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A Study on the Standards for Depicting Heliport Charts in Aeronautical Information Services Based on PR Number 6 of 2023 MOS 175-01 Aeronautical Chart

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ABSTRACT

Heliports play a vital role in supporting urban mobility and emergency medical services, necessitating accurate and standardized aeronautical information to maintain aviation safety. The heliport chart, as a specialized type of aeronautical chart, serves as the primary medium for disseminating this information. However, current official charts in Indonesia display significant inconsistencies and missing data, potentially leading to misinterpretation by pilots. This study assesses the adequacy of existing internal standards for heliport chart production and their alignment with the Ministry of Transportation Regulation (PR) No. 6 of 2023, which governs the depiction of aeronautical charts under MOS 175-01. A qualitative approach was employed, including comparative analysis of published heliport charts, direct observation, and semi-structured interviews with cartographic personnel at AIS units in Jakarta and Denpasar. The results reveal that the current standard operating procedures (SOPs) are overly generic, lack specific provisions for heliport facilities, and fail to fulfill regulatory requirements. These deficiencies result in inconsistent chart content, omission of critical operational information, and reduced production efficiency. To address these issues, it is recommended to develop a distinct and detailed standard dedicated to heliport chart production in compliance with PR 6 of 2023. Such standardization is crucial to ensure clarity, completeness, and consistency of heliport charts, ultimately enhancing both flight safety and cartographic workflow effectiveness.

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INTRODUCTION

Aviation safety critically depends on the availability of accurate, up-to-date, and standardized aeronautical information, which is disseminated through various information services including aeronautical charts [1], [2]. Among the key products developed by Aeronautical Information Service (AIS) units is the aeronautical chart—defined by the International Civil Aviation Organization (ICAO) as a graphical representation of a portion of the earth's surface, its culture, and relief, specifically designed to meet the requirements of air navigation [3].

ICAO Document 8697 categorizes aeronautical charts into mandatory, non-mandatory, and conditional publications [3]. For ICAO member states such as Indonesia, the Aerodrome/Heliport Chart is classified as mandatory. In parallel with technological advancements and the increased use of helicopters in urban mobility, emergency response, and industrial operations, the need for accurate and well-structured heliport charts has become more critical [4]. A heliport is defined as a designated area, either on land or a structure, used for the arrival and departure of helicopters [5].

In Indonesia, the task of drafting heliport charts is assigned to regional AIS units. These units operate under a centralized framework using internal standards that, although applicable to aerodrome charts, are general in nature and not specifically tailored to heliport needs. According to PR Number 6 of 2023, the depiction of aeronautical data on charts must be accurate, unambiguous, complete, and legible to support safe flight operations.

Preliminary reviews indicate that many existing heliport charts exhibit inconsistencies with regulatory standards. Such discrepancies can lead to misinterpretation by pilots, potentially compromising flight safety [6]. Studies have shown that perceptual errors—such as misreading altitude or distance from chart visuals—are a contributing factor in helicopter accidents, often categorized as pilot error [7].

This context reveals a critical gap between internal procedural standards and national regulatory mandates. Therefore, the focus of this study is to evaluate the degree of conformity between the internal heliport chart drafting procedures and the stipulations of PR Number 6 of 2023, as well as to assess the impact of these standards on the efficiency of the chart production workflow and the consistency of the final output.

METHODS

This study is qualitative research that systematically and accurately describes the facts and nature of the research object. It focuses on the process of drawing heliport charts and the conformity of the standards used at the Regional Aeronautical Information Service (AIS) Units in Denpasar and Jakarta. The object of study includes the quality of the standards, the level of compliance, the conformity of the drawings, and the completeness of the information presented. This research does not use the term "population" but instead refers to the "social situation" at the Denpasar and Jakarta Regional AIS Units, which involves the cartographers as actors and the activities they perform [8], [9].

The sample was selected using a purposive sampling technique, where the researcher intentionally selects individuals considered to have mastery of the subject matter [8], [10]. The primary informants are the cartographers at the AIS Units in Denpasar and Jakarta. A total of seven informants were involved, selected based on their experience in creating heliport charts. Each informant participated in a semi-structured interview lasting approximately 20 minutes.

