Convention)[11] on December 7, 1944 and established the International Civil Aviation Organization ("ICAO") on April 4, 1947, when the Convention came into force.[12] A primary objective of the ICAO is to "ensure the safe and orderly growth of international civil aviation throughout the world."[13] Accordingly, since the date of its birth, the ICAO has been closely linked with aviation safety.[14] Historically, whenever there has been relative rapid growth in air transport, it has often been followed by a series of accidents. The occurrence of such events has stimulated the introduction

8 The Offensive Strategic Weapon Agreements or Strategic Arms Limitation Task (SALT I) 1968-1972.

9 Text of Hague Code of Conduct against Ballistic Missile Proliferation 2002, pmbl.

10 Chicago Convention art. 3(a). It states: "This Convention shall be applicable only to civil aircraft, and shall not applicable to state aircraft."

11 ICAO, Convention on International Civil Aviation-DOC 7300, *available at* https://www.icao.int/publications/pages/doc7300.aspx (last visited on Nov. 10, 2018).

12 ICAO, The History of ICAO and the Chicago Convention, *available at* https://www.icao.int/about-icao/History/Pages/default.aspx (last visited on Nov. 10, 2018). For details, *see* Eric Y.J. Lee, *A Study on the Development of International Air Law before 1944* (1995) (unpublished LL.M. thesis, Leiden University) (on file with author).

13 ICAO, Strategy Guiding International Civil Aviation in the 21st Century, *available at* https://www.icao.int/Documents/secretary-general/rpereira/strategy.pdf (last visited on Nov. 10, 2018).

14 J. Huang, Aviation Safety through the Rule of Law: ICAO's Mechanisms and Practices 1 (2009).

of technical and operational measures. As a result, overall safety has improved over time. The ICAO, for example, has shown that the fatality rate for international and domestic scheduled aviation operations has consistently decreased over time. Between 1970 and 1993, the fatality rate fell from 0.18 to 0.04 fatalities per 100 million passenger kilometers, with particularly marked reductions recorded between 1970 and 1977.[15]

Aviation safety includes but is not limited to operational flight safety. The tragic September 11 attacks in 2001 not only constituted the most serious threat, but also caused unprecedented damage to aviation safety. These attacks have conclusively demonstrated that aviation safety should extend to more profound political, strategic and legal dimensions beyond accident prevention from a technical point of view. It includes preventive, remedial and punitive measures. Accordingly, safety is not limited to accident prevention but should be considered in a broader term as risk management.[16] This was clearly indicated by the ICAO in responding to the September 11 attacks, as they realized immediately the urgent need for restoring the integrity of the aviation system and met representatives from 32 nations to discuss new security measures.[17] The ICAO has since then implemented 66 security standards, 16 Recommended Practices ("SRPs") and recommended the Universal Security Audit Program ("USAP").[18] The USAP program promotes global aviation security through the auditing of contracting states on a regular basis to determine the status of implementation of the ICAO Annex 17 Security Standards.[19]

The air transport industry is rapidly increasing in size. Data show that there were 3.3 billion scheduled commercial international and domestic operations passengers and 38 million scheduled passenger flights in 2014.[20] In 2017, the airline industry globally carried over 4 billion passengers.[21] In this regard, the ICAO will collectively

15 M. Janic, *An Assessment of Risk and Safety in Civil Aviation*, 6 J. Air Transport Mgmt. 44 (2000).

16 R. Lofaro & K. Smith, *Rising Risk? Rising Safety? The Millennium of Air Travel*, 28 Transportation L. J. 216 (1998).

17 As response to 9/11 attack, ICAO immediately held 33rd Session of the ICAO General Assembly in Montreal in October 2011 and unanimously adopted a Resolution to hold accountable with severity those who misuse civil aircraft as weapons of destruction, including those responsible for organizing such acts for aiding, supporting or harboring the perpetrators. *See* Milestones in International Civil Aviation, *available at* https://www.icao.int/about-icao/History/Pages/Milestones-in-International-Civil-Aviation.aspx; Resolution adopted at the 33rd Session of the ICAO General Assembly, *available at* https://www.icao.int/Meetings/AMC/MA/Assembly 33rd Session/plugin-resolutions_a33.pdf (all last visited on Nov. 11, 2018).

