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CHALLENGING TASKS, MOTIVATED CADETS: STRUCTURAL VALIDATION OF TASK CHALLENGE IN ESP READING FOR AVIATION

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Abstract: English for Specific Purposes (ESP) plays a crucial role in preparing aviation cadets to comprehend technical documents and operate safely in global contexts. This study examines how perceived task characteristics—task relevance, task benefit, and task challenge—relate to cadets' Motivation/Confidence in ESP reading tasks. Using a quantitative confirmatory design, survey data were collected from 95 cadets and analyzed with Structural Equation Modeling (SEM) in SAS Studio 9.4. Results show that among the three task-characteristic constructs, only task challenge significantly predicted cadets' Motivation/Confidence in reading. Task relevance and task benefit, although rated positively, did not yield statistically significant effects in the structural model. These findings highlight the central role of optimally challenging task demands in fostering engagement and persistence among aviation cadets in high-stakes learning environments. The validated model underscores the importance of calibrating ESP reading tasks to an appropriate level of difficulty to sustain motivation in aviation education. This study provides empirical grounding for curriculum innovation in aviation English and contributes to theoretical understanding of motivational dynamics in ESP contexts.

Keywords: ESP motivation, task challenge, aviation English, SEM validation, reading engagement

Introduction

English proficiency is essential for safety and operational efficiency in the global aviation industry primarily because it facilitates clear communication among pilots, air traffic controllers, and ground staff. According to ICAO's regulations, effective use of Aviation English (AE), a specialized register, is mandated to diminish misunderstandings that can lead to accidents (Zhao, 2023). Furthermore, proficiency in AE is critical for interpreting technical documentation, enabling personnel to adhere to safety protocols and ensure regulatory compliance (Prado, 2024). Beyond its technical demands, aviation training is inherently high-stakes: errors in interpreting operational texts can carry serious safety consequences. In such environments, learners are not only required to understand specialized language but also to sustain effort under pressure—conditions that make the psychological experience of competence especially salient. From a motivational perspective, challenging tasks can become a key driver when they are perceived as demanding yet achievable, because they provide clear signals of progress and mastery. Accordingly, this study hypothesized Task Challenge as a central predictor of cadets' Motivation/Confidence in ESP reading, over and above value-based perceptions such as task relevance or perceived benefit.

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Aviation cadets often encounter significant challenges in reading and interpreting technical aviation documents in English. These difficulties stem from the specialized vocabulary inherent in aviation communication, which differs markedly from general English. For instance, aviation terms necessitate not only recognition but also context-based understanding, which can overwhelm cadets (Thambirajah & Krish, 2023). Additionally, the complexity of technical texts often includes idiomatic expressions and varied registers that cadets may not have encountered in their general English studies (Mahmood et al., 2025). Enhanced training tailored to address these specific linguistic needs is necessary to effectively prepare cadets for their roles in a high-stakes environment (Rahmati & Izadpanah, 2021).

Current aviation English training practices for reading comprehension face several limitations. Many programs inadequately address the specific vocabulary and technical complexities inherent in aviation texts, which can hinder students' ability to interpret crucial documents effectively. Furthermore, training often focuses primarily on verbal communication skills, neglecting comprehensive reading strategies that are vital for understanding technical manuals (Thambirajah & Krish, 2023; Mahmood et al., 2025). For instance, while insights into language usage exist, they may not translate effectively to practical applications required in aviation contexts, leaving gaps in learners' comprehension skills (Rahmati & Izadpanah, 2021).

The aviation context intensifies the necessity for effective and motivating English for Specific Purposes (ESP) reading pedagogy. Given the high stakes of aviation operations, where misinterpretations can have grave consequences, a tailored approach to reading that incorporates technical language and contextual scenarios is paramount (Mahmood et al., 2025; Rahmati & Izadpanah, 2021). Additionally, the varying proficiency levels and diverse backgrounds of cadets necessitate differentiated instructional strategies that engage and motivate learners (Thambirajah & Krish, 2023). The incorporation of innovative pedagogical methods, such as project-based learning and digital resources, can enhance comprehension and retention of technical knowledge, ultimately improving safety and operational efficiency in aviation (Prado, 2024;Treadaway & Read, 2024).