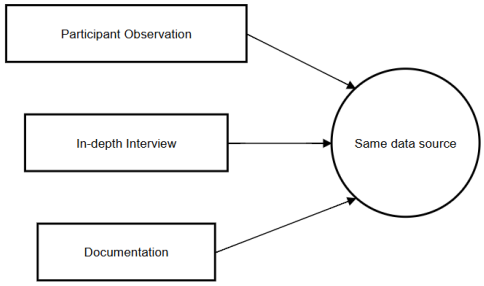

Figure 1 Data Triangulation

To ensure data validity and credibility, this research employed a sequential data collection process grounded in data triangulation [8]. The process began with participant observation, conducted over a one-month period from January to February 2025. The researcher was directly involved in the daily activities at the AIS units, allowing for an in-depth observation of the cartographers' work processes. This initial phase was crucial for identifying a potential problem regarding inconsistencies in chart production [11].

Following the observation phase, semi-structured interviews were conducted with the seven selected informants to explore the problems that had been identified. This method allowed for a more open discussion to understand the cartographers' perspectives on the challenges they face. The findings from both observation and interviews were then verified against a gap analysis. This analysis involved a detailed comparison between the published heliport charts (the actual condition) and the technical requirements stipulated in PR 6 of 2023 (the ideal condition). Throughout the process, a documentation technique was also used, involving the collection of relevant documents and photos to support the findings [12].

The main instrument in this research is the author, who aims to deeply understand the context and research object in order to objectively collect and analyze data [8]. The data analysis technique used is data reduction, which involves filtering, focusing, and organizing relevant information from the raw data. Data display is conducted in the form of descriptive narratives and comparison tables showing the results of the gap analysis. Finally, conclusion drawing is performed to answer the established research questions.

Table 1 Research Design

Research Stage	Activities Performed	Output
Preparation	a. Determination of the research topic b. Reading relevant literature c. Conducting participatory observationd. Creating the research proposal	Research Proposal
Data Collection	a. Conducting interviews related to the research problem b. Performing a gap analysis of all heliport charts against Regulation PR 6 of 2023	Data on the standards used for creating heliport charts and the discrepancies of each chart.
Analysis and Development	a. Analysis of the compliance of the standards used with applicable regulations b. Analysis of the impacts caused by the use of the standards c. Devising solutions for the resulting impacts	Analysis results and solutions to address the problems.
Composition	a. Writing the final project b. Presenting the final project	Final Project

RESULT AND DISCUSSION

The data processing for the Aeronautical Information Publication (AIP), specifically for the Aerodrome (AD) section and the drafting of non-procedural charts like heliport charts, is currently conducted at the Regional PIA (Aeronautical Information Services). This drafting process refers to internal standards, namely STD. 12 Standar *Chart* di PIA Wilayah and JKS. 02 Pembuatan *Chart.* Based on observations, the submission of new or updated heliport data is made via a request letter with a form intended for general AIP data, not specifically for chart drafting. Consequently, the existing standards are only general in nature and do not provide detailed specifications for heliport facilities as stipulated in the Minister of Transportation Regulation (PR) 6 of 2023.

A case study on the creation of the Mason Elephant Park Heliport Chart demonstrates a workflow that begins with data submission, verification, and classification, leading to the drafting process. The drafting stage involves three main steps:

- Initial Plotting: Determining coordinates on Google Earth.
- Vector Digitization: Converting raster data into vector format using AutoCAD.

- Cartographic Refinement: Finalizing visual elements such as symbology, colors, and text using Adobe Illustrator.

The information currently displayed on the chart includes symbols, TLOF, FATO, safety area (if available), building silhouettes (for elevated heliports), a true north arrow, scale, the Heliport Reference Point (HRP), runway characteristics, frequency, and the heliport type.

The lack of specific guidance leads to several problems. Cartography personnel face confusion in selecting which information is mandatory to display. To overcome this, they sometimes refer to international documents, such as ICAO annexes, or copy existing charts. This practice causes inconsistencies, as each cartographer has a different workflow.

