

The Influence of Narcissism and Overconfidence on Safety Decision-Making Among Commercial Pilot Students within The Context of Hazardous Aviation Attitudes

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Received: May 5, 2026

Revised: June 4, 2026

Accepted: June 8, 2026

Abstract

Human factors remain the predominant cause of aviation accidents globally, yet the specific role of subclinical personality traits and cognitive biases in shaping safety decision-making among student pilots remains underexplored. This mixed-methods study examined the influence of narcissism (X1) and overconfidence bias (X2) on safety decision-making (Y1) among commercial pilot students in Thailand, within the theoretical context of Bounded Rationality and hazardous aviation attitudes. Using an explanatory sequential design, quantitative data were collected from 274 student pilots via a structured questionnaire incorporating the Narcissistic Personality Inventory-16 (NPI-16), a knowledge-confidence calibration measure, and hazardous scenario-based decision items. Hypotheses were tested using simple linear regression analysis and hierarchical moderated regression analysis. All four hypotheses were supported. Narcissism was a strong and significant positive predictor of safety decision-making quality ($\beta = 0.564$, $p < .001$, $R^2 = .318$) and positively predicted overconfidence ($\beta = 0.148$, $p = .014$). Overconfidence was a strong predictor of hazardous decision-making, explaining 24.0% of the variance ($\beta = 0.490$, $p < .001$). Critically, narcissism acted as a synergistic moderator: the narcissism x overconfidence interaction accounted for an additional 14.1% of explained variance, bringing the total model fit to $R^2 = .628$. Qualitative interviews with senior flight instructors identified three amplifying mechanisms: Feedback Resistance, Mission-Oriented Fixation, and the Halo Effect of Early Success. These findings provide empirical grounds for integrating personality-informed psychological screening and ego-management modules into Crew Resource Management training curricula.

Keywords: narcissism, overconfidence, safety decision-making, hazardous aviation attitudes, commercial pilot students, Crew Resource Management, Bounded Rationality, human factors

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Introduction

The commercial aviation industry is universally recognized as one of the most high-risk and systemically complex sectors in the modern world. Despite unprecedented technological advancements in avionics, automation, and aircraft engineering, aviation accidents and severe operational incidents continue to occur with alarming persistence. Comprehensive global accident investigations consistently converge on a singular conclusion: human factors remain the predominant root cause behind the vast majority of operational catastrophes (Boeing, 2023; ICAO, 2022). This stark reality underscores that the contemporary challenge of aviation safety management no longer resides in the mechanical reliability of aircraft, but in the profound cognitive limitations and personality characteristics of the human operators who control them.

The theoretical lens of Bounded Rationality (Simon, 1958, 1991) fundamentally challenges classical models that portray pilots as perfectly rational decision-makers. Within the chaotic milieu of an aviation crisis—characterized by systemic complexity, ambiguous data, and overwhelming cognitive load—human operators are compelled to rely on rapid cognitive heuristics, which simultaneously open the door to systematic biases. These biases severely distort an operator's perception of objective risk, causing them to underestimate emerging hazards and maintain unwarranted overconfidence at the very moment a critical crisis unfolds.

For commercial pilot students—who operate precisely at the demanding intersection of acquiring complex technical skills and developing non-technical situational awareness—the vulnerability to such cognitive biases and personality-driven errors is exponentially magnified. Two psychological constructs are particularly relevant in this context: narcissism and overconfidence. Narcissism, characterized by grandiose self-views, an insatiable need for admiration, a sense of entitlement, and a fundamental lack of empathy (Brunzel, 2021; Keskin & Fidan, 2021), predisposes individuals to dismiss expert warnings and violate safety protocols as acts of ego preservation. Brunzel (2021) specifically documents the link between narcissism and overconfidence in decision-making contexts, providing theoretical grounding directly applicable to high-stakes operational settings such as aviation. Overconfidence—widely described as the ‘father of all biases’ (Dias et al., 2020)—leads student pilots to falsely inflate the subjective probability of favorable outcomes while systematically underestimating the risks of flight operations. Dias et al. (2020) examine overconfidence specifically in the context of risk assessment and decision-making under uncertainty, making this framework directly applicable to safety-critical operational environments.