18 G. Tamasi & M. Demichela, *Risk Assessment Techniques for Civil Aviation Security*, 96 Reliability Engineering & System Safety 594 (2011).

19 *Id*.

20 *See Safety Spotlight*, 70:1 ICAO J. 14 (2015).

21 *See* Number of scheduled passengers boarded by the global airline industry from 2004 to 2017 (in millions), Statista, *available at* https://www.statista.com/statistics/564717/airline-industry-passenger-traffic-globally (last visited on Nov.

manage this growth effectively, uniformly and consistently in all countries and regions paying attention to the safety, security, sustainability and efficiency of the global air transport system in the coming decades.[22] Therefore, the necessary measures to minimize risk and ensure safety should be highly implemented.

3. Military Activities Affecting Civil Aviation: Case Studies

Threats may arise to the safety of aviation passengers from many aspects: runway, fatigue, loss of control in-flight,[23] hijack and terrorism,[24] bomb attack, man portable air defense system, renegade procedures,[25] and others. However, the most disastrous is the destruction of an aircraft commonly with a bomb or gunfire. Two of the deadliest terrorist acts against aviation were bombings. On June 23, 1985, a bomb exploded on an Air India 747, resulting in 329 fatalities. On December 21, 1988, a bomb exploded on a Pan Am 747, resulting in 259 fatalities aboard the aircraft and 11 fatalities on the ground. Aircraft destruction with missiles or gunfire occurs most often as part of military activities or in countries subject to civil war or other conflicts.[26]

Other cases of aircraft destruction were caused by military activities, in particular by missile, both in war and peacetime. Several cases are listed below:

> Bulgaria shot down El Al Flight 402 (1955): On July 27, 1955, an El Al plane carrying 51 passengers and seven crew members was shot down by two fighter jets belonging to the Bulgarian Air Force, after it had gone off course and strayed across the border into western Bulgaria. Everyone on board was killed.[27]
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> Israel shot down Libyan Arab Airlines Flight 114 (1973): On February 21, 1973, Libyan Arab Airlines Flight 114 left Tripoli and, after a brief stopover in Benghazi, began its

1, 2018).

22 *See Global Leadership*, 62:4 ICAO J. 10 (2007).

23 *See The Future of Safety*, 61:1 ICAO J. 5 (2012).

24 J. Arasly, *Terrorism and Civil Aviation Security: Problems and Trends*, 4:1 Q. J. 78 (2005), *available at* http://www.comw.org/tct/fulltext/0503arasly.pdf (last visited on Nov. 10, 2018).

25 T. Schober, I. Koblen & S. Szabo, *Present and Potential Security Threats Posed to Civil Aviation*, 4:2 INCAS Bull. 171 (2016).

26 C. Voster, J. Strong & C. Zorn, *Analyzing Aviation Safety: Problems, Challenges, Opportunities*, 43 Research in Transport Economics 158 (2013).

27 I. Tharoor, *The Terrible History of Passenger Planes Getting Shot out of the Sky*, Wash. Post, July 14, 2014, *available at* https://www.washingtonpost.com/news/worldviews/wp/2014/07/17/the-terrible-history-of-passenger-planes-getting-shot-out-of-the-sky/?noredirect=on&utm_term=.9edc9755c514 (last visited on Nov. 10, 2018).

journey to Cairo with 113 people on board. Tragically, the plane drifted into Israeli airspace over the Sinai Peninsula, then under Israeli control, and was shot down after ignoring repeated requests to change its flight path while under fighter escort.[28]