Task-Based Language Teaching (TBLT) draws on constructivist learning theory, positing that knowledge acquisition is most effective when learners actively engage with authentic, goal-directed tasks. In English for Specific Purposes (ESP), this approach has gained traction for its alignment with vocational learning outcomes, especially in technical domains such as aviation. TBLT positions language as a medium for completing meaningful tasks that closely resemble workplace communication, such as interpreting flight documentation, engaging in pilot-controller dialogue simulations, or analyzing operational protocols (Mahmood et al., 2025). The emphasis on authenticity fosters a more direct connection between classroom activities and professional demands, thereby reinforcing learner motivation and autonomy (Supunya, 2023).

In the aviation context, TBLT serves as a pedagogical bridge between general language competence and specific communicative competencies required in safety-critical environments. Research underscores the importance of integrating real-world scenarios into ESP instruction to build functional communicative skills that align with operational realities (Van Den Branden, 2016;Yildiz, 2020). These tasks provide a scaffolded platform for learners to build confidence while navigating technical vocabulary and complex syntactic structures.

Empirical studies have demonstrated the effectiveness of TBLT in enhancing language outcomes across various vocational domains, including aviation. Rahmati and Izadpanah (2021) reported improved comprehension and verbal fluency in aviation students exposed to task-based modules focusing on safety communication and document analysis. Similarly, Mahmood et al. (2025) found that task-based interventions significantly improved vocabulary acquisition and

reading fluency among cadets. These improvements are attributed to the alignment between tasks and real-world aviation demands, which enhances both retention and transfer of knowledge.

In addition to linguistic gains, TBLT also contributes to motivational and affective outcomes. Learners often report higher engagement when tasks mirror authentic aviation scenarios (Clark & Williams, 2020; Er & Kırkgöz, 2018). However, while the broader utility of TBLT is well established, its effectiveness in addressing reading comprehension challenges—particularly those involving complex documentation and technical interpretation—remains under-explored. This indicates the need for more research focusing specifically on reading-related TBLT applications within aviation ESP programs.

Motivation is a crucial factor in second language acquisition, and this is particularly evident in ESP reading, where texts often demand high levels of concentration, decoding skills, and background knowledge. In aviation contexts, the necessity of understanding safety manuals, checklists, and regulatory documents makes motivational engagement non-negotiable (Kim, 2018; Ryan & Deci, 2020). Learner motivation is typically conceptualized as a multidimensional construct, encompassing both intrinsic interest (e.g., enjoyment of reading) and extrinsic drivers (e.g., career relevance) (Rochmawati et al., 2023).

Quantitative studies on ESP motivation frequently employ Likert-scale instruments to measure components such as learner confidence, task engagement, and perceived value (Rochmawati et al., 2023). These measures are critical in assessing how likely students are to persist in reading tasks that may be linguistically and cognitively demanding. In aviation, where the consequences of misunderstanding texts are severe, high levels of sustained motivation are especially critical.

Three key constructs have emerged as influential in learner motivation: task relevance, task benefit, and task challenge. Task relevance refers to the perceived alignment between a learning activity and real-world professional needs. When cadets see direct connections between reading exercises and the demands of their future roles, engagement tends to increase (Rochmawati et al., 2023). Similarly, perceived task benefit—the belief that an activity will yield valuable skills or career advantages—correlates strongly with motivational persistence. However, both factors are mediated by the learner's perception of task difficulty (Karimi et al., 2019).

Task challenge, defined as the cognitive and linguistic demand posed by a task, has emerged as a central predictor of motivation. According to Self-Determination Theory (Ryan & Deci, 2020), learners are most engaged when tasks fall within the optimal challenge zone—demanding enough to require effort but not so difficult as to cause disengagement. Similarly, Cognitive Load Theory suggests that moderate challenge enhances motivation by supporting perceived competence while avoiding cognitive overload (Awwad & Tavakoli, 2022). In the aviation context, this balance is especially critical due to the high density and operational specificity of ESP texts.