Despite established theoretical frameworks linking these constructs to unsafe behavior, there remains a significant empirical gap in understanding how narcissism and overconfidence interact to degrade safety decision-making in student pilot populations. Most existing research focuses on

experienced crews or post-accident forensic analysis, leaving the formative training period understudied. This study addresses that gap by investigating the influence of narcissism and overconfidence on safety decision-making among commercial pilot students in Thailand, and specifically, the moderating role of narcissism in amplifying the detrimental effect of overconfidence.

Literature Review and Theoretical Framework

Narcissism

Narcissism is a multifaceted personality construct distributed along a continuum in the general population (Liu et al., 2021). Structurally, it is characterized by deeply ingrained grandiose self-views, an excessive degree of self-love, a pervasive sense of entitlement, an insatiable need for external admiration, and a fundamental lack of interpersonal empathy (Brunzel, 2021). Contemporary research recognizes narcissism as a prominent pillar of the 'Dark Triad' alongside psychopathy and Machiavellianism (Chughtai et al., 2022), and validated measurement tools for these three Dark Triad traits have been developed and psychometrically tested in Thai contexts, confirming their structural validity for use with Thai populations (Boonroungrut & Huang Fei, 2018).

The literature distinguishes two primary manifestations: grandiose narcissism-characterized by extreme self-confidence, interpersonal dominance, and exhibition-and vulnerable narcissism, marked by hidden insecurities, high neuroticism, and explosive sensitivity to criticism (Jauk & Kanske, 2021). The Narcissistic Admiration and Rivalry Concept (NARC) model further operationalizes grandiose narcissism through two behavioral strategies: narcissistic admiration (assertive self-enhancement seeking social praise) and narcissistic rivalry (antagonistic self-protection triggered by ego threats), the latter of which directly poisons collaborative safety cultures.

Research consistently documents that narcissism is centrally implicated in hazardous decision-making and systematic disregard for safety protocols. Narcissists exhibit heightened risk propensity driven by overconfidence and high reward sensitivity, causing them to ignore objective risk assessments and dismiss expert advice (Campbell et al., 2004). Neurophysiological evidence indicates that highly narcissistic individuals show reduced feedback learning they fail to update safety strategies after making errors (Yang et al., 2018). Furthermore, narcissistic rivalry in leaders destroys the psychological safety necessary for crew members to speak up, effectively silencing the 'safety voice' that is fundamental to Crew Resource Management (Gauglitz et al., 2023).

Overconfidence

Overconfidence is defined as a psychological state in which an individual's subjective confidence in their abilities systematically exceeds their actual objective accuracy (Bonini et al., 2015). Academic literature identifies three primary dimensions: overestimation erroneously assessing

one's actual performance as higher than it is; overplacement the 'better-than-average' effect where individuals believe their abilities exceed those of peers; and overprecision excessive certainty in one's beliefs, producing dangerously narrow confidence intervals (Moore and Healy, 2008). Additional components include the illusion of control and unrealistic optimism.

The Dunning-Kruger Effect (Kruger and Dunning, 1999) is particularly applicable to novice pilot students: individuals with limited experience simultaneously lack actual competence and the metacognitive awareness to recognize their incompetence. As students master basic flight maneuvers, confidence often inflates far more rapidly than their actual threat-assessment capabilities, creating a 'danger zone' of unwarranted overconfidence. This overconfidence phenomenon is not unique to aviation; parallel findings in road traffic research similarly demonstrate that young drivers exhibit high self-confidence coupled with limited experience, leading to significantly elevated accident rates and hazardous behavioral decisions (Chueadamrong, 2023).

Research across multiple high-risk domains establishes overconfidence as a 'root trigger' for technological disasters and critical crashes (Murata, 2017), causing decision-makers to adopt unwarranted risks and ignore negative safety warnings.

