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VALIDATION OF STANDARD INSTRUMENT DEPARTURE (SID) NAMING AT SEAHORSE AIRPORT AS A LEARNING MEDIA FOR AERODROME AND APPROACH CONTROL PROCEDURES

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ABSTRACT

The naming of the Standard Instrument Departure (SID) at Seahorse Airport is a crucial element in the learning process of Aerodrome Control Procedure (ADC) and Approach Control procedure (APP). This study aims to validate the naming of the SID at Seahorse Airport as a learning media for ADC and APP. Although it plays an important role in improving cadets' understanding and skills, the implementation of SID at the Surabaya Aviation Polytechnic has not been optimal, as cadets still prepare ATC Clearance manually. This research refers to ICAO Doc 4444 on Air Traffic Management and the principles of SID implementation at other airports. The research method used is Research and Development (R&D) with the ADDIE model (Analysis – Design – Development – Implementation – Evaluation). A literature review was also conducted to examine the relevance and effectiveness of SID in the context of safety and clear communication in ATC. The results indicate that the designed SID naming has been validated by several experts and has proven effective in enhancing students' understanding. Training simulations using the SID naming show a significant improvement in communication efficiency and students' skills. The SID naming is expected to be integrated into the curriculum to enhance the quality of aviation education.

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1. INTRODUCTION

The Air Traffic Controller Study Program (D3 LLU) is oSne of the study programs at the Surabaya Aviation Polytechnic that trains students to become Air Traffic Controllers (ATCs) (Cahyadi et al.,

2022). The LLU program educates future associate experts who will work in the aviation sector, specifically in air traffic control services (Ahmad et al., 2024). To ensure the safety and efficiency of air traffic, Air Traffic Services (ATS) play a central role in airspace management (Guo et al.,2023).

One important aspect of ATC is the issuance of ATC Clearance, which is authorization from ATC allowing an aircraft to proceed with its flight under specified conditions (ICAO, 2016). The purpose of ATC Clearance is to prevent collisions and regulate aircraft movements effectively within the airspace (Gyles &. Bearman, 2017). ATC Clearance consists of ACC Clearance and APP Clearance. ACC Clearance is authorization from the Area Control Center (ACC) to regulate the aircraft's route and altitude within the en-route airspace (Diffenderfer et al., 2018b). APP Clearance is authorization from Approach Control to guide the aircraft toward landing, ensuring its path and altitude comply with procedures (Diffenderfer et al.,2018a).

The Standard Instrument Departure (SID) is part of APP Clearance, containing standardized procedures designed to manage aircraft from takeoff until reaching the en-route phase, following predetermined routes to maintain safety and efficiency (Bikir et al., 2024). SID is used after receiving ACC Clearance to proceed at cruising altitude (Chandra et al., 2024).

In the Aerodrome Control Tower (ADC) and Approach Control (APP) Procedural training at the Surabaya Aviation Polytechnic, students still prepare ATC Clearances manually. The following are other issues found in writing SIDs during ADC and APP practice sessions:

a. Not aligned with real conditions where the airport has existing SIDs.
b. Overly lengthy entries on Flight Progress Strips (FPS).
c. Poor formatting in writing APP Clearance.
d. Prolonged delivery of departure clearance from ATC to pilot.
e. Insufficient space in FPS columns for writing clearance.

This study aims to validate the SID naming design for Seahorse Airport as a learning medium, involving experts in the field of air navigation and air traffic services. The results of this validation are expected to serve as a foundation for developing a more realistic, standardized, and applicable ATC procedure learning medium.

2. METHODS

The In this study, the author employed a Research and Development (R&D) approach using the ADDIE instructional design model (Analysis–Design–Development–Implementation–Evaluation) developed by Dick and Carey in 1996. This model serves as a generic framework for designing efficient, effective, and dynamic learning or training programs that support the performance of training activities (Amalia et al., 2021). Sugiyono (2013) emphasizes that research methodology is a scientific way to obtain valid data in order to discover and develop knowledge (Sugiyono, 2013).