Self-Determination Theory (SDT) asserts that intrinsic motivation arises when learners experience autonomy, relatedness, and competence (Ryan & Deci, 2020). In task-based ESP instruction, well-calibrated challenges can fulfill the need for competence, provided learners perceive themselves as capable of meeting task demands. This is particularly applicable in aviation reading, where cadets must interpret dense, technical documentation under time constraints and pressure. Cognitive Load Theory (CLT) complements SDT by emphasizing that learning is impaired when the cognitive demands of a task exceed working memory capacity. Accordingly, task difficulty must be carefully managed to support learning without generating anxiety or fatigue (Yan, 2025). When applied together, these theories advocate for the design of tasks that are challenging but within learners' capacity to complete.

Empirical studies support this theoretical integration. For instance, Karimi et al. (2019) found that aviation cadets exhibited higher motivation when faced with tasks of moderate difficulty. Learners expressed a greater sense of accomplishment and satisfaction when successfully completing tasks that were neither trivial nor overwhelming. These findings are echoed in studies from second language contexts beyond aviation, suggesting that the principle of optimal challenge has cross-domain relevance.

Despite the robust theoretical grounding and promising empirical evidence, several research gaps persist in TBLT-based aviation ESP instruction. Most notably, few studies have rigorously examined the discrete effects of task relevance, benefit, and challenge on learner motivation using advanced modeling techniques. While the significance of task authenticity has been acknowledged, the structural relationships among various task features and their motivational outcomes remain underexplored (Pacheco, 2022; Desoky, 2022). Moreover, there is a scarcity of studies that incorporate both SDT and CLT frameworks to inform task design within the aviation domain.

Furthermore, methodological limitations prevail in the existing body of literature. Much of the research relies on small sample sizes or qualitative descriptions, lacking generalizability. Studies employing Structural Equation Modeling (SEM) to validate theoretical models of task-motivation relationships in ESP contexts are rare. This lack of empirical rigor limits the ability to draw robust conclusions about the effectiveness of specific pedagogical strategies, particularly in safety-critical fields like aviation.

Therefore, the current study positions itself at the intersection of TBLT, SDT, and CLT to fill this empirical and theoretical void. By adopting a confirmatory SEM approach to analyze aviation cadets' perceptions of task characteristics and their motivational impacts, this research contributes to both pedagogical practice and academic theory in ESP instruction. It proposes a validated model that can guide the design of future curricula, ensuring that reading tasks are not only authentic and relevant but also optimally challenging and motivationally effective.

Method

This study adopted a quantitative confirmatory research design with a cross-sectional survey approach. The primary objective was to investigate the structural relationships between task characteristics (task relevance, task benefit, and task challenge) and aviation cadets' motivation in English for Specific Purposes (ESP) reading. A confirmatory design was appropriate given the study's intent to validate a theoretical model grounded in Self-Determination Theory (SDT), Cognitive Load Theory (CLT), and Task-Based Language Teaching (TBLT). Structural Equation Modeling (SEM) was employed to examine latent constructs and test the hypothesized model relationships. The quantitative-confirmatory approach ensured the alignment between theoretical propositions and empirical testing, enhancing the validity and generalizability of the findings (Alamer, 2021; Byrne, 2016; Kline, 2023).

The dataset was collected from 95 cadets enrolled in a national aviation polytechnic in Indonesia. The participant pool consisted of 55% third-semester cadets and 45% seventh-semester cadets, with an average age of 20 years. All participants were non-native English speakers. Stratified random sampling was used to ensure balanced representation across gender and academic levels (Munira & Sikder, 2022). The demographic composition allowed for invariance testing to assess the robustness of the model across subgroups.

Data collection was conducted between August and September 2025. Participants responded to a structured questionnaire comprising four latent constructs: Task Relevance (TR1–TR3), Task Benefit (TB1–TB3), Task Challenge (TC1–TC3), and Motivation/Confidence (MC1–MC3). Each item was rated on a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree).