Safety Decision-Making

Safety decision-making refers to the complex cognitive and behavioral processes through which individuals evaluate risks, process critical hazard information, and select actions aimed at preventing accidents in high-reliability organizations (Stiegler and Tung, 2014; Tao et al., 2023). Tao et al. (2023) specifically examine safety decision-making behaviors in high-risk operational contexts, identifying cognitive and attitudinal antecedents that parallel the personality-driven mechanisms examined in this study, making this framework directly applicable to aviation safety contexts. Modern safety literature identifies five dimensions: risk perception and threat assessment; safety attitudes; safety voice and communication; decision-making patterns and cognitive strategies; and unsafe behaviors comprising human errors (unintended mistakes) and violations (deliberate contraventions of safety regulations) (Cakir et al., 2022).

Under the framework of Bounded Rationality, safety decision-making is heavily constrained by cognitive capacity and time pressure, causing operators to rely on heuristic processing that opens the door to systematic biases (Simon, 1991). The dual-process model further posits that high-stress safety threats trigger automatic Type I processing, generating the most dangerous cognitive distortions (Stiegler and Tung, 2014). Empirical evidence from the traffic safety domain further supports the role of personality in shaping these cognitive processes: sensation-seeking and aggressive personality traits closely mirroring the FAA's hazardous attitude constructs have been identified as the strongest personality predictors of unsafe decision-making, with screening

instruments such as the ZKA-PQ demonstrating utility in identifying high-risk individuals across operational contexts (Chueadamrong, 2023). The Federal Aviation Administration's (FAA) Hazardous Aviation Attitudes framework identifies five specific attitudinal precursors to unsafe behavior: Anti-authority, Impulsivity, Invulnerability, Macho, and Resignation attitudes theoretically consistent with the personality and cognitive profiles of narcissistic and overconfident individuals.

Theoretical Framework and Hypotheses

The Threatened-Egotism and Dynamic Self-Regulatory Processing Model (Morf and Rhodewalt, 2001) explains the mechanism by which narcissism translates into hazardous behavior: a narcissist's grandiose self-view requires constant external validation, and when threatened by failure or criticism common in flight training they react not with humility but with defensive hostility and aggressive risk-taking. Crew Resource Management (CRM) theory further contextualizes these individual-level effects within the systemic framework of collaborative safety, wherein narcissism and overconfidence destroy the psychological safety required for effective safety voice.

Based on this theoretical synthesis, four hypotheses were formulated:

H1: Narcissism (X1) significantly influences Safety Decision-Making (Y1).

H2: Narcissism (X1) significantly influences Overconfidence (X2).

H3: Overconfidence (X2) has a significant influence on Safety Decision-Making (Y1).

H4: Narcissism (X1) significantly moderates the relationship between Overconfidence (X2) and Safety Decision-Making (Y1), synergistically amplifying hazardous aviation attitudes.

Methodology

Research Design

This study employed a Mixed Methods Explanatory Sequential Design (Creswell and Creswell, 2018), structured into two phases. Phase 1 utilized a quantitative cross-sectional survey to empirically test the research hypotheses across a sample of commercial pilot students. Phase 2 subsequently employed in-depth qualitative interviews with aviation experts to contextualize and explain the statistical findings from Phase 1.

Participants

The target population consisted of all commercial pilot students enrolled in Civil Aviation Authority of Thailand (CAAT)-accredited aviation training organizations (ATOs), comprising a known population of 691 individuals (432 student pilot licenses and 259 commercial pilot licenses; CAAT, 2022). Using Yamane's (1973) finite population formula at a 95% confidence level and 0.05 margin of error, a minimum sample of 254 was determined. The researcher set a target of 260–300 respondents to ensure statistical power for moderated regression analysis. A total of 274 valid and

complete responses were obtained through purposive sampling, representing participants across four training phases: Year 1–2 (Ground School, approximately 18–24 months of academic and ground study), Year 3 (Initial Flight Training, comprising primary and basic flight phases), Year 4 (Advanced Flight Training, encompassing instrument and multi-engine training), and CPL/IP (Non-degree, for candidates pursuing a Commercial Pilot License outside the standard four-year degree program). The sample of 274 represents approximately 39.7% of the total known population of 691 CAAT-accredited student pilots, which substantially exceeds the minimum required sample of 254 and provides adequate statistical power for the moderated regression analyses employed. For Phase 2, five to seven senior flight instructors and check airmen were selected through purposive sampling based on the principle of data saturation.

