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Frontline Perspectives on Safety Voice in Airlines: Organizational Factors Across Cockpit, Cabin, and Ground

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ABSTRACT: This study examines how organizational conditions shape safety voice and silence in airline operations across cockpit, cabin, and ground teams, including outsourced personnel. Using an interpretivist qualitative design with Reflexive Thematic Analysis, the analysis draws on 22 semi-structured interviews (captains/first officers; junior/senior cabin; ramp, dispatch, load control, catering, security) supplemented by Safety Management Systems artifacts. Six themes explain patterned variation: psychological safety versus fear of blame; feedback-loop quality (timeliness, specificity, visibility); KPI and time-pressure trade-offs that erode "beats for checks"; tool usability and anonymity that raise or lower real-time reporting costs; local leadership micro-climates (invitational briefs, pacing, recognition, conflict mediation); and role/contract differences that concentrate voice costs on junior and outsourced staff. An integrative map shows how these elements form either a virtuous loop (voice → visible change → stronger voice) or a vicious loop (silence → opacity → more silence). Contributions include a role-sensitive model linking just-culture signaling, psychological safety, and operational tempo, and a concrete implementation roadmap: brief/debrief scripts and shared hold-points, dual KPI dashboards balancing OTP with safety-process integrity, feedback SLAs with "you said → action taken" notes, mobile privacy-controlled reporting, and contractor-inclusive escalation and learning channels.

KEYWORDS: Safety Voice; Airline Operations; Psychological Safety; Safety Management Systems (SMS); Key Performance Indicators (KPI)

I. INTRODUCTION

Airline organizations routinely invest in formal Safety Management Systems (SMS), yet persistent gaps remain between these structures and the everyday practice of speaking up about hazards, near misses, and procedural drift. Frontline employees frequently underreport concerns, and when reports are filed they often disappear into weak or delayed feedback loops that erode local learning and trust in the system [1]. These gaps are especially consequential in high-tempo operations characterized by on-time performance pressures, compressed turnarounds, and tightly coupled handoffs. The interpersonal risk calculus is uneven: psychological safety—the shared belief that candor will not be punished—varies by team and moment [2], and organizational climate signals about fairness and inclusion differentially shape access to voice across ranks and employment arrangements [3]. Together, these conditions create environments in which safety voice may be normalized through visible learning and fair accountability, or selectively suppressed by hurried tone, KPI salience, and opaque post-report processes.

The study examines how specific organizational conditions shape safety voice and silence across cockpit, cabin, and ground teams, explicitly including personnel employed through third-party contracts. Rather than treating "culture" as a monolith, the analysis focuses on the situated interplay among leadership practices, KPI regimes, reporting tools and anonymity provisions, and the formal commitments of the SMS. By foregrounding the operational cycle—from pre-brief to post-event closure—the approach pinpoints where, how, and for whom organizational levers most effectively convert weak signals into actionable learning [1,2].

The study addresses three research questions: (RQ1) How do frontline employees construe the risks and benefits of speaking up during routine operations, and how do these perceptions vary with situational cues such as time pressure and public visibility? (RQ2) Which organizational practices—specifically leadership routines, KPI design and guardrails, just-culture policies, and the usability and privacy characteristics of reporting tools—enable or inhibit safety voice in practice?

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(RQ3) How do these mechanisms differ across roles (cockpit, cabin, ground) and employment arrangements (core versus outsourced), and what role-specific barriers or enablers emerge from these comparisons [3].

Contributions are twofold. Practically, the study specifies actionable levers—briefing and debriefing routines, paired KPI dashboards that balance punctuality with safety-process integrity, feedback service levels that make learning visible, mobile and privacy-preserving reporting tools, and cross-boundary escalation rights—to strengthen both reporting and organizational learning. Theoretically, it advances a role-sensitive framework that links just-culture signaling, psychological safety, and operational tempo within a closed-loop model of the operational cycle, clarifying why safety voice flourishes in some local micro-climates and falters in others [1,2].