The questionnaire was piloted on 20 cadets to ensure clarity and reliability before final distribution. The final instrument was administered under supervised conditions to minimize response bias.

Table 1. Latent Constructs and Indicators

Variable Type	Construct	Indicators	Description
Independent	Task Relevance	TR1–TR3	Alignment of task content with professional aviation needs
Independent	Task Benefit	TB1–TB3	Perceived utility of tasks for future aviation careers
Independent	Task Challenge	TC1–TC3	Cognitive and linguistic difficulty of tasks
Dependent	Motivation/Confidence	MC1–MC3	Intrinsic motivation and reading self-efficacy

Data analysis was conducted using SAS Studio 9.4. The analysis proceeded through the following stages:

1. Descriptive Statistics: Computed means, standard deviations, and ranges for all latent variables.
2. Reliability Testing: Internal consistency was assessed using Cronbach's alpha and Composite Reliability (CR), with a threshold of α and CR ≥ 0.70 deemed acceptable (Ma & Chen, 2025;Lena & Nikolov, 2025).
3. Internal consistency: Prior to factor and structural modeling, internal consistency was evaluated for each construct. All scales met the recommended thresholds (≥ 0.70). Specifically, Task Relevance demonstrated Cronbach's $\alpha = 0.81$ and CR = 0.84; Task Benefit $\alpha = 0.83$ and CR = 0.86; Task Challenge $\alpha = 0.78$ and CR = 0.80; and Motivation/Confidence $\alpha = 0.85$ and CR = 0.87 (see Table 2). These results support the reliability of the measurement instrument for subsequent CFA and SEM analyses.
4. Exploratory Factor Analysis (EFA): Conducted to identify factor structure, with principal axis factoring and varimax rotation.
5. Confirmatory Factor Analysis (CFA): Used to validate the measurement model and assess construct validity. Fit indices included χ^2/df, RMSEA, CFI, and TLI.
6. Structural Model Testing: Path analysis evaluated the direct effects of task characteristics on motivation. Significance was determined at $p < 0.05$.
7. Measurement Invariance Testing: Multi-group CFA was conducted to assess model invariance across gender and academic levels.

Table 2. Descriptive Statistics and Reliability Indices

Variable	Mean	SD	Min	Max	Cronbach's α	Composite Reliability
Task Relevance	3.21	0.42	2.10	4.00	0.81	0.84
Task Benefit	3.18	0.45	2.00	4.00	0.83	0.86
Task Challenge	3.02	0.47	1.90	4.00	0.78	0.80
Motivation/Confidence	3.28	0.40	2.00	4.00	0.85	0.87

Additional model indices included:

1. KMO = 0.86; Bartlett's Test of Sphericity: $\chi^2 = 317.4$, $p < 0.001$
2. CFA Fit Indices: $\chi^2/df = 1.92$; RMSEA = 0.061; CFI = 0.944; TLI = 0.936
3. Explained Variance in Motivation: $R^2 = 0.10$.

To ensure instrument quality and analytical integrity, a multi-layered validity and reliability protocol was followed:

1. Content Validity: The questionnaire was reviewed by three aviation English and psychometrics experts. Feedback was incorporated to refine wording and eliminate ambiguity (Ma & Chen, 2025).
2. Construct Validity: CFA confirmed convergent and discriminant validity. The Average Variance Extracted (AVE) was above 0.50 for all constructs, and the Fornell-Larcker criterion was satisfied.
3. Internal Consistency: Reliability was confirmed via Cronbach's α and Composite Reliability, all above 0.78.
4. Ethics and Confidentiality: Ethical approval was obtained from the Institutional Review Board. All participants provided informed consent, and anonymity was maintained throughout data processing (Bullock & Westbrook, 2021).

The application of SEM in this study was justified by its capacity to estimate both measurement and structural models concurrently (Byrne, 2016). SEM is widely recognized for its effectiveness in assessing multidimensional latent variables, particularly in language learning research (Kline, 2023; Lena & Nikolov, 2025). The inclusion of invariance testing across demographic groups added robustness to the findings. Furthermore, the model's explanatory power, while modest ($R^2 = 0.10$), provided insight into how task challenge, as opposed to perceived task relevance or benefit, influences cadets' reading motivation—a critical factor in aviation English training.