Instruments

The structured questionnaire comprised four parts. Part 1 collected demographic information (gender, year of study, accumulated flight hours). Part 2 assessed narcissism using the Narcissistic Personality Inventory-16 (NPI-16; Ames et al., 2006), a validated 16-item forced-choice instrument with binary scoring (0–16), where higher scores indicate greater subclinical narcissism. The cross-cultural applicability of narcissism measurement instruments within Thai populations has been independently supported by prior psychometric validation research demonstrating structural validity of Dark Triad measurement tools in Thai contexts (Boonroungrut and Huang Fei, 2018), lending confidence to the use of narcissism instruments with this study's Thai sample. Part 3 measured overconfidence through a knowledge-confidence calibration paradigm: respondents evaluated five technical aeronautical statements (True/False) adapted from FAA standards and rated their subjective confidence (0–100%). Overconfidence was operationalized as the absolute discrepancy between confidence levels and objective accuracy scores. Part 4 assessed safety decision-making using a 5-point Likert-type rating scale across hazardous flight scenario items adapted from FAA risk management protocols.

Instrument validity was established through expert panel review using the Item-Objective Congruence (IOC) index. Reliability was assessed through a 31-participant pilot test, yielding KR-20 = 0.852 for the NPI-16, Cronbach's α = 0.895 for the overconfidence measure, and Cronbach's α = 0.834 for the safety decision-making scale, all exceeding the 0.70 acceptability threshold. For Phase 2, a semi-structured interview guide was developed iteratively based on the quantitative findings.

Procedure and Analysis

Quantitative data were collected via Google Forms distributed through closed aviation community groups and through on-site hard-copy administration at participating ATOs. Respondent anonymity was maintained throughout. Quantitative data were analyzed using SPSS, employing

descriptive statistics (means, standard deviations, skewness, kurtosis), simple linear regression analysis, and hierarchical moderated regression analysis using Hayes' (2018) PROCESS Macro (Model 1) with mean-centered predictors. Qualitative interview audio recordings were transcribed verbatim and analyzed using thematic analysis. Qualitative themes were subsequently integrated with the quantitative findings in the discussion.

Results

Participant Characteristics

The sample of 274 respondents was predominantly male ($n = 255$, 93.07%; female $n = 19$, 6.93%), reflecting the current gender composition of Thai commercial aviation training. The largest subgroup was Year 3 initial flight training students ($n = 94$, 34.31%), followed by Year 4 advanced training students ($n = 84$, 30.66%), Year 1–2 ground school students ($n = 61$, 22.26%), and CPL/IP non-degree students ($n = 35$, 12.77%). Regarding accumulated flight hours, the largest proportion had 0–50 hours ($n = 93$, 33.94%), with progressively smaller proportions at higher experience levels, consistent with the typical training pipeline distribution.

Descriptive Statistics

Descriptive statistics for all key variables are presented in Table 1. The mean narcissism score ($M = 7.22$, $SD = 2.98$) falls slightly above the midpoint of the NPI-16 scale, indicating a moderate-to-elevated level of subclinical narcissistic traits within this cohort. The mean overconfidence score ($M = 1.05$, $SD = 0.55$) reflects a calibration gap between confidence and accuracy. The safety decision-making mean ($M = 11.99$, $SD = 3.05$) corresponds to a moderate-to-high level of hazardous decision-making tendency across the scenario items. Skewness and kurtosis values for all variables fell within ± 2.0 , confirming normal distributions suitable for parametric analysis.