II. BACKGROUND & LITERATURE

Safety Voice & Silence in High-Reliability Work

In high-reliability settings, *safety voice* denotes proactive speaking up about hazards, weak signals, and near-misses, whereas *silence* reflects deliberate withholding driven by anticipated interpersonal and career costs; upward voice is especially salient where operations are time-pressured and error-intolerant [4]. The core psychological mechanism enabling voice is *psychological safety*—a shared belief that candor will not be punished—because it lowers fear of blame and raises expectations that speaking up will lead to improvement rather than retribution [5]. Team evidence indicates that psychologically safe groups channel disagreements into task-focused conflict, which increases perceived voice efficacy and reduces defensive silence when anomalies emerge [6]. Peer dynamics further shape the cost–benefit calculus: coworker knowledge sharing and a promotion focus normalize reporting as a prosocial, career-consistent behavior that is likely to yield constructive outcomes [7]. Micro-behaviors by leaders also matter; even seemingly light-touch cues such as leader humor can bolster psychological safety and, in humor-supportive teams, translate into greater employee voice frequency and quality [8]. Together, these mechanisms—reduced blame threat, heightened outcome expectations, and stronger efficacy beliefs—explain why some crews surface issues early while others stay silent until risks crystallize [5,6].

At the organizational and system level, climates that both *signal* learning and *demonstrate* it through visible feedback loops convert reports into change, which in turn reinforces the belief that voice "works" [1]. In HROs, measuring psychological safety alongside local learning practices provides leaders with actionable diagnostics to target units where silence persists despite formal Safety Management Systems [1]. Empirical work shows that upward voice is amplified when team learning norms and safety climate are strong—conditions that decrease anticipated interpersonal risk and increase outcome expectancies of reporting [4]. Leadership orientation is pivotal: socially responsible leadership elevates psychological safety and job satisfaction, shifting employees from withdrawal toward engagement and disclosure of weak signals [9]. Healthcare HRO findings generalize the mechanism: higher psychological safety is associated with stronger intention to stay, and more stable, confident teams sustain healthier reporting and learning cycles [10]. In combination, these studies imply that durable voice cultures arise when organizations systematically reduce fear of blame, close the loop on reports, and resource local learning—thereby raising perceived efficacy and positive outcome expectations that make speaking up the rational default.

Organizational Climate & Just Culture

Organizational climate—shared perceptions of policies, practices, and expected behaviors—provides the context in which "just culture" shifts organizations from punitive responses after errors toward learning-oriented routines that encourage speaking up and fair accountability. Syntheses show that climate is multidimensional (e.g., ethical, safety, inclusion) and functions as a proximal mechanism translating strategic intent into day-to-day conduct [11]. A just culture can be read as a configuration of ethical climate (norms about right action) and justice climate (perceived fairness), where employees anticipate proportionate, restorative responses rather than blame when weak signals or incidents are reported. Climate for inclusion complements this by signaling interpersonal respect and voice access across ranks and identities, reducing status-linked silence and bolstering perceptions of fair treatment [7]. In combination, these climate facets recalibrate outcome expectations: reporting is more likely when

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employees infer that leadership will treat disclosures as inputs to learning, not triggers for sanction—precisely the inflection that distinguishes punitive from learning-oriented systems [11].

Leadership is the engine that sets and maintains these climates. Evidence shows that leadership and organizational culture shape governance through climate, highlighting climate's mediating role between espoused values and operational behavior [12]. Ethical leadership, in particular, increases employee ethical behaviors via dual mediators—organizational justice and ethical climate—with leader moral attentiveness strengthening these pathways, underscoring how leaders' sensitivity to moral cues sustains just-culture practices under pressure [13]. Employees' perceptions of ethical climate and justice also feed into attributions of leader effectiveness, which then elevate performance—an attributional chain that explains why fair, learning-oriented responses to incidents can enhance both safety and productivity [14], justice fosters organizational citizenship behavior that, in turn, improves performance, making clear that climates oriented to fairness and learning generate discretionary effort crucial for reliability work [15]. Together, these findings position just culture not as rhetoric but as a leader-enabled climate mechanism that aligns governance, ethics, and performance.

Boundary conditions qualify when just-culture signals translate into voice and learning. Incident severity can push organizations toward outcome-biased, punitive reactions that erode justice and ethical climate perceptions unless leaders actively reaffirm fair accountability standards [13,14]. Recency intensifies affect and scrutiny: immediately after salient events, climate for inclusion and justice norms must buffer against scapegoating—especially for lower-status or outsourced groups—so that disclosure remains rational [3,11]. Visibility (who knows about the event and how publicly it is discussed) shapes reputational stakes; transparent but non-punitive governance structures help preserve learning orientation when incidents are highly visible [12]. Practically, organizations should codify response protocols that make proportionality, learning reviews, and feedback loops routine and auditable, protecting the climate under severe, recent, and visible events; theoretically, future work can model these moderators within justice–climate–performance pathways, testing how leader moral attentiveness and inclusion climate buffer punitive drift in high-reliability contexts.