Discussion

Initial descriptive statistics showed that all constructs scored relatively high, indicating generally positive perceptions among cadets toward their ESP reading tasks. Task Relevance (M = 3.21, SD = 0.42), Task Benefit (M = 3.18, SD = 0.45), and Task Challenge (M = 3.02, SD = 0.47) were all rated positively. Motivation/Confidence yielded the highest average (M = 3.28, SD = 0.40). These results indicate that cadets viewed their reading tasks as generally relevant, beneficial, and challenging within a manageable scope .

Table 3. Descriptive Statistics and Reliability Indices

Variable	Mean	SD	Min	Max	Cronbach's α	Composite Reliability
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Task Challenge	3.02	0.47	1.90	4.00	0.78	0.80
Motivation/Confidence	3.28	0.40	2.00	4.00	0.85	0.87

Exploratory Factor Analysis (EFA) extracted four latent factors that explained 71.3% of total variance. The Kaiser-Meyer-Olkin (KMO) value was 0.86 and Bartlett's Test of Sphericity was significant ($\chi^2 = 317.4$, $p < 0.001$), supporting factorability of the data. Confirmatory Factor Analysis (CFA) confirmed the adequacy of the four-factor measurement model, with fit indices meeting accepted standards: $\chi^2/df = 1.92$, RMSEA = 0.061, CFI = 0.944, and TLI = 0.936. All factor loadings exceeded 0.60, supporting convergent validity .

Correlation analysis revealed a moderate positive association between Task Challenge and Motivation (r = 0.42), indicating that as perceived difficulty increased, so did cadet motivation. Correlations between Task Relevance and Motivation (r = 0.29) and Task Benefit and

Motivation (r = 0.24) were positive but weaker, suggesting that while relevance and utility were important, they played a less influential role in shaping motivational responses.

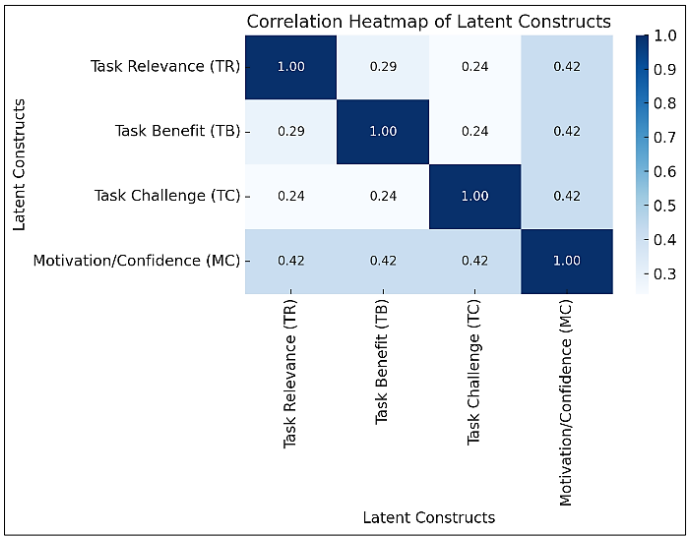

Figure 1. Heatmap of Inter-Variable Correlations

Note: Color intensities reflect strength of correlation; strongest pairings are seen between Task Challenge and Motivation.

Structural path analysis showed that Task Challenge significantly predicted Motivation/Confidence ($\beta = 0.19$, $p < 0.05$), confirming the study's hypothesis. In contrast, Task Relevance ($\beta = 0.11$, $p = 0.08$) and Task Benefit ($\beta = 0.09$, $p = 0.10$) were not statistically significant. The structural model explained 10% of the variance in Motivation/Confidence ($R^2 = 0.10$), indicating a modest effect size. These results validate the unique motivational contribution of perceived task difficulty in the context of ESP reading for aviation cadets.