ตารางที่ 1 Descriptive Statistics of Key Variables ($n = 274$)

Variable	M	SD	Skewness	Kurtosis
Narcissism (X1)	7.22	2.98	0.160	-0.448
Overconfidence (X2)	1.05	0.55	-0.092	-0.861
Safety Decision-Making (Y1)	11.99	3.05	0.740	0.424

Hypothesis Testing

Hypothesis 1: Narcissism $\rightarrow$ Safety Decision-Making (ANOVA)

Simple linear regression analysis was conducted to examine the direct relationship between narcissism and safety decision-making. Results revealed that narcissism is a strong and statistically

significant positive predictor of hazardous safety decision-making ($B = 0.576$, $SE = 0.051$, $\beta = 0.564$, $t(272) = 11.254$, $p < .001$; $R^2 = .318$; $F(1, 272) = 126.653$, $p < .001$), confirming that narcissism exerts a significant direct influence on safety decision-making among commercial pilot students. H1 was supported. Narcissism alone accounts for 31.8% of the variance in hazardous decision-making, representing a large effect. Pilot students with higher narcissism scores exhibited markedly more hazardous decision-making tendencies, consistent with the Threatened-Egotism model (Morf and Rhodewalt, 2001), whereby evaluative challenges in flight training are perceived as ego threats that elicit defensive risk-taking rather than adaptive learning.

ตารางที่ 2 Simple Linear Regression Results: Narcissism (X1) Predicting Safety Decision-Making (Y1)

Predictor	B	SE	β	F	p
Narcissism (X1)	0.576	0.051	0.564	11.254	< .001
Model Fit	$R^2 = .318$	$F(1, 272) = 126.653$	$p < .001$		
Note	n = 274. Standardized coefficients reported for β .				

Hypothesis 2: Narcissism $\rightarrow$ Overconfidence (Simple Regression)

Simple regression analysis revealed that narcissism is a statistically significant positive predictor of overconfidence ($\beta = 0.148$, $t = 2.463$, $p = .014$; $R^2 = .022$; $F(1, 272) = 6.065$, $p = .014$). Pearson correlation further confirmed a significant positive association ($r = .25$, $p < .001$). H2 was supported. It is important to acknowledge that the explained variance of 2.2% is modest, indicating that narcissism alone accounts for only a small proportion of the variance in overconfidence. This is consistent with the broader overconfidence literature, which recognizes that overconfidence is a multi-determined phenomenon shaped by a wide range of factors beyond personality traits alone including domain-specific experience, task difficulty, feedback quality, training environment, and situational stress (Moore and Healy, 2008). Narcissism should therefore be understood as one contributing factor among many, rather than a primary driver of overconfidence in isolation. Nonetheless, the statistically significant relationship confirms that narcissism functions as a cognitive distortion mechanism, with self-enhancement processes driving systematic upward bias in self-assessment particularly through the illusion of control leading narcissistic students to believe they possess exceptional, innate abilities that exceed those of their peers. The practical significance of this modest direct effect becomes substantially clearer in the context of H4, where the narcissism-by-overconfidence interaction produces a markedly amplified effect on safety decision-making.

Hypothesis 3: Overconfidence → Safety Decision-Making (Simple Regression)

Overconfidence emerged as a powerful and statistically significant predictor of hazardous safety decision-making ($\beta = 0.490$, $t = 9.280$, $p < .001$; $R^2 = .240$; $F(1, 272) = 86.113$, $p < .001$). This single variable accounts for 24.0% of the variance in unsafe decision-making behavior, making it the strongest individual predictor in the study. H3 was supported. The mechanism operates through degraded risk perception: overconfident pilot students systematically underestimate the severity of real-world hazards and disregard critical safety signals (e.g., deteriorating weather, low fuel warnings), rationalizing the continuation of dangerous courses of action due to a false sense of capability.

ตารางที่ 3 Simple Regression Results: Narcissism Predicting Overconfidence (H2) and Overconfidence Predicting Safety Decision-Making (H3)

Predictor	B	SE	β	t	p	R ²
Narcissism → Overconfidence	0.028	0.011	0.148	2.463	.014	.022
Overconfidence → SDM	2.689	0.290	0.490	9.280	< .001	.240

Note. SDM = Safety Decision-Making (Y1).