This research applies the R&D approach with the ADDIE model to validate the naming of the Standard Instrument Departure (SID) at Seahorse Airport as a learning medium for Aerodrome Control and Approach Control procedures. The main objective of this study is to enhance the effectiveness of air traffic control training at the Surabaya Aviation Polytechnic.

The R&D process in this study follows the structured procedure developed by Robert Maribe Branch, which consists of:

a. Analysis – Identifying the needs and challenges in learning ADC and APP procedures.
b. Design – Designing SID names in accordance with ICAO standards and training requirements.
c. Development – Developing learning materials and training aids based on SID naming.
d. Implementation – Conducting trials of the materials and aids in training simulations for students.
e. Evaluation – Gathering feedback from participants and validators to assess the effectiveness of

SID naming in improving students' understanding and skills.

Through this approach, SID naming is expected to serve as an effective tool for improving the quality of aviation education.

3. FINDINGS AND DISCUSSION

Based on the design process carried out by the author regarding the SID design for Aerodrome Control Procedure and Approach Control Procedure training, the research findings and discussion are presented for each stage using the ADDIE model.

3.1. Analysis Results

The analysis at the Surabaya Aviation Polytechnic identified significant issues in Air Traffic Management practicums, particularly in Aerodrome Control Procedure and Approach Control Procedure. These issues affect students' understanding as well as the efficiency and safety of air traffic control. A comparison between operations with and without Standard Instrument Departure (SID) shows that SID provides standardized departure routes, time efficiency, enhanced safety, and better coordination, whereas operations without SID may increase the risk of collisions and procedural complexity

3.2. Design Results

The outcome of the design stage presents the naming design for the Standard Instrument Departure at Seahorse Airport for Runway 34L, Runway 34R, Runway 16L, and Runway 16R, each directed toward several destination airports.

Table 1. Naming the Standard Instrument Departure.

No	*Runway*	*Destination*	SID
1	34L	SANS	*BURSA ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W13 to Bursa*
			BURSA TWO ALPHA DEPARTURE *Take Off RWY 34L, TR 060° ≥ W11 ≥ QDR 317° TF NDB ≥ W13 to Bursa*
		SATF/SABD	*COMET ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W12 to Comet*
			COMET TWO ALPHA DEPARTURE *Take Off RWY 34L, TR 060° ≥ W11 ≥ QDR 011° TF NDB ≥ W12 to Comet*
		SAEN/SANF	*CORAL ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W11 to Coral*

				CORAL TWO ALPHA DEPARTURE *Take Off RWY 34L, TR 060° ≥ W11 to Coral*
2	34R	SAGL	*DORIN ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W13 to Dorin*	
				DORIN TWO ALPHA DEPARTURE *Take Off RWY 34L, TR 080° ≥ W13 to Dorin*
		SASK	*ECTOR ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W12 ≥ W12E to Ector*	
				ECTOR TWO ALPHA DEPARTURE *Take Off RWY 34L, TL 245° ≥ W12 ≥ W12E to Ector*
		SAUW/SAFD	*POLAR ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W12 to Polar*	
				POLAR TWO ALPHA DEPARTURE *Take Off RWY 34L, TL 245° ≥ W12 to Polar*
		SAPT/SAST	*AMBER ONE ALPHA DEPARTURE* *Take Off RWY 34L, DCT BTF VOR ≥ W11 to Amber*	
				AMBER TWO ALPHA DEPARTURE *Take Off RWY 34L, TL 300° ≥ W11 to Amber*
		SANS	*BURSA ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W13 to Bursa*	
				BURSA TWO BRAVO DEPARTURE *Take Off RWY 34R, TR 060° ≥ W11 ≥ QDR 317° TF NDB ≥ W13 to Bursa*
		SATF/ SABD	*COMET ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W12 to Comet*	
				COMET TWO BRAVO DEPARTURE *Take Off RWY 34R, TR 060° ≥ W11 ≥ QDR 011° TF NDB ≥ W12 to Comet*