Socio-educational interpretation in the Indonesian aviation context. The non-significant effects of Task Relevance and Task Benefit can be interpreted through the socio-educational realities of Indonesian aviation training, where English is widely framed as a mandatory professional requirement rather than an optional academic asset. In safety-critical programs, cadets are frequently socialized to view Aviation English competence as part of operational compliance and employability expectations. Under such conditions, perceptions of "relevance" and "benefit" may become normalized-cadets may assume that most ESP reading tasks are inherently aligned with aviation duties and career outcomes. When value perceptions are broadly shared and treated as given, they may contribute less unique variance in motivation within a structural model.

This interpretation is consistent with a motivational account in which extrinsic necessity can coexist with internalized acceptance of professional norms: cadets may recognize that English is essential for certification, performance evaluation, and workplace legitimacy, so task value (relevance/benefit) becomes a stable background condition. Consequently, what differentiates day-to-day engagement is not whether a task is useful in principle, but whether it provides an optimal competence signal—that is, a level of difficulty that is demanding yet attainable. In this context, Task Challenge can function as the more salient trigger for active engagement because it immediately shapes perceived competence and persistence during reading.

In other words, the Indonesian aviation cadet context may compress variability in perceived task value while amplifying the motivational role of challenge. This may explain why Task Challenge emerged as the only significant predictor of Motivation/Confidence even when

relevance and benefit were positively rated. Future research could examine this account more directly by comparing cohorts with different degrees of professional pressure (e.g., early vs. late semesters) or by modeling indirect pathways in which relevance/benefit influence motivation through mediators such as professional identity internalization or self-efficacy.

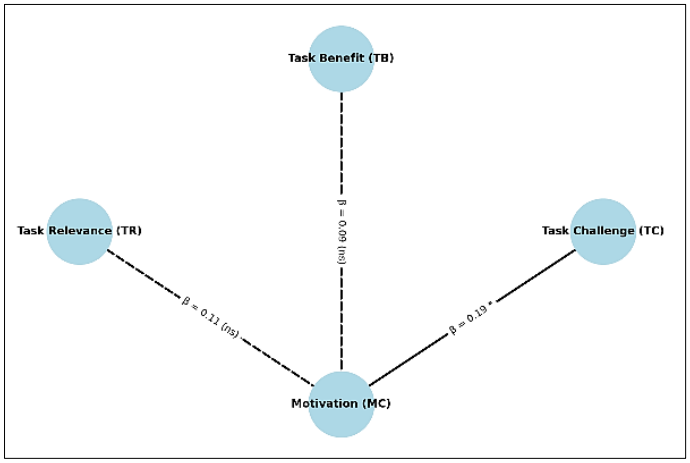

Figure 2. Structural Path Diagram of SEM Model

Note: Standardized regression coefficients shown along arrows; significant path observed only between Task Challenge and Motivation.

Multi-group confirmatory factor analysis demonstrated model invariance across gender and academic levels. No statistically significant differences were found in factor loadings or path coefficients between third- and seventh-semester cadets, or between male and female participants. This suggests that the model's structure holds consistently across demographic subgroups .

Table 4. Summary of SEM Regression Weights

Predictor	Outcome	β Coefficient	p-value	Significance
Task Challenge	Motivation/Confidence	0.19	0.037	Significant
Task Relevance	Motivation/Confidence	0.11	0.082	Not Significant
Task Benefit	Motivation/Confidence	0.09	0.103	Not Significant

The findings affirm the central hypothesis that Task Challenge significantly predicts Motivation/Confidence among aviation cadets in ESP reading contexts. While Task Relevance and Task Benefit showed positive trends, their effects were not statistically significant. The model's explanatory power, though moderate, highlights the role of task difficulty as a unique motivational driver. Furthermore, the model's structural stability across demographic subgroups strengthens its applicability in diverse aviation education settings. These results serve as an empirical foundation for pedagogical strategies that prioritize optimally challenging reading tasks in aviation-focused ESP curricula.