Hypothesis 4: Moderating Effect of Narcissism on Overconfidence → Safety Decision-Making

Hierarchical moderated regression analysis demonstrated that the inclusion of the narcissism × overconfidence interaction term produced a highly significant improvement in model fit ($\beta_{\text{interact}} = 0.379$, $t = 10.112$, $p < .001$; $\Delta R^2 = .141$; $\Delta F(1, 270) = 102.245$, $p < .001$). The full model—comprising main effects and the interaction—explained 62.8% of the variance in safety decision-making ($R^2 = .628$). H4 was supported. These results confirm that narcissism does not merely add to the risk created by overconfidence; it acts as a potent amplifier that transforms individually dangerous biases into a synergistically hazardous combination.

ตารางที่ 4 Hierarchical Regression: Moderating Effect of Narcissism on the Overconfidence–SDM Relationship

Model	β	t	p	R ²	ΔR^2
Model 1: Main Effects				.487	
Narcissism (X1)	0.502	11.417	< .001		
Overconfidence (X2)	0.416	9.463	< .001		
Model 2: + Interaction				.628	.141
Narcissism × Overconfidence	0.379	10.112	< .001		

Note. All predictors mean-centered prior to entry. $n = 274$.

Qualitative Themes (Phase 2)

Thematic analysis of in-depth interviews with senior flight instructors and check airmen identified three core psychological mechanisms that contextualize the quantitative findings.

Theme 1: Feedback Resistance. Highly narcissistic pilot students systematically deflect instructor feedback onto external attributions (equipment malfunction, unfair evaluation), preventing the correction of overconfidence miscalibration. Rather than internalizing critical feedback as information for skill recalibration, these students maintain their grandiose self-image by externalizing blame, leaving the underlying cognitive bias intact and unresolved.

Theme 2: Mission-Oriented Fixation. Ego-driven fear of 'losing face' compels narcissistic, overconfident students to continue into deteriorating conditions such as pressing on into adverse weather rather than diverting because they perceive a conservative safety decision as a public admission of incompetence. The psychological cost of this perceived humiliation overrides the objective safety imperative, a pattern directly linked to classic 'get-there-itis' and 'press-on-itis' accidents.

Theme 3: The Halo Effect of Early Success. Initial achievements such as a first successful solo flight create a confidence spike that narcissistic students misinterpret as evidence of innate superiority rather than as the product of disciplined foundational training. This false validation leads to a perilous disregard for Standard Operating Procedures (SOPs) in subsequent, more complex flight phases, as the student believes they have mastered skills that in reality require continued practice.

Discussion

This study provides empirical confirmation that narcissism and overconfidence are not merely abstract psychological vulnerabilities but measurable, active predictors of hazardous safety decision-making among commercial pilot students. The integrated findings across quantitative and qualitative phases offer a coherent, theoretically grounded picture of how latent psychological traits translate into operationally dangerous behaviors within the aviation training environment.

Narcissism as a Driver of Overconfidence and Unsafe Behavior

The finding that narcissism significantly predicts overconfidence (H2) is consistent with the broader self-enhancement literature (Campbell et al., 2004; Zajenkowski et al., 2020) and extends it to the novel context of aviation training. Narcissistic individuals possess an inflated self-view that distorts cognitive self-assessment upward, producing the calibration failure operationalized as overconfidence in this study. In the aviation training context, this manifests as an illusion of control (Langer, 1975): narcissistic students believe their personal skill supersedes the need for Standard Operating Procedures. This belief system is the cognitive foundation from which violations emerge.

The direct influence of narcissism on safety decision-making (H1) is explained by the Threatened-Egotism Model (Morf and Rhodewalt, 2001). Flight training, by its nature, involves repeated evaluative pressure and unavoidable errors. For a narcissistic student whose self-image is contingent on perceived superiority, these events constitute ego threats that trigger defensive rather than adaptive responses. Rather than accepting corrective feedback from instructors, these students deploy ego-protective mechanisms that externalize blame directly paralleling the qualitative theme of Feedback Resistance and engage in aggressive risk-taking to reassert their self-concept of competence. This cyclical process perpetuates a persistent failure of safety learning.