3	16L	SAEN/SANF	*CORAL ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W11 to Coral*
			CORAL TWO BRAVO DEPARTURE *Take Off RWY 34R, TR 060° ≥ W11 to Coral*
		SAGL	*DORIN ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W13 to Dorin*
			DORIN TWO BRAVO DEPARTURE *Take Off RWY 34R, TR 080° ≥ W13 to Dorin*
		SASK	*ECTOR ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W12 ≥ W12E to Ector*
			ECTOR TWO BRAVO DEPARTURE *Take Off RWY 34R, TL 245° ≥ W12 ≥ W12E to Ector*
		SAUW/SAFD	*POLAR ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W12 to Polar*
			POLAR TWO ALPHA DEPARTURE *Take Off RWY 34R, TL 245° ≥ W12 to Polar*
		SAPT/SAST	*AMBER ONE BRAVO DEPARTURE* *Take Off RWY 34R, DCT BTF VOR ≥ W11 to Amber*
			AMBER TWO BRAVO DEPARTURE *Take Off RWY 34R, TL 300° ≥ W11 to Amber*
3	16L	SANS	*BURSA ONE CHARLIE DEPARTURE* *Take Off RWY 16L, TL 070° ≥ QDM 040° TF NDB ≥ QDR 317° TF NDB ≥ W13 to Bursa*
			BURSA TWO CHARLIE DEPARTURE *Take Off RWY 16L, TR DCT BTF VOR ≥ W13 to Bursa*
		SATF/SABD	*COMET ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDR 040° SH NDB ≥ QDR 011° TF NDB ≥ W12 to Comet*

			COMET TWO CHARLIE DEPARTURE *Take Off RWY 16L, TL 070° ≥ QDM 040° TF NDB ≥ QDR 011° TF NDB ≥ W12 to Comet*
		SAEN/SANF	*CORAL ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDR 040° SH NDB ≥ W11 to Coral*
			CORAL TWO CHARLIE DEPARTURE *Take Off RWY 16L, TL 070° ≥ QDM O4O° TF NDB ≥ W11 to Coral*
		SAGL	*DORIN ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDR 079° SH NDB ≥ W13 to Dorin*
			DORIN TWO CHARLIE DEPARTURE *Take Off RWY 16L, TL 110° ≥ QDR 079° SH NDB ≥ W13 to Dorin*
		SASK	*ECTOR ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDR 200° SH NDB ≥ W12E to Ector*
			ECTOR TWO CHARLIE DEPARTURE *Take Off RWY 16L, TR 250° ≥ QDM 280° BT NDB ≥ W12E to Ector*
		SAUW/SAFD	*POLAR ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDM 280° BT NDB ≥ W12 to Polar*
			POLAR TWO CHARLIE DEPARTURE *Take Off RWY 16L, TR 250° ≥ QDM 280° BT NDB ≥ W12 to Polar*
		SAPT/SAST	*AMBER ONE CHARLIE DEPARTURE* *Take Off RWY 16L, DCT SH NDB ≥ QDM 280° BT NDB ≥ QDR 299° BT NDB ≥ W11 to Amber*
			AMBER TWO CHARLIE DEPARTURE *Take Off RWY 16L, TR 250° ≥ QDM 280° BT NDB ≥ QDR 299° BT NDB ≥ W12 to Amber*
4	16R	SANS	*BURSA ONE DELTA DEPARTURE* *Take Off RWY 16R, TL 070° ≥ QDM 040° TF NDB ≥ QDR 317° TF NDB ≥ W13 to Bursa*
			BURSA TWO DELTA DEPARTURE *Take Off RWY 16R, TR DCT BTF VOR ≥ W13 to Bursa*