The key finding from this study confirms that Task Challenge significantly predicts aviation cadets' Motivation and Confidence in ESP reading, whereas Task Relevance and Task Benefit do not exert significant effects. This finding substantiates the core hypothesis that appropriately challenging tasks foster greater motivation in aviation English reading. The data support the idea that moderate levels of difficulty stimulate learners' cognitive engagement, prompting them to persist and succeed in reading complex aviation texts. This aligns with the

principles of Self-Determination Theory (Ryan & Deci, 2020), which posits that learners experience heightened motivation when challenges enhance their sense of competence. Additionally, the positive but non-significant associations between task relevance and motivation suggest that relevance is perceived as a baseline expectation in aviation training, rather than a variable determinant of engagement.

The result regarding the predictive role of Task Challenge is consistent with existing literature on motivation in ESP contexts. Karimi et al. (2019) found that cognitive demands embedded in ESP tasks significantly enhance motivation and attitudes toward learning, particularly when the complexity of the tasks is perceived as surmountable. This echoes the findings from Tavakoli and Awwad (2022), who argued that task complexity, when calibrated to the learner's skill level, facilitates not only language acquisition but also motivational persistence. Moreover, the results affirm insights from Friginal et al. (2019), emphasizing that real-world authenticity and intellectual rigor in aviation English tasks are crucial for student readiness and performance.

By contrast, the weaker effects of Task Relevance and Task Benefit contradict some general ESP studies, which often highlight these elements as primary drivers of motivation. However, the current findings align with the argument by Georgy (2023) that in highly vocationalized domains, the motivational impact of relevance may diminish due to saturation. Aviation cadets likely assume that all learning tasks are aligned with their professional goals, rendering task relevance a less distinctive influence. Furthermore, performance pressure in such high-stakes training environments may cause learners to interpret tasks primarily through the lens of utility rather than engagement, thereby undermining the motivational potential of perceived benefit (Komonniramit & Tepsuriwong, 2023).

Theoretically, the findings extend the applicability of Self-Determination Theory (SDT) and Task-Based Language Teaching (TBLT) within English for Specific Purposes (ESP) contexts. The significance of Task Challenge as a motivational factor confirms the SDT postulate that moderate difficulty fosters autonomy and competence, key components of intrinsic motivation (Ryan & Deci, 2020). Moreover, this study validates TBLT's emphasis on real-world task simulation by demonstrating that task challenge—not merely authenticity or relevance—plays a decisive role in learner engagement (Ellis, 2022).

Additionally, the results contribute to Cognitive Load Theory by demonstrating that an optimal level of task complexity supports learners' working memory capacity and performance. When challenge exceeds this optimal point, motivation and engagement may decline; when it falls short, boredom and disengagement ensue. These findings also support Karimi et al. (2019) and reinforce the need for balanced cognitive demands in ESP task design.

In uniting TBLT, SDT, and CLT, this study offers a conceptual model of motivation that emphasizes the interaction between instructional design and learner psychology. It situates Task Challenge at the core of this interplay, suggesting that motivational dynamics in ESP reading hinge more on task calibration than contextual alignment alone.

The results of this study hold several important implications for instructional practice, particularly in aviation education. First, curriculum developers should prioritize the design of ESP reading tasks that balance difficulty with learner capability. Examples include interpreting aircraft operation manuals, decoding emergency protocols, or analyzing technical maintenance records. These tasks inherently demand high-level reasoning and domain-specific vocabulary, offering cadets the cognitive stretch necessary for deep engagement.

Second, the results point to the need for structured scaffolding strategies to help learners cope with task complexity. Instructors can break down texts into manageable segments, provide glossaries for technical terms, and use pre-reading discussion activities to activate prior

knowledge. This approach can mitigate cognitive overload while preserving the motivational benefits of challenge (Rahayu & Pravitasari, 2021).

Third, the findings suggest that less emphasis should be placed on ensuring that every task appears relevant or beneficial from a vocational perspective. Instead, task design should assume that learners already perceive alignment with their future roles and focus more on ensuring tasks stimulate critical thinking and problem-solving. This approach reframes relevance as implicit and shifts attention to deeper cognitive and motivational triggers.