Overconfidence as a Catalyst for Hazardous Judgment

The finding that overconfidence independently accounts for 24% of the variance in hazardous safety decision-making (H3) is the strongest individual effect identified in this study and is highly consistent with cross-domain evidence (Murata, 2017; Bonini et al., 2015).

This effect operates primarily through the mechanism of degraded risk perception: overconfident students systematically underestimate the probability and severity of hazards, effectively filtering out critical safety signals before they can influence the decision-making process. The FAA's hazardous attitude constructs of 'Macho' and 'Invulnerability' 'I can do it' and 'It won't happen to me' are not simply abstract attitudinal categories; this study provides empirical evidence that they are direct behavioral manifestations of measurable overconfidence bias. This finding converges with evidence from traffic safety research, which similarly identifies overconfidence and sensation-seeking as primary drivers of high-speed errors and impulsive decision-making among young operators (Chueadamrong, 2023), suggesting a cross-domain pattern that transcends the aviation context.

This finding also aligns with the Dunning-Kruger Effect (Kruger and Dunning, 1999): students in the early-to-intermediate training phases, having successfully mastered basic maneuvers, enter a dangerous zone of inflated confidence that outpaces their actual threat-assessment capability. Because they do not know what they do not know, they are blind to low-probability but catastrophic events such as sudden weather deterioration or complex system failures precisely the scenario types that demand the most conservative, procedurally compliant decision-making.

The Synergistic Moderating Effect: A Critical Safety Risk

The most significant contribution of this study is the confirmation of narcissism as a moderator that synergistically amplifies the detrimental influence of overconfidence (H4). The interaction term alone accounted for an additional 14.1% of explained variance, bringing the total model to $R^2 = .628$. This is not merely an additive combination of two independent risks; it is a qualitatively different and more dangerous psychological profile. Ordinarily, a momentary lapse into

overconfidence can be corrected through objective instructor feedback. However, when this overconfidence is combined with high narcissism, the personality trait functions as a psychological shield that actively blocks remediation.

The qualitative themes of Mission-Oriented Fixation and the Halo Effect of Early Success illuminate the specific mechanisms of this synergy. Narcissistic, overconfident students become convinced through a process of self-reinforcing grandiose attribution that their superior competence has already been demonstrated and requires no further validation through procedural compliance. When confronted with a decision point requiring a conservative choice (e.g., diverting due to marginal weather), the ego-preservation motive overrides the threat-management motive, leading to willful continuation into dangerous conditions. This profile aligns precisely with real-world accident patterns such as VFR flight into Instrument Meteorological Conditions (IMC) and controlled flight into terrain (CFIT), where objective evidence of danger was available but disregarded.

Implications for Crew Resource Management

These findings carry substantial implications for the CRM training paradigm. CRM depends fundamentally on the willingness of all crew members to voice concerns, acknowledge errors, and defer to collective judgment. The narcissistic, overconfident student operating under Feedback Resistance and Mission-Oriented Fixation is systematically disinclined to do any of these things. By creating a high power-distance environment in which they reject external input and react with hostility to questioning of their judgment, such students effectively destroy the psychological safety that enables CRM to function. This is not simply an interpersonal issue; it is a structural safety failure that compromises the last layer of defense against catastrophic decision errors.

Conclusions and Recommendations

Conclusions

This mixed-methods study provides robust empirical evidence that narcissism and overconfidence are not simply personality quirks or minor training concerns among commercial pilot students they are measurable psychological predictors of hazardous safety decision-making with direct implications for flight safety. All four hypotheses were supported. Narcissism is a strong direct predictor of safety decision-making quality, explaining 31.8% of its variance (H1), predicts overconfidence through self-enhancement mechanisms (H2), and acts as a potent moderator that synergistically amplifies the influence of overconfidence to produce extreme hazardous aviation attitudes (H4). Overconfidence is independently the strongest individual predictor of unsafe decision-making in this cohort (H3), operating through a degraded risk perception mechanism. Qualitatively,

three mechanisms Feedback Resistance, Mission-Oriented Fixation, and the Halo Effect of Early Success explain precisely how these traits translate into operationally dangerous behavior.