The Soviet Union shot down Korean Air Lines Flight 007 (1983): On September 1, 1983, the most tragic event in aviation history, associated with the shooting down of a communication aircraft by a fighter, took place. On that day, a Korean Air Lines (KAL) Boeing 747-230B was performing a scheduled flight from New York to Seoul, with a stopover in Alaska (flight KAL007). The first missile, guided by infrared, missed the target, but the second, guided by radar, hit the Boeing, causing decompression and destroying three of its four hydraulic systems. After 12 minutes, the burning Boeing crashed into the sea about 37 km west of Sakhalin, killing all 269 people on board. At the time of being hit, the Boeing was already a few kilometers outside of Soviet airspace.[29]

The US shot down Iran Air Flight 655 (1988): This shoot down by the US Naval Ship occurred on July 3, 1998, toward the end of eight years of Iran-Iraq War and killed 290 civilian passengers.[30]

The Ukrainian Air Force accidentally shot down Siberia Airlines Flight 1812 during an exercise (2001): The flight was shot down by Ukraine's military accidentally by an anti-aircraft missile fired during an exercise; the missile was carrying a warhead, and exploded near the plane, killing all 78 passengers and crew members.[31]

Malaysia Airlines Flight 17 was shot down (2014): The Malaysia Airlines plane was hit by a Russian-made Buk missile over eastern Ukraine. Flight MH17, route from Amsterdam to Kuala Lumpur, was travelling over conflict-hit Ukraine on July 17, 2014. The plane crashed killing a total of 283 passengers, including 80 children, and 15 crew members, who were on board.[32]

28 T. Smith, *Israelis Down a Libyan Airliner in the Sinai, Killing at least 74; Say It Ignored Warnings to Land*, N. Y. Times, Feb. 22, 1973, *available at* https://www.nytimes.com/1973/02/22/archives/israelis-down-a-libyan-airliner-in-the-sinai-killing-at-least-74.html (last visited on Nov. 10, 2018).

29 J. Marszalkiewicz, *Contemporary Threats Facing Air Transport*, 94 Scientific J. Silesian U. Tech. 153 (2017).

30 M. Fisher, *The Forgotten Story of Iran Air Flight 655*, Wash. Post, Oct. 16, 2013, *available at* https://www.washingtonpost.com/news/worldviews/wp/2013/10/16/the-forgotten-story-of-iran-air-flight-655/?utm_term=.e8e2241560bd (last visited on Nov. 10, 2018).

31 Staff reporter, *Ukraine admits missile may have downed Russian plane*, Guardian, Oct. 12, 2001, *available at* https://www.theguardian.com/world/2001/oct/12/russia.israel (last visited on Nov. 10, 2018).

32 *See MH17 Ukraine plane crash: What we know*, BBC News, Sept. 28, 2016, *available at* https://www.bbc.com/news/world-europe-28357880 (last visited on Nov. 10, 2018).

From the incidents above, most of the aircrafts were shot by guided missiles, one of which was caused by an accidental explosion during missile testing.

4. Current Measures to Deal with the Missiles Threat against Civil Aviation

There are some measures to ensure civil aviation safety against the threat of missiles. The latest examples are practiced by the ICAO, Israel and the US. Member States of the ICAO are obligated to investigate serious incidents and accidents in accordance with the standards and recommended practices laid out in Annex 13 (Aircraft Accident and Incident Investigation) of the Chicago Convention. The ICAO states: "The sole objective of the investigation of an accident or a serious incident shall be the prevention of accidents and incidents."[33] This is further reflected in documentations such as the European Directive 94/56/EC in 1994 and national legislations.[34] Although the purpose of this activity is not "to apportion blame or liability," the entire process is also dependent on the quality of investigation in order that any future recommendations are based on a sound assessment of what happened and why.[35]

The 2015 ICAO High-Level Safety Conference ("HLSC"), which followed the inaugural ICAO HLSC in 2010 as per its five-year cycle, was originally expected to focus on ongoing issues of information sharing and protection.[36] However, two dramatic events in 2014 redirected the HLSC to pay its attention to the high-profile topics of aircraft tracking and conflict zone overflight.[37] This was in response to the shooting down of MH17 on July 17, 2014, apparently by a surface to air missile, as it operated over the Dnipropetrovsk flight information region near Donetsk in

33 International Standards and Recommended Practices Aircraft Accident and Incident Investigation Annex 13 to the Convention on International Civil Aviation, ch. 3, *available at* http://www.iprr.org/manuals/Annex13.html (last visited on Nov. 10, 2018). Annex 13 states: "The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability."