Leadership & Local Micro-Climates

Local micro-climates are made in the moment by the people who run the shift—line and station managers, captains, and crew chiefs—through what they model, what they cue, and how they de-escalate when risk rises. Evidence across high-risk industries shows that supervisory and co-worker safety support *mediate* the link between an organization's stated safety climate and actual safety performance, underscoring why frontline leaders' day-to-day behaviors matter more than posters or policies [12]. Leadership influence is not strictly top-down: teams benefit when influence is *shared*—for example, transformational behaviors distributed across employees, formal leaders, and the team as a whole—because shared leadership enlarges the set of people who can model safe practice, issue timely cues, and calm a tense situation before it cascades [16]. In airline operations, that translates to captains modeling briefings that invite dissent, crew chiefs signaling "speak-up" at push decisions, and station managers normalizing after-action learning, creating micro-climates where voice is expected rather than exceptional.

Mechanistically, leaders shape safety behavior by building *knowledge*, *attitudes*, and *motivation* for safe action, which together predict whether individuals choose thoroughness over speed under pressure [16]. The strength of these leadership effects depends on relational resources: where social capital is higher—trust, shared norms, network ties—supervisor leadership more reliably converts into safe behaviors, suggesting that unit cohesion and cross-team familiarity (e.g., ramp–dispatch–flight deck) amplify the impact of modeling and cueing [17]. Practically, this means that a captain's invitation to challenge, a crew chief's "time-out" gesture, or a line manager's calm reframing during delays works best in crews that already share trust and mutual expectations; absent that relational substrate, the same cues can be missed or discounted [16,17]. Thus, investing in both leader capability and the social fabric of teams is pivotal for sustaining local micro-climates that favor early reporting and error trapping [18].

Aviation's own frameworks crystallize these leader behaviors into operational routines. Crew Resource Management (CRM) develops graded assertiveness, inquiry, and cross-monitoring so that captains and first officers *model* open communication, *cue* clarification and checks, and *de-escalate* interpersonal tension when authority gradients threaten voice [19]. When

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integrated with Threat and Error Management (TEM) and principles from Resilience Engineering, leadership aims shift from preventing every deviation to sustaining adaptive capacity—leaders create slack, call strategic "pauses," and convert weak signals into adjustments before risk hardens emotional temperature in disruptions, reinforcing fair accountability, and making it easy to speak up *in time* to matter.

System Pressures & KPIs

In airline operations, KPI systems translate strategic priorities into day-to-day pressure around on-time performance (OTP), turnaround targets, and service standards—pressures that can unintentionally narrow safety margins if designed or governed poorly. Evidence from EU KPI disclosure shows that stakeholder pressure shapes which indicators are emphasized and how intensely they are pursued, often privileging visible timeliness metrics that signal responsiveness to markets and regulators [21]. Cross-sector KPI design research further warns that efficiency-centric dashboards can crowd out safety-relevant leading indicators unless portfolios are deliberately balanced; frameworks developed for autonomous shipping, for example, explicitly integrate safety, environmental, and operational dimensions to avoid single-metric fixation [21]. For airlines, this implies that OTP and service SLAs should be paired with checks on safety-critical task integrity (e.g., completion quality, exception handling), so the pursuit of punctuality does not erode the buffer needed for detecting and resolving weak signals.

At the ramp, turnaround orchestration technologies make these trade-offs concrete. The Aircraft Turnaround Manager (ATM) concept coordinates multi-party tasks (fuelling, catering, loading, pushback) to meet tight targets and reduce variability, but its value depends on embedding "safety gates" and escalation cues—structured pauses, hold points, and exception workflows—so speed gains do not bypass inspections or documentation [23]. KPI-driven strategies for airline logistics highlight the need to cascade indicators beyond headline OTP into process-level measures such as handoff accuracy, load-sheet correctness, and timely anomaly escalation, which function as leading indicators protecting safety while supporting service reliability [24]. Practically, units should monitor paired metrics (e.g., A14 departure and turnaround-integrity index) and audit cases where schedule recovery coincides with elevated defect or rework signals—an approach that [20]. In practice, that means station managers and crew chiefs establish brief, repeatable rituals (pre-push "go/no-go" cues, post-turn debriefs) that turn just-culture ideals into observable micro-behaviors—lowering

detects safety margin erosion masked by good punctuality.