Table 2 Gap Analysis

Category	No.	Ideal Condition	Actual Condition	Gap	Impact
Header	1.	Type of Publication: The publication type and its identification must be displayed in bold capital letters.	Displayed according to regulations, but some are not labeled with "-ICAO".	Inconsistency in the notation of the chart type was identified.	Potentially slows down the visual identification of the chart type.
	2.	Heliport Reference Point (HRP): Must be displayed using ° (deg), ' (min), " (sec) symbols with center text alignment.	Displayed in the correct format, but many use "ARP" as the abbreviation instead of "HRP".	Non-compliance of the abbreviation code used and the availability of HRP.	Causes differences in reader interpretation.
	3.	Heliport Elevation: Must be displayed in feet.	Listed in feet as per regulations, but a majority use the term "AD ELEV".	Inconsistency identified in the use of "HELIPORT ELEV" vs. "AD ELEV" on several charts.	Creates information ambiguity.
	4.	Page of Chart: The page number is displayed along with the location indicator.	Listed according to regulations, but not all heliports have a location indicator.	Identified that some heliports do not yet have a location indicator.	Facilitates page identification on the chart.
	5.	Name of Province: The province name must be displayed in capital letters.	Listed according to applicable regulations.	No gap identified.	Facilitates identification of the heliport's location.
	6.	Name of Heliport: The heliport name must be displayed with a capital letter at the beginning of each word.	Listed according to applicable regulations.	No gap identified.	Facilitates identification of the heliport's name.
Footer	1.	Producing Organization: The name must be displayed with a capital letter at the beginning of each word.	Available according to applicable regulations.	No gap identified.	Provides authority and validity to the chart information.
	2.	Number of Publication: The publication number must be written in capital letters.	Available according to applicable regulations.	No gap identified.	Establishes a controlled and verifiable information documentation system.
	3.	Effective Date: The effective date must be displayed.	Available according to applicable regulations.	No gap identified.	Facilitates identification of the chart's effective date.

Table 2 Gap Analysis (Continued)

Category	No.	Ideal Condition	Actual Condition	Gap	Impact
Content	1.	Unit of Measurement: A. Indicates units used. B. Elevation in feet. C. Bearing in magnetic.	All heliport charts show the Unit of Measurement according to regulations.	No gap identified.	Interoperability is ensured.
	2.	Magnetic Variation: Variation changes every 5 years, and the year must be displayed.	Listed according to regulations, but not all heliports have magnetic variation data.	Only Altius Resida and Bali Helitour heliports display magnetic variation.	The completeness of information on the map is reduced.
	3.	Annual Rate of Change: Can change every 5 years, and the year must be displayed.	Listed according to regulations, but only Altius Resida and Bali Helitour heliports display it.	Only Altius Resida and Bali Helitour heliports display the Annual Rate of Change.	The completeness of information on the map is reduced.
	4.	True North: A true north arrow with a variation arrow must be displayed.	Listed according to regulations on all heliport charts.	No gap identified.	Facilitates the reader's identification of direction.
	5.	Coverage and Scale: A. Scale must cover the entire chart. B. A scale bar must be shown. C. Units in meters and feet.	Listed and covers the entire heliport area.	No gap identified.	The chart can display all parts of the heliport.
	6.	Heliport Type: The type (surface-level, elevated, helideck) must be displayed.	One heliport was identified that does not list the type as per regulations.	Cengkareng Heliport does not specify its heliport type.	Causes interpretation difficulties for users.
	7.	TLOF (Touchdown and Lift-off Area): Must include: A. Dimensions, B. Slope, C. Surface Type, D. Bearing strength, E. Coordinates.	TLOF is depicted on the chart and noted in a table, but with inconsistencies.	The diagram does not indicate TLOF location, the description lacks surface type, and each heliport uses a different format.	Potentially reduces the reader's situational awareness.
	8.	FATO (Final Approach and Take-off Area): Must include: A. FATO Type, B. True bearing, C. Dimensions, etc.	FATO is shown in diagrams and text, but information is incomplete, especially points A and C.	Information is consistent with existing AIP, but points A (FATO Type) and C (Designation) are not available.	Reduces the reader's situational awareness.
	9.	Safety Area: Must include: A. Length, B. Width, C. Surface Type.	Information is not available in the existing AIP or on the chart.	The actual condition does not meet regulatory standards.	Implies a decrease in operational safety and security.
	10.	Helicopter Taxiway/Taxi-route: Must include: A. Length, B. Width, C. Surface Type.	Available on some heliports as a diagram but without details on length, width, or surface type.	There is no information regarding length, width, and surface type.	Causes operational confusion.
	11.	Helicopter Stand: Coordinates for the stand must be provided.	Only Cengkareng Heliport has multiple stands with coordinates.	Not all heliports have or list multiple helicopter stands.	Data accuracy is increased (when present).