SATF/SABD	*COMET ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDR 040° SH NDB ≥ QDR 011° TF NDB ≥ W12 to Comet*
	COMET TWO DELTA DEPARTURE *Take Off RWY 16R, TL 070° ≥ QDM 040° TF NDB ≥ QDR 011° TF NDB ≥ W12 to Comet*
SAEN/SANF	*CORAL ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDR 040° SH NDB ≥ W11 to Coral*
	CORAL TWO DELTA DEPARTURE *Take Off RWY 16R, TL 070° ≥ QDM O4O° TF NDB ≥ W11 to Coral*
SAGL	*DORIN ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDR 079° SH NDB ≥ W13 to Dorin*
	DORIN TWO DELTA DEPARTURE *Take Off RWY 16R, TL 110° ≥ QDR 079° SH NDB ≥ W13 to Dorin*
SASK	*ECTOR ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDR 200° SH NDB ≥ W12E to Ector*
	ECTOR TWO DELTA DEPARTURE *Take Off RWY 16R, TR 250° ≥ QDM 280° BT NDB ≥ W12E to Ector*
SAUW/SAFD	*POLAR ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDM 280° BT NDB ≥ W12 to Polar*
	POLAR TWO DELTA DEPARTURE *Take Off RWY 16R, TR 250° ≥ QDM 280° BT NDB ≥ W12 to Polar*
SAPT/SAST	*AMBER ONE DELTA DEPARTURE* *Take Off RWY 16R, DCT SH NDB ≥ QDM 280° BT NDB ≥ QDR 299° BT NDB ≥ W11 to Amber*
	AMBER TWO DELTA DEPARTURE *Take Off RWY 16R, TR 250° ≥ QDM 280° BT NDB ≥ QDR 299° BT NDB ≥ W12 to Amber*

3.3. Development Results

The researcher developed the SID Charts for Seahorse Airport, which will serve as a learning aid in aerodrome and approach control procedure training. The following are the SID Charts for Seahorse Airport for Runway 34L, Runway 34R, Runway 16L, and Runway 16R.