Methodologically, environment-based design (EBD) for KPIs offers a disciplined way to tie indicator selection and weighting to operational context, reliability requirements, and stakeholder salience, reducing goal conflict and metric gaming [25]. An EBD-guided airline KPI system would intentionally couple service standards with safety-assurance measures (e.g., minimum inspection durations, completion quality thresholds, exception closure SLAs) and set governance routines to rebalance weights after incident clusters or operational changes, echoing multi-criteria insights from maritime KPI frameworks [22]. Transparency in KPI disclosure—shaped by stakeholder expectations—should extend to how safety guardrails are embedded and audited, aligning external legitimacy with internal reliability [21]. In sum, robust KPI architectures for OTP and turnaround achieve reliability not by maximizing speed alone but by co-optimizing punctuality with verifiable safety-process integrity—designed up front (EBD), orchestrated in execution (ATM), and sustained through KPI portfolios that elevate leading safety signals alongside service performance [23].

Technology & Process Enablers

Effective safety voice at scale depends on a socio-technical stack that makes reporting easy, safe, and useful: low-friction e-reporting tools, optional anonymity, reliable feedback channels, and systematic SMS dissemination of lessons. At ecosystem level, digital enablers such as interoperability, data governance, and platform architectures are repeatedly identified as prerequisites for coordinated improvement in aerospace, shaping how information flows across organizational boundaries and turning isolated reports into shared learning assets [26]. A parallel synthesis on innovation and value creation in aviation shows that service-centric, data-driven designs (dashboards, mobile apps, knowledge repositories) are the mechanisms by which technology translates into operational value, reinforcing the case for purpose-built reporting and feedback platforms rather than ad-hoc tools [27]. Together, these reviews position e-reporting and lesson dissemination not as standalone apps but as

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ecosystem capabilities that must be designed for timeliness, usability, and trust.

Concretely, secure data-sharing backbones can harden the integrity and traceability of reports and corrective actions. A blockchain-based process- reporting where chain-of-custody matters (Cao et al., 2023). Complementing this, the "Aviation Technical Support as a Service" concept outlines modular, on-demand technical support functions—remote diagnostics, digital documentation, and knowledge services—that can be bound to reporting workflows so that submissions automatically trigger curated guidance and escalation paths rather than disappearing into a queue (Kabashkin & Perekrestov, 2023). In practice, that means mobile e-forms with role-aware fields and optional anonymity, cryptographically signed event records when needed, and integrated feedback widgets that show status, actions taken, and links to relevant procedures—turning reports into actionable, auditable processes [28,29].

Finally, technology only improves safety culture when leaders use it to signal and deliver commitment to SMS. Evidence from collegiate flight programs indicates that perceived SMS commitment is associated with stronger safety culture, implying that visible feedback loops, timely lesson bulletins, and accessible repositories are as important as the reporting intake itself [30]. Process design should therefore codify feedback service levels (e.g., acknowledgment within 24–48 hours; closure summaries within set windows), push "lessons learned" via dashboards and micro-briefing packs, and embed searchably indexed case libraries that teams can reference during pre-flight and turnaround—practices consistent with ecosystem enablers identified for aerospace innovation [27]. When anonymity options reduce fear costs, when feedback channels reliably close the loop, and when SMS dissemination keeps lessons alive in the workflow, organizations convert individual reports into collective resilience—fulfilling the cultural promise of technology-enabled safety voice.

Role Differences

Authority gradients shape cockpit dynamics by defining who speaks, who challenges, and how quickly weak signals surface. Cross-domain evidence shows that steep or ambiguous gradients suppress upward challenge even when hazards are recognized, highlighting a generalizable reliability risk for tightly coupled transport operations [31]. In the cockpit, role (captain vs. first officer), flight experience, and power distance orientation jointly condition situation awareness quality sharing platform for aviation suppliers demonstrates how tamper-evident logs, standardized schemas, and selective access can connect OEMs, MROs, and tiered suppliers, enabling cross-firm visibility on defects, rework, an (SA): higher power distance and lower experience can degrade shared SA and delay voicing, especially for junior pilots in high-tempo phases [32]. Findings from Turkish airlines further reveal a "flight safety versus professional courtesy" dilemma, where culturally reinforced deference can mute corrective input despite recognized risk—an authority-gradient effect with direct implications for safety voice [33]. Practically, graded assertiveness and explicit invitation to dissent are needed to rebalance gradients without undermining command authority, ensuring that role-based expertise—not hierarchy alone—drives final decisions.