Finally, the results support the incorporation of collaborative reading tasks, which may diffuse cognitive burden and encourage mutual support among cadets. Peer-based tasks also cultivate the soft skills required for aviation teamwork, enhancing both linguistic and professional competence (Saputri, 2025).

Empirically, this study offers one of the few SEM-based validations of motivational constructs in the context of aviation ESP reading. By focusing specifically on the comparative roles of task relevance, benefit, and challenge, the study clarifies how these factors function independently within a motivational model. Previous literature has tended to examine motivation holistically or assume equal influence among task dimensions. This study provides quantitative evidence that such assumptions may not hold in specialized vocational contexts, such as aviation, where task challenge emerges as a more potent motivational variable.

Methodologically, the integration of confirmatory factor analysis and structural path modeling lends statistical rigor to the findings. This study thus responds to calls from Pacheco (2022) and Desoky (2022) for more robust empirical validation of pedagogical frameworks in aviation ESP. In doing so, it contributes to the refinement of task design theory and the operationalization of motivation constructs in future ESP studies.

This study is not without limitations. The sample size, while statistically adequate, is limited to a single institution and may not capture the diversity of learner experiences across different aviation academies or cultural contexts. Future research should employ multi-site sampling and increase demographic variance to enhance external validity.

Another limitation lies in the cross-sectional design, which restricts causal inference. Longitudinal studies tracking the evolution of motivation over time and in relation to shifting curriculum demands would provide deeper insights into motivational trajectories. Moreover, while SEM offers powerful analytic capacity, reliance on self-report data introduces the risk of social desirability bias. Mixed-method approaches, incorporating interviews or classroom observations, would help triangulate findings and uncover latent dimensions of motivation.

Finally, future studies should consider exploring interaction effects among task constructs or examining potential mediators such as self-efficacy or metacognitive awareness. Investigating whether learners' prior academic performance or English proficiency moderates the impact of task challenge would further enrich the current model. These directions would build on the foundation established here and help construct a more comprehensive theory of motivation in ESP reading.

Conclusion

This study confirms that task challenge is a critical motivational factor in English for Specific Purposes (ESP) reading within aviation training. Unlike task relevance and task benefit, which showed non-significant effects, task challenge emerged as a statistically significant predictor of Motivation/Confidence among cadets. These findings directly address the research objective by empirically validating a structural model of motivation grounded in Task-Based Language Teaching (TBLT), Self-Determination Theory (SDT), and Cognitive Load Theory (CLT). The results reinforce that cadets are more engaged when tasks are cognitively demanding yet attainable, thereby fostering a sense of competence and persistence. This insight has practical

implications for designing ESP curricula that emphasize optimal difficulty rather than over-relying on professional alignment or utility. The study contributes to a more nuanced understanding of how motivational constructs operate in vocational language education and offers a validated framework for future ESP instructional strategies in aviation and other high-stakes fields.

Practical Implications for ESP Instructors. To translate these findings into classroom practice, ESP instructors in aviation programs can intentionally **calibrate task difficulty** so that reading activities remain demanding yet achievable. First, instructors can adopt a **progressive difficulty sequence** (e.g., from simplified excerpts to authentic operational documents) while keeping the communicative goal constant (such as identifying hazards, extracting procedural steps, or interpreting constraints). Second, task difficulty can be adjusted by manipulating **text complexity** (lexical density, sentence length, and technical abbreviation load), **time pressure** (extended vs. timed reading), and **task demands** (recognition questions vs. justification-based questions that require inference and evidence). Third, instructors can use **scaffolding that preserves challenge**—for example, pre-teaching a small set of high-frequency aviation terms, providing a glossary for non-essential technical items, and using guided questions—while still requiring learners to complete core comprehension and decision-making steps independently. Fourth, instructors can monitor whether a task is in the "optimal challenge zone" by using quick formative checks (e.g., error patterns, completion rates, and short confidence ratings) and then fine-tune subsequent tasks to avoid both overload (frustration, disengagement) and underload (boredom, minimal effort). Finally, pairing moderately challenging texts with **collaborative problem-solving** (pair or small-group briefings) can maintain cognitive demand while supporting persistence and confidence through peer interaction.

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