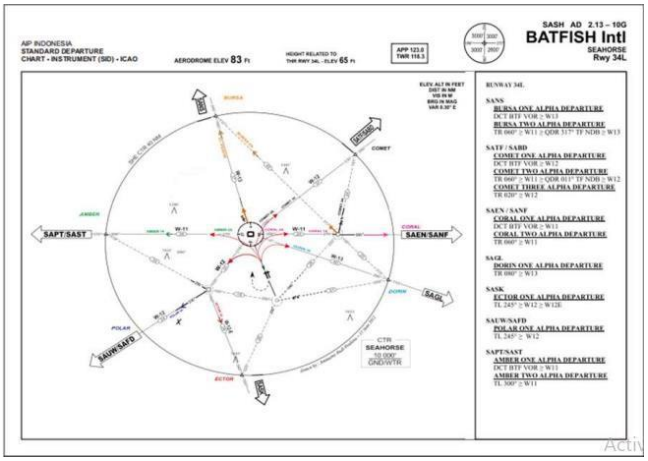

Figure 1. Chat SID Runway 34L

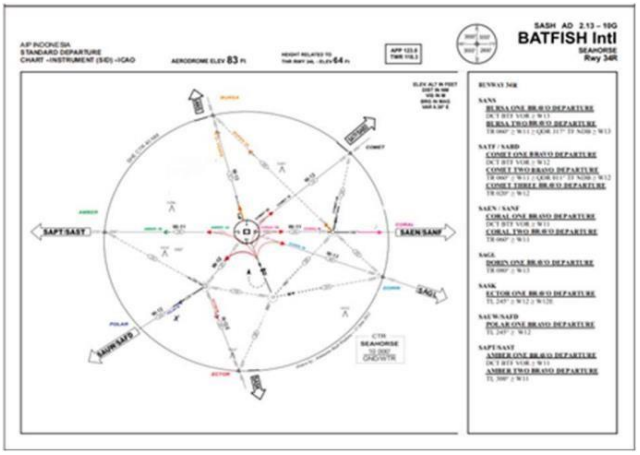

Figure 2. Chat SID Runway 34R

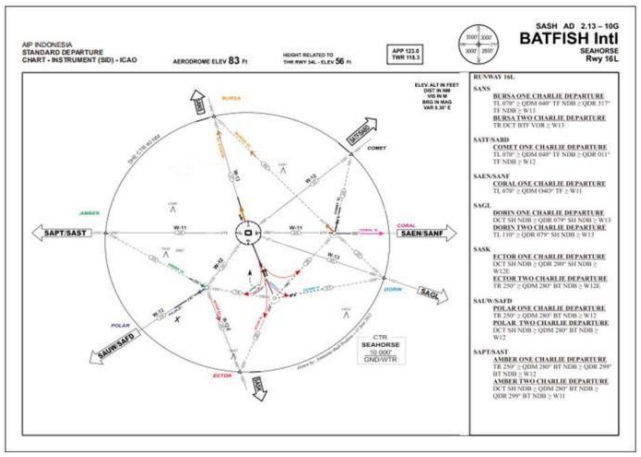

Figure 3. Chat SID Runway 16L

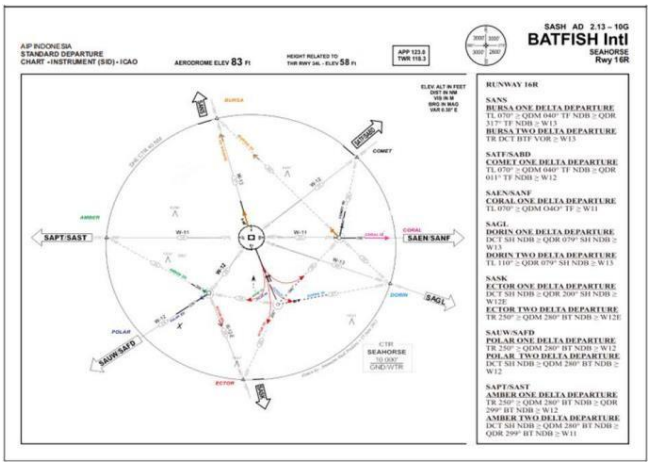

Figure 4. Chat SID Runway 16R

This validation was conducted by three validators: Dani Chandra Y.P., S.Pd., as a Subject Matter Expert on April 30, 2025; Raharjo Tejo as an Air Traffic Expert on May 9, 2025; and Lusiana Dewi K., S.Pd., M.Pd., as a Language Expert on April 24, 2025. The validation results are presented in the table below.

Table 2. Validation Sheet Results.

No.	Indicator	Validity Results		
		Validator 1	Validator 2	Validator 3
1.	Accuracy of SID Content	Valid	Valid	Valid
2.	SID Naming	Valid	Valid	Valid
3.	SID Chart	Valid	Valid	Valid

3.4. Implementation Results

The implementation stage was carried out by testing the application of the SID design during flight training sessions on June 12 and 16, 2025. The trial included a simulation of the Aerodrome Control Procedure (problem 2) for 6 LLU 14 cadets and the Approach Control Procedure (problems 3 and 4) for 9 LLU 13 cadets, who were randomly selected. The trial was conducted to obtain relevant feedback through observation sheets and interviews. The results of the implementation stage showed that the presence of the SID Chart greatly supports the learning of Aerodrome Control and Approach Control procedures.

3.5. Evaluation Results

The evaluation results of the trial use of SID at Seahorse Airport provided constructive feedback from lecturers and cadets. The main suggestions include adding SID modules and learning media to Aerodrome Control Procedure training, as well as providing more structured training sessions. In addition, it was recommended to prepare a phraseology guide to improve the efficiency and effectiveness of communication between ATC and pilots. This evaluation feedback is expected to enhance learning quality, minimize simulation errors, and strengthen cadets' readiness to face challenges in the aviation industry.