Cabin crews encounter a different constraint set: customer-facing duties demand emotional labor, which elevates stress and can depress satisfaction, narrowing attention for hazard detection and discouraging discretionary speaking up during service disruptions [34]. Organizations often respond with high-performance work practices (HPWPs) aimed at service excellence, yet the conversion of such practices into reliable recovery after disruptions depends on the psychosocial safety climate (PSC) that legitimizes pausing service to address safety-relevant concerns [35]. Where PSC is strong, employees perceive support for candid escalation and receive latitude to deviate from service scripts to protect safety, improving both recovery performance and the sustainability of emotional labor demands [35]. Consequently, cabin role design should pair service KPIs with PSC safeguards—clear "stop/service-hold" cues and non-punitive debriefs—so that customer obligations do not crowd out safety voice during high-visibility events [34].

Ground operations add time and commercial pressures at multi-team interfaces (ramp, loading, dispatch), where authority gradients can be amplified by task specialization and supervisory span. Although derived from rail, evidence on team-level gradients underscores how hierarchical distance and unclear challenge pathways suppress early correction in distributed, schedule-driven work—an insight that maps to ramp turnarounds with many handoffs [31]. In these settings, contractual boundaries and outsourcing can further stratify status, increasing silence costs for contractor staff during peak pressure; PSC becomes the lever that maintains a common standard for speaking up across employer lines while HPWPs

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focus on uniform recovery goals [35]. The implication is to engineer role-appropriate challenge protocols and shared escalation rights (e.g., "anyone can call time-out") that traverse organizational boundaries, ensuring time and revenue pressures do not differentially suppress voice among ground and outsourced teams relative to cockpit and cabin.

III. METHODOLOGY

This study adopts an interpretivist qualitative design using Reflexive Thematic Analysis to surface how frontline actors construct, negotiate, and enact "safety voice" within operational constraints across cockpit, cabin, and ground settings [36]. The setting will span one to three airlines/airports, ideally mixing a legacy carrier and a low-cost carrier to capture organizational design variation. We will use purposive, maximum-variation sampling to recruit 22 participants across roles—captains and first officers; junior and senior cabin crew; ground staff in ramp, dispatch, load control, catering, and security—explicitly including outsourced personnel where relevant to voice dynamics [37,38]. Data sources comprise 45–60 minute semi-structured interviews, brief artifact review (e-reporting templates, feedback bulletins, SMS notices), and limited non-intrusive observation of briefings/turnarounds where feasible [39]. Procedures include recruitment via safety/HR, informed consent, private audio recording, verbatim transcription, and encrypted storage. Ethics safeguards emphasize role/base anonymization, avoidance of event-specific blame, right to withdraw, and extra masking for small units; researcher reflexivity will be managed through pre/post-interview memos, bracketing prior assumptions, and peer debriefs [2]. Analysis will proceed inductively from familiarization to coding, theme generation, and refinement with attention to negative cases and role contrasts; credibility will be strengthened by triangulating roles and artifacts and sharing a short theme map for participant reflections [40].

Planned participant matrix (P01–P22). This distribution targets heterogeneity in authority gradient, customer-facing pressure, and time/commercial constraints, and includes contractors where outsourcing may alter voice costs.

Table 1: Participant Matrix: Roles, Employment Status, Experience, and Operational Context

ID	Stream / Role	Employment	Experience (yrs)	Base/Carrier Type	Notes (CRM/SMS, roster, leadership)
P01	Captain (A320)	Core	18	Base A / Legacy	Line-check exp; CRM facilitator
P02	First Officer (A320)	Core	3	Base A / Legacy	Recent upgrade path; night turns
P03	Captain (B737)	Core	15	Base B / LCC	High OTP pressure route
P04	First Officer (B737)	Core	6	Base B / LCC	New e-reporting user
P05	Captain (A321)	Core	9	Base C / Legacy	Mixed charter/scheduled
P06	First Officer (A321)	Core	1	Base C / Legacy	Junior; recent CRM initial
P07	Senior Cabin Crew	Core	14	Base A / Legacy	Purser; manages service disruptions
P08	Junior Cabin Crew	Core	2	Base A / Legacy	High customer contact
P09	Senior Cabin Crew	Core	11	Base B / LCC	Known for assertive "time-out" cues
P10	Junior Cabin Crew	Core	4	Base B / LCC	New SMS app user
P11	Senior Cabin Crew	Core	8	Base C / Legacy	Service recovery experience