Table 2 Gap Analysis (Continued)

Category	No.	Ideal Condition	Actual Condition	Gap	Impact
Content	12.	Clearway: Must include: A. Length, B. Ground profile.	Information is not available in the existing AIP or on the chart.	Does not comply with applicable regulations.	Potentially reduces the level of safety.
	13.	Visual Aids: Markings and lighting for FATO and TLOF.	Visual Aids are displayed according to regulations.	No gap identified.	Ensures operational safety and efficiency.
	14.	Obstacle: The type and height of obstacles (in feet or meters).	Obstacles are displayed using appropriate symbols.	Does not show the obstacle's height.	Limits the reader's ability to determine obstacle clearance.
	15.	Declared Distances: Must include: Take-off distance available, Rejected take-off distance available, Landing distance available.	No information is available in the existing AIP or on the chart.	Not available as required by regulations.	Risks endangering safety and increases the risk of emergencies.
	16.	Important Operational Buildings: Must be depicted on the chart.	The depiction of buildings on the chart matches actual conditions.	No gap found.	Increases situational awareness of key infrastructure.
	17.	ATS Communication Facilities: Communication equipment and frequencies must be displayed.	Communication tools are displayed as text with frequencies, but in inconsistent formats.	Some are shown as symbols and others only as text.	The consistency of data provision is reduced.

A gap analysis of eight heliport charts in Indonesia, based on PR 6 of 2023, identified several significant shortcomings:

- General Information: Many charts do not include the ICAO location indicator because not all heliports are registered.
- Terminology: There are inconsistencies in terminology, such as the continued use of "Aerodrome Reference Point" (ARP) and "Aerodrome Elevation" instead of the correct "Heliport Reference Point" (HRP) and "Heliport Elevation". Accuracy in coordinate data is a crucial matter that can affect operational safety [13]
- Safety Data: Vital information such as the safety area and clearway is often not depicted. TLOF and FATO data are also frequently incomplete. The absence of this data can reduce a pilot's situational awareness, which is a critical factor in accident prevention [14].
- Obstacle Information: Although obstacle symbols are displayed, their height is not included. This makes it difficult for pilots to accurately calculate obstacle clearance [15].
- Absence of Declared Distances: This data is important for enhancing situational awareness during takeoff and landing. The lack of this data increases operational risk [14].

These gaps are largely caused by incomplete data submitted by the applicants. Presenting incomplete data on aeronautical charts can be a contributing factor to accidents, considering that the human factor is the primary cause of 80% of aviation incidents [14].

Chart standardization is essential to help pilots and other users interpret them correctly [16]. The current standards in use are STD. 12 Standar Chart di PIA Wilayah and the prevailing regulation, PR 6 of 2023 concerning the Technical and Operational Standards part 175-01 (Manual of Standards) Aeronautical Chart. Clarity on aeronautical charts is critical for maintaining safety [16]. Standard compliance is very closely related to human error in aviation safety [17], as personnel cannot work effectively and efficiently without appropriate standardization. Aspects within a standard should be differentiated into three categories: critical data that must be provided, data that is important but optional, and supplementary data [18].

Interviews indicate that the drafting process follows STD. 12 and JKS. 02. While these two documents provide a structured workflow, their content is general for both Aerodrome/Heliport Chart-ICAO and non-procedural charts. They mostly provide detailed specifications for aerodrome charts and lack specific details for heliport facilities. This represents a discrepancy with PR 6 of 2023 regarding MOS 175-01, which contains Chapter XIII that specifically regulates mandatory aspects for Aerodrome/Heliport Maps – ICAO and provides explicit details on aspects needed for heliport charts. This non-compliance is proven through a gap analysis, which found that many mandatory aspects from PR 6 of 2023 are not included in existing charts. The most significant gaps were the absence of critical facility data—such as the heliport reference point, safety area, helicopter taxiway, and clearway—on most charts, as well as several differences in the use of abbreviation codes.