4. FINAL PRODUCT

The image below shows the final SID charts that have been validated by the respective validators regarding the development of the SID (Standard Instrument Departure) naming design at Seahorse Airport. Several charts illustrate different flight routes: the first chart for Runway 34L, followed by Runway 34R, then Runway 16L, and finally Runway 16R. The development of these charts aims to enhance the efficiency and safety of airport operations.

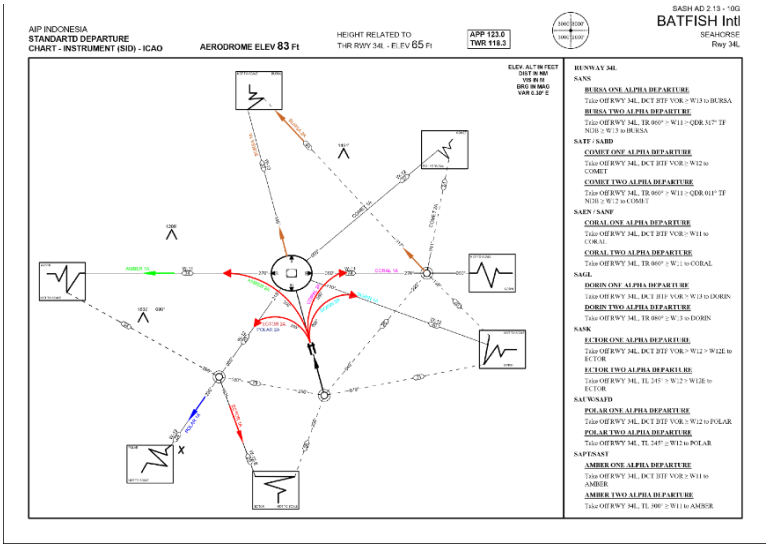

Figure 5. Final Chat SID Runway 34L

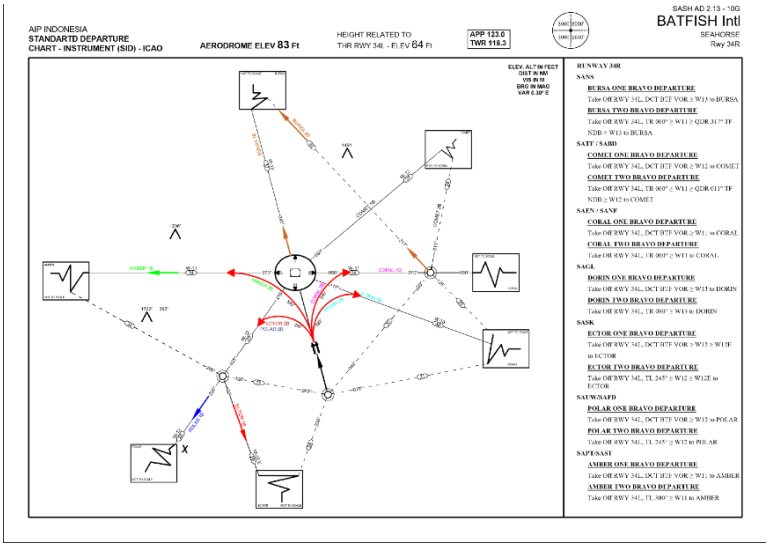

Figure 6. Final Chat SID Runway 34R

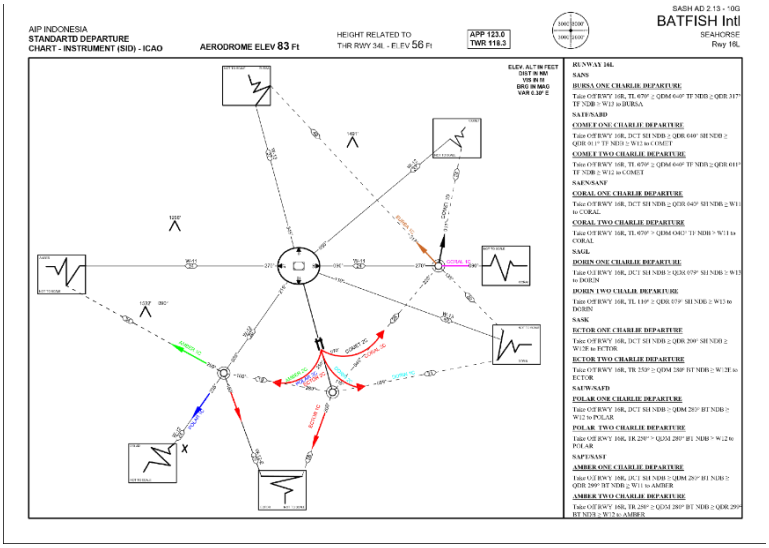

Figure 7. Final Chat SID Runway 16L

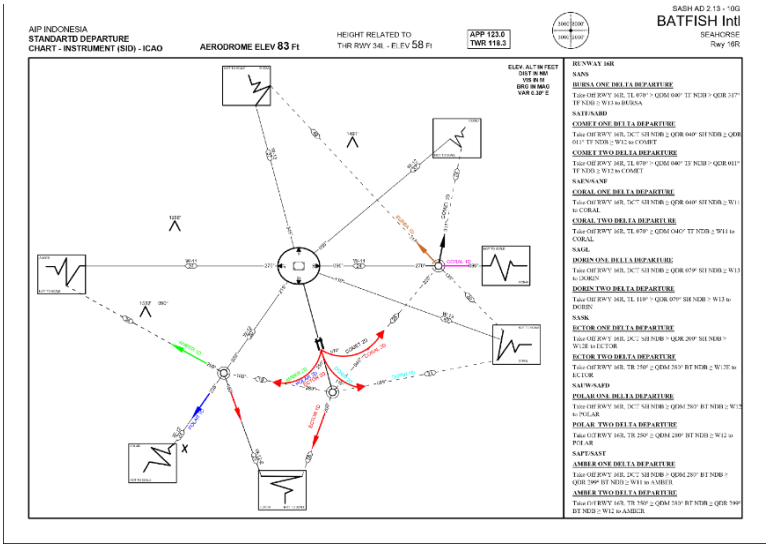

Figure 8. Final Chat SID Runway 16R

5. CONCLUSION

The This study aimed to validate the naming design of the Standard Instrument Departure (SID) at Seahorse Airport as part of the learning media for Aerodrome Control and Approach Control procedures. Based on the validation results from three experts, an average score of 3.44 was obtained, which falls into the very valid category. This indicates that the developed SID naming design complies with the ICAO naming structure standards, has clear phonetics, and is suitable for use in ATC training contexts.

Expert feedback also emphasized the importance of aligning SID names with route directions and avoiding phonetic similarities with other navigation names. This aspect is crucial to maintain clarity in communication and improve the effectiveness of simulation-based learning.

Overall, the SID naming design for Seahorse Airport has been proven suitable for integration into air traffic control procedure learning scenarios and can support the development of future ATC competencies in understanding and applying departure procedure structures.

Based on the findings, the following recommendations are proposed for further development :

1. Develop the Standard Instrument Arrival (STAR) procedures for Seahorse Airport to complete the operational standards.
2. Prioritize the development of SID procedures for Runway 25 and Runway 07 to accommodate all runway configurations.
3. Include Standard Instrument Departure (SID) procedures systematically in aerodrome procedure training materials.
4. Prepare phraseology guidelines based on official documents for ATC communication.
5. Implement the use of SID Charts in Problems 8 to 15 of Aerodrome Control training and Problems 10 to 13 of Approach Control training.

These recommendations are intended to enhance the quality of ATC procedure training and the development of learning media in line with aviation industry needs.

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