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P12	Junior Cabin Crew	Outsourced	3	Base C / Legacy	Contractor; differing KPIs
P13	Ramp Agent	Outsourced	7	Base A / Legacy	Night ramp; pushback interface
P14	Ramp Crew Chief	Core	12	Base A / Legacy	Leads turnarounds; de-escalation
P15	Dispatcher	Core	10	OCC / Legacy	Flight watch; cross-team handoffs
P16	Load Control Officer	Outsourced	9	Base B / LCC	Loadsheet integrity; time pressure
P17	Security Screener	Outsourced	5	Base B / LCC	Contract boundary with airline
P18	Catering Lead	Outsourced	13	Base B / LCC	Last-minute changes; SLA tension
P19	Turnaround Coordinator	Core	6	Base C / Legacy	ATM tool super user
P20	FO (B737)	Core	5	Base B / LCC	High-tempo short sectors
P21	Station Manager	Core	16	Base A / Legacy	Local climate setter
P22	Load Control (Senior)	Core	20	Base C / Legacy	Mentor; exception protocols

The guide covers: (i) why people speak up or stay silent—how confident they feel about the impact of reporting, how much blame they expect, and what outcomes they anticipate; (ii) small leadership signals from captains, crew chiefs, and station managers—how briefings are run, whether challenge is invited, and how tone (including appropriate humor) shapes safety voice; (iii) what happens after a report—how fast and how specifically feedback arrives, and how that affects future reporting; (iv) performance pressures—on-time performance (OTP), turnaround targets, and service standards—and how these targets can squeeze the time needed to notice and fix issues; (v) the usability and trustworthiness of e-reporting tools—mobile access, number of clicks, clarity of categories, and the availability and credibility of anonymity options; (vi) differences across roles and employment types—cockpit, cabin, and ground; core and outsourced—and how authority and status influence the cost of speaking up; (vii) local cultural norms such as power distance and "professional courtesy," and how these shape everyday challenge and deference; (viii) practical de-escalation routines and teamwork methods (e.g., brief, repeatable scripts for pausing, checking, and resuming work) that keep discussions calm under time pressure; (ix) how lessons learned are shared—what information reaches crews, what gets lost between bases or teams, and which formats actually change practice; and (x) design implications for policies, KPIs, and tools—what to change, add, or remove to make reporting easier and safer. The guide is applied flexibly in situ, with role-tailored probes, "walk-me-through" reconstructions of recent events, and deliberate contrasts (e.g., day vs. night, legacy vs. low-cost) to produce rich, comparable accounts suitable for inductive theme development.

IV. DATA ANALYSIS

We apply Reflexive Thematic Analysis (RTA) to understand how frontline actors construct and enact safety voice across cockpit, cabin, and ground. The process is iterative rather than linear; phases are waypoints that we may cycle through multiple times. Throughout, we treat researcher subjectivity as an analytic resource, keep reflexive memos, and maintain an audit trail of decisions. NVivo (or equivalent) supports the work but does not substitute analyst judgment. Descriptive counts (e.g., code references by role) are used only to *sensitize* attention to patterns; they are not inferential statistics.

Familiarization → Inductive Coding

All P01–P22 interviews are transcribed verbatim and anonymized (role/base masking). The analyst reads each transcript at least twice, writes margin notes, and drafts reflexive memos (e.g., first hunches

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about authority gradients, KPI pressure, or tool trust). Artifacts (e-reporting forms, feedback bulletins, SMS notices) are reviewed alongside at both semantic (explicit meanings) and latent (underlying assumptions) levels. Codes remain granular at v0 (e.g., "invited dissent in briefing," "OTP override," "anonymity distrust," "contractor second-class," "humor to defuse gradient," "feedback black box"). Each code has a brief memo capturing its story across roles/bases; source attributes (role, employment type, base) are applied to enable later descriptive contrasts.

Candidate Themes

Codes are clustered around *central organizing concepts* that explain patterned meaning (not just topics). Early candidates may include: Making it Safe to Speak, Chasing Time vs. Guarding the Margin, Tools that Talk Back—or Don't, and Across the Line (contracting & belonging). For each candidate, we write a one-paragraph proposition, inclusion/exclusion rules, and assemble high-tension extracts. We then stress-test themes against the full dataset and actively seek negative cases (e.g., a junior FO challenging a captain on a night turn; a small base with rapid personal feedback that counters the "black box" pattern). When such cases redefine the pattern, themes are split/