Recommendations for Aviation Practice

Three evidence-based recommendations are proposed for flight training organizations. First, Integration of Ego-Management into CRM Training: FTOs should expand their CRM curricula to explicitly address ego management, developing specific modules that help students recognize the threshold at which healthy confidence becomes dangerous overconfidence. High-fidelity simulator scenarios should be designed to induce controlled human error, forcing students to confront their limitations and accept corrective feedback directly targeting the narcissistic defensive barriers identified in this study.

Second, Psychological Profiling and Peer Review Systems: Flight instructors must be formally trained to detect early behavioral markers of narcissism and feedback resistance. Beyond technical debriefing, FTOs should implement a structured peer feedback system in which students receive constructive criticism from their colleagues. This approach helps narcissistic individuals evaluate their performance through the eyes of peers, effectively dismantling the superiority complex and reducing social desirability bias in self-assessment. The adoption of validated personality screening instruments such as those demonstrating psychometric validity in Thai contexts (Boonroungrut and Huang Fei, 2018) and behavioral screening tools shown to identify high-risk personality profiles across operational safety domains (Chueadamrong, 2023) may further strengthen systematic early detection.

Third, Restructuring Assessment and Reward Criteria: Aviation academies should restructure grading rubrics to explicitly reward conservative decision-making and Non-Technical Skills (NTS). Positive reinforcement for safety-first decisions such as executing a go-around or diverting due to marginal weather will systematically dismantle Mission-Oriented Fixation and ensure that openness to feedback is valued as much as technical proficiency.

Recommendations for Future Research

Future research should employ longitudinal designs tracking pilot students from initial training through to commercial airline operations to determine whether narcissistic traits and overconfidence naturally attenuate with accumulated experience or calcify into permanent hazardous attitudes. Subsequent investigations should encompass the complete Dark Triad incorporating Machiavellianism and psychopathy to understand how these combined traits impact multi-crew coordination and flight deck safety. Cross-cultural comparative studies are also warranted to examine whether the moderating effect of narcissism on overconfidence varies across

individualistic versus collectivistic cultural contexts, informing the development of culturally tailored CRM programs for the global aviation industry.

Limitations

Several limitations of this study should be acknowledged. Regarding generalizability, the sample was drawn from specific flight training organizations in Thailand, and the results may not fully represent experienced commercial pilots, military aviation contexts, or pilot populations in other cultural settings. First, self-selection bias is a notable concern: respondents were recruited partly through closed aviation community groups and voluntary participation, meaning that pilots who chose to respond may differ systematically from those who did not potentially inflating or deflating the prevalence of certain personality traits within the broader student pilot population. Second, training school heterogeneity was not fully controlled; differences in organizational culture, instructor philosophy, and curriculum structure across the participating ATOs may have introduced unmeasured variance in safety decision-making norms and scores. Future research should consider stratified sampling across schools and explicitly model school-level effects. Third, the cultural context of Thailand warrants particular attention. Thailand's collectivist culture, high power-distance orientation, and aviation training norms may interact with narcissism and overconfidence in ways that differ from individualistic Western contexts. The findings should therefore be interpreted within this specific sociocultural framework, and cross-cultural replication is warranted before broad generalization. Concerning self-report bias, this limitation is especially salient in the aviation context: unlike general social science research, pilots are trained and professionally conditioned to present themselves as competent and safety-conscious. Self-assessments of safety attitudes and overconfidence are therefore likely to be systematically biased in a socially favorable direction, potentially underestimating the true prevalence and severity of the traits under investigation. This aviation-specific dimension of self-report bias exceeds the standard social desirability concern and should be regarded as a meaningful methodological constraint on the findings. Future research should supplement self-report measures with instructor-rated behavioral assessments or objective performance data. Finally, the cross-sectional design captures data at a single point in time; future longitudinal research could provide deeper insights into how these personality traits and cognitive biases evolve across the trajectory of pilot training and beyond.

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