34 EU, Council Directive 94/56/EC of 21 November 1994 establishing the fundamental principles governing the investigation of civil aviation accidents and incidents, *available at* https://publications.europa.eu/en/publication-detail/-/publication/d32e616d-a7b2-4abd-9033-23a11b44c146/language-en. For national legislation implemented in UK, *see* The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996, *available at* http://www.legislation.gov.uk/uksi/1996/2798/contents/made (all last visited on Nov. 10, 2018).

35 G. Braithwaite & M. Greaves, *Training Aircraft Accident Investigators through High Fidelity Simulation*, J. Aviation Mgmt. 1 (2009).

36 Safety Spotlight, *supra* note 20, at 6.

37 *Id*.

Eastern Ukraine. A special high-level meeting was held on July 29, which formed a Task Force on Risks to Civil Aviation arising from Conflict Zones. Based on the Task Force recommendations, the ICAO is developing a comprehensive conflict zone risk mitigation work program.[38] The conference recommended that the ICAO establish, as matter of urgency, a simple centralized web-based repository to make information available, which supports the assessment of risks over or near conflict zones. The source of this information should be clearly identified in the repository.[39]

As a multinational institution which deals with civil aviation safety, the ICAO considers the importance of exchange of information as a fundamental tenet for a safe air transportation system, which enables to achieve the objectives of the Global Aviation Safety Plan ("GASP").[40]

Several airlines in the world are already using missile detection systems on-board to fight missile systems.[41] For example, Israel has equipped their El Al airline with Rafael's Britening missile detection system, following El Al Flight 402 incident. This anti-missile systems in Israel has sensors for detecting the incoming missiles, which is triggered by changes in heat in the environment. If this occurs, the Britening system generates a powerful beam of light that interferes with the guiding system of the missiles. It can protect against light-guided missiles, especially during take-off and landing, with the automatic system. The Britening system is based on the Aero-Gem protection system for military helicopters, with costs of around USD 2 millions. Another similar system is the Israeli IAI/Elta Flight Guard, which works in a similar way to the Britening system except that it detects missiles using Doppler radar. Another related Israeli system is the C-MUSIC or Multi Spectral Infrared Countermeasures. It is a system to protect aircrafts from guided infrared missiles fired with hand-held launchers. Its action depends on detecting the firing of a missile and blinding or destroying its infrared tracking head by a strong laser.[42] The US is also developing such technology for civil aircrafts by signing a contract with

38 *Id.* at 11.

39 *Id.*

40 *Id.* at 12. The Global Aviation Safety Plan ("GASP") sets out a strategy which supports the prioritization and continuous improvement of civil aviation safety. The GASP provides a framework for the development and implementation of regional, sub-regional and national plans. Through this document, the ICAO promotes harmonization and coordination of efforts aiming at improving international civil aviation safety.

41 T. Baviskar & A. Patil, *Aircraft Detection and Missile Firing System*, 2:2 IOSR J. Elec. & Comm. Engineering. 9 (2009). Missiles use aircraft detection system including passive sensing means for receiving electromagnetic radiation from a moving object and generating intensity signals representative of the received radiation as well as processing means for subtracting the intensity signals to obtain a differential signature representative of the position of the moving objects.

42 Marszalkiewicz, *supra* note 29, at 158.

BAE Systems to provide this type of equipment. Under this contract, anti-missile systems are to be installed on aircrafts belonging to the American Airlines flying between New York and California. A similar guardian system has been developed by Northrop Grumman, which is a civilian variant of the AN/AAQ-24 (V) Nemesis military system.[43]

However, these countermeasures only highlight the incident risk and are just effective against missiles that are directed to civil aircraft heat without considering the possibility of new threats, such as ballistic missiles.

5. Urgency of Ballistic Missile Regulation for Civil Aviation Safety

The only purpose of a missile is to deliver a warhead to a target. The function of the warhead is to damage the target. The warhead is located in the missile. In most tactical missiles, the warhead is based on conventional chemical explosives called high explosives. They are meant for large-scale destructions of areas with sub-orbital trajectory.[44]

The smaller ones carry nuclear material equivalent to 10-15,000 tons of TNT (a high explosive), while the larger ones are in terms of tens of millions of tons of TNT. Most of the advanced versions of ballistic missiles called MIRVs (Multiple Independently-targeted Re-entry Vehicles) would carry multiple nuclear bombs in each missile.[45] To anticipate a ballistic missile attack, some states, such as the US, have developed Ballistic Missile Early Warning System.[46]

The ballistic missile threat is deemed as fatal, since it can directly crash an aircraft entirely. If the ballistic missile route is close to national or international flight routes, it is deemed dangerous as well, since ballistic missiles could explode at any time considering that some ballistic missiles are still been tested and may fail technically in air whether they are carrying nuclear/chemical/biological weapon or not in their warheads. This could be harmful to civil aviation. The chances of a missile actually

43 *Id.* at 159.

44 A ballistic missile will reach outer space, but its ending route is not in space because it is not created to orbit (sub-orbital). Instead, it will land on an area specified in its ballistic trajectory on the Earth.

45 M. Debnath, *Protection of Inter-Continental Ballistic Missile (ICBM) from Anti-Ballistic Missile (ABM) by Using Anti-Anti Ballistic Missile (AABM)*, 5:8 Int'l J. Engineering & Computer Sci. (2016).

46 M. Stone & G. Banner, *Radars for the Detection and Tracking of Ballistic Missiles, Satellites, and Planets*, 12:2 Lincoln Lab. J. 217 (2000).

hitting an aircraft seemed slim, so that any discussion on the subject would not last long. However, there are now real concerns depicted by a few ballistic missile tests of what regulation or treaty policymakers will use to respond.

One case is North Korea's ballistic missile test[47] with its Hwasong 14 ICBM. Then, the missile came dangerously close, 62 miles, to an Air France flight route carrying more than 330 passengers and actually flew through busy airspace.[48] Although it seemed difficult for North Korea to start any armed attack against the US and its closest allies, this missile test may constitute a serious threat to civil aviation safety.[49]

Another case is a UK passenger plane carrying 189 people that had to take evasive action over Sharm el-Sheikh in August to reportedly avoid a missile in 2015.[50] In this regard, none of these countries proclaimed their territories as prohibited areas as stipulated in Article 9 of the Chicago Convention, to which even North Korea and Egypt are member states. Even if the areas were proclaimed as prohibited areas, because ballistic missiles have long ranges, it would aggressively encroach on the flight routes of civil aviation. Also, it should be recalled that none of the current treaties is binding on these states regarding their ballistic missile proliferation that cause incidents to civil aviation.[51]

If evaluating the efficiency of current counter measures by member states of the ICAO, Israel and the US definitely would have contributed a lot to civil aviation safety. It should be, however, noted that information and data sharing among member states of the ICAO in perfecting risk assessment is a key to preventing future incidents. Meanwhile the urgency of regulating ballistic missiles should be added into its GASP, as the rising number of missile tests may endanger civil aviation safety in the most unpredictable way.

Counter measures taken by Israel and the US to missile detection on board can only be beneficial to first world countries. Even if the technology is feasible and the planes of all airlines could be equipped with missile detection on board, this missile

47 Between 2011 and 2017 (September), Kim Jong Un regime made 88 missile tests. In 2017, North Korea conducted 22 ballistic missile tests with various ranges, further perfecting its technology with each launch. Four missiles exploded or failed before reaching its destination. *See* J. Belinger, *North Korea's missile tests: What you need to know North Korea Missile 'as close as 100km' to Air France Flight*, CNN, Dec. 4, 2017, *available at* http://edition.cnn.com/2017/05/29/asia/north-korea-missile-tests/index.html (last visited on Nov. 11, 2018).

