

ABSTRAK

Perkembangan teknologi informasi dan komunikasi telah merevolusi sistem penerbangan sipil global, namun juga meningkatkan kerentanan terhadap serangan siber yang berpotensi mengganggu keselamatan dan keamanan penerbangan. Organisasi Penerbangan Sipil Internasional (ICAO) menanggapi isu ini dengan menetapkan standar dan rekomendasi melalui *Annex 17 (Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference) Chapter 4.9 (Measures Relating to Cyber Threats)* meliputi beberapa indikator penerbangan, antara lain penilaian risiko siber, identifikasi sistem atau data teknologi informasi dan komunikasi, mendeteksi dan merespon ancaman siber, serta perlindungan sistem dan data dari gangguan yang melanggar hukum. Kemudian, terdapat berbagai panduan teknis yang menekankan pentingnya pendekatan kolaboratif antarnegara dan pemangku kepentingan. Penelitian ini bertujuan untuk mengkaji regulasi keamanan siber penerbangan sesuai standar keamanan ICAO, serta menganalisis implementasinya dari perspektif hukum di Amerika Serikat dan Indonesia. Metode penelitian yang digunakan adalah pendekatan yuridis normatif. Spesifikasi penelitian dilakukan secara deskriptif analitis terhadap regulasi yang relevan. Pengolahan data primer dan data sekunder diperoleh melalui studi kepustakaan dan literatur hukum yang dianalisis secara kualitatif. Hasil penelitian menunjukkan, 1) ICAO telah mengeluarkan SARPs yang harus diadopsi oleh negara anggotanya beserta panduan untuk membantu negara anggota dalam menerapkan SARPs tersebut. 2) Amerika Serikat mengembangkan kerangka keamanan siber melalui lembaga federal seperti FAA dan TSA meskipun belum memiliki undang-undang khusus. Sedangkan, Indonesia cenderung mengharmonisasi regulasinya dengan *Annex 17* ICAO melalui Peraturan Menteri Perhubungan Nomor PM 9 Tahun 2024 tentang Program Keamanan Nasional dan penguatan kolaborasi institusional, seperti pembentukan *Indonesia Aviation Sector Computer Security Incident Response Team (IAS-CSIRT)* bersama BSSN.

Kata Kunci: keamanan siber, penerbangan sipil, ICAO, hukum udara, Amerika Serikat, Indonesia.

ABSTRACT

The development of information and communication technology has revolutionized the global civil aviation system, but it has also increased vulnerabilities to cyberattacks that have the potential to disrupt the safety and security of aviation. The International Civil Aviation Organization (ICAO) has responded to this issue by establishing standards and recommendation through Annex 17 (Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference) Chapter 4.9 (Measures Relating to Cyber Threats) covering several aviation indicators, including cyber risk assessment, identification of information and communication technology systems or data, detecting and responding to cyber threats, and protection of systems and data from unlawful interference. Then, there are various technical guidelines that emphasize the importance of a collaborative approach among countries and stakeholders. This research aims to examine aviation cybersecurity regulations in accordance with ICAO security standards, as well as to analyze their implementation from a legal perspective in the United States and Indonesia. The research method used is a normative juridical approach. The research specification is conducted descriptively analytically on relevant regulations. The processing of primary and secondary data is obtained through literature studies and legal literature which are analyzed qualitatively. The results of the study show that, 1) ICAO has issued SARPs that must be adopted by its member states along with guidelines to assist member states in implementing these SARPs. 2) The United States has developed a cybersecurity framework through federal agencies such as the Federal Aviation Administration FAA and TSA, although it does not yet have a specific law. Meanwhile, Indonesia tends to harmonize its regulations with ICAO Annex 17 through the Peraturan Menteri Perhubungan Nomor PM 9 Tahun 2024 tentang Program Keamanan Nasional and strengthening institutional collaboration, such as the establishment of the Indonesia Aviation Sector Computer Security Incident Response Team (IAS-CSIRT) together with BSSN.

Keywords: *cybersecurity, civil aviation, ICAO, air law, the United States, Indonesia.*