The use of non-uniform abbreviation codes forces the reader to perform additional interpretation, which can increase the risk of error. This points to inaccuracies and inconsistencies in the presented data, whereas data accuracy and consistency are the foundation of a reliable aeronautical information system [19]. Consistency in data presentation is crucial for reducing information search time and preventing interpretation errors by the reader [20]. Furthermore, information on the TLOF and FATO is incomplete, even though both are depicted with detailed information in table form. Declared distance information, which is crucial for performance calculations on a helipad, is entirely unavailable on all charts.

The use of STD. 12 for drafting heliport charts results in an inefficient workflow for cartographers. A well-designed chart is crucial to avoid creating confusion that could distract the reader. When the standard being used is only general and fails to provide specific instructions, it compels cartographers to make subjective decisions. This increases their workload, the potential for errors, and the likelihood of requiring repeated revisions [21].

Non-compliant standards directly affect the work efficiency and effectiveness of cartography personnel at the Regional PIA Unit [22]. A standard that is general and not specific to heliports forces personnel to continuously perform their own interpretations. Instead of simply following clear guidance from a standard, staff must search for precedents to use as examples, even though these existing charts are also inconsistent. This increases the cognitive load and the time needed to complete a chart, as the process becomes based on personal judgment rather than on regulations.

A lack of clarity in the standard leads to differing interpretations between drafter personnel and Quality Control (QC) personnel. Based on observations, this results in an inefficient revision cycle caused by these different perceptions. A standard that does not align with regulations also creates a dependency on originator data. Personnel have limited authority to demand complete data such as the safety area, clearway, declared distances, and magnetic variation.

Accurate data is essential for safety and operational efficiency [19]. Data originators need to be aware of the mandatory data that must be provided or submitted to an AIS Officer. Likewise, personnel must know which mandatory data must be available on the chart. In practice, personnel are forced to adapt to the submitted data because the required information is not available, and in some cases, personnel are not even aware of what data must be reported. The regulation of color in charts is also necessary; coloring and differences in intensity can make it easier for readers to find and focus on information [18].

Difficulty in maintaining product consistency is the final impact of this non-compliant standard. According to the gap analysis results, one chart can have a completely different format from another. This is not caused by a lack of personnel competence, but rather by the standard's non-compliance with applicable regulations.

CONCLUSION

Based on the research, it can be concluded that the standard currently used for drafting heliport charts in Indonesia does not fully comply with regulation PR 6 of 2023. This non-compliance is evident from the gaps identified between existing published charts and the mandatory requirements outlined in Chapter XIII for Aerodrome/Heliport Maps – ICAO. The root cause of this disparity is systemic and can contribute to human error. Specifically, the failure to separate the standards for aerodrome charts and heliport charts within the STD. 12 document creates ambiguity for cartography personnel and fosters a high dependency on data from originators, which is often incomplete. Moreover, the required

completeness of information must be regulated, recognizing that not all heliports have the same data available.

This study is specifically confined to an analysis of the standards for heliport chart depiction as implemented by the Jakarta and Denpasar Regional Aeronautical Information Service (AIS) Units. The primary objective is to assess the conformity of current standards against the regulations stipulated in PR 6 of 2023 regarding the Technical and Operational Standards for Aeronautical Charts (Part 175-01). Furthermore, the research investigates the subsequent impact of these standards on the effectiveness of charts published on the iWISH platform.

The negative impacts stemming from this non-compliant standard are significant. These consequences include product inconsistency, where heliport charts vary in format and data completeness; a reduction in safety for pilots; and workflow inefficiencies that result in high workloads, an increased potential for errors, and the likelihood of multiple revisions on specific chart aspects.

It is recommended to update the internal standard, STD. 12, by creating a distinct standard for heliport charts that is separate from aerodrome charts. This new heliport standard should be developed by adopting the aspects outlined in MOS 175-01, Chapter XIII, in order to establish clear and mandatory information requirements, thereby providing an unambiguous guide for personnel. Secondly, to enhance data quality, the submission mechanism should be strengthened by separating the application forms for charts from those for the general AIP and the Letter of Operational Coordination Agreement (LOCA), and it is recommended that subsequent research evaluates how well pilots understand various heliport chart formats, with the aim of creating a new standard prototype that incorporates their feedback. It is recommended that the scope of future research be extended to encompass the development of a comprehensive standard, followed by its practical implementation and validation within the operational heliport chart production workflow.

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