48 *See North Korea missile 'as close as 100km' to Air France flight*, BBC News, Aug. 3, 2017, *available at* http://www.bbc.com/news/world-asia-40816416 (last visited on Nov. 11, 2018).

49 P. Charthand et al., *North Korea: Perfect Harmony between Totalitarianism and Nuclear Capability*, 71:3 Can. Mil. J. 31 (2017).

50 *See British Sharm el-Sheikh flight in 'missile' incident*, BBC News, Nov. 7, 2015, *available at* http://www.bbc.com/news/uk-34754577 (last visited on Nov. 11, 2018).

51 Egypt and North Korea are not member states to the treaties on missile proliferation such as The Hague Code of Conduct against Ballistic Missile Proliferation 2002 and Arms Trade Treaty 2013.

detection would only be useful to jam or destroy missiles directed to the planes and would be unable to detect ballistic missiles that are fired near them, as a ballistic missile has its own trajectory and is not directed to planes. Therefore, the only direct counter measure to regulate a ballistic missile is to prohibit or at least limit its proliferation. This regulation should contain mandatory rules for states that are still implementing ballistic missile tests to be transparent with information, as not all missiles intended for mass destruction are known to be successful. Therefore, such regulation process should comprise a code of conduct, a supervisory board to control ballistic missile proliferation and sanctions to the incompliance by contracting states as well as a body on settlement of dispute in a situation where a ballistic missile causes harm to civil aviation.

The above suggestion is urgently needed to regulate ballistic missile proliferation multilaterally threatening civil aviation. This regulation would contribute to ensuring civil aviation safety, since by 2030, the number of passengers is predicted to reach 6 billion a year and the number of aircraft departures will reach more than 50 million - roughly double that of 2011.[52] Such growth will progressively exert mounting pressure on all aviation systems, many of which are operating at maximum capacity.

6. Conclusion and Recommendations

Missile development during World War II triggered the present concept of military superiority measured by massive proliferation of nuclear weapons and its delivery system, i.e., ballistic missiles. This started from the development of V-2 and has led 31 states to develop ballistic missiles. Several movements and regulations have been created to limit the development of ballistic missiles, such as Missile Technology Control Regime, Anti-Ballistic Missile Treaty, Offensive Strategic Weapon, Intermediate Range Nuclear Forces Treaty, and Hague Code of Conduct against Ballistic Missile Proliferation. However, existing regulations (bilateral or multilateral) on the issue of weapons of mass destruction are not marked as priority. They are characterized by the following features: less multilateral in regulation; less mandatory in nature; voluntary; short-term durations; and easily terminated. These problems indicate that achieving international peace and security by regulating the use of ballistic missiles is not a global priority.

[52] The Future of Safety, *supra* note 23, at 5.

The Chicago Convention marked the development of air law as a reaction to post World War II, because the usage of air was no longer limited to military purposes. The rapid development of civil aviation along with the existence of military actions in air have caused several international incidents, which constitute new threats to civil aviation. Those countermeasures have been taken in response to guided missiles that may attack civil aviation. However, these measures have not made any meaningful effect on ballistic missiles, which are also a potential threat, because of their different nature. Therefore, there is an urgent need to regulate ballistic missiles to ensure civil aviation safety.

The lack of international laws regulating the proliferation of ballistic missiles multilaterally has hampered the effort to overcome or prevent threats to international peace and security. Responding to this issue, a regulation on ballistic missile proliferation with the following features is recommended: binding and multilateral; non-voluntary; and long-term duration. Also, a body should be set up to supervise and control its member states. It will help to prohibit or at least control the proliferation the ballistic usage against civil aviation.

With the rapid development of civil aviation along with military activities in the air, the urgent need to ensure civil aviation safety should be the first priority. The new potential threat of ballistic missiles test against civil aviation should be regulated strictly. The regulation should consist of a code of conduct that is binding in nature, a supervisory board as well as a dispute settlement body. These measures will help to control the proliferation of ballistic missiles and ensure civil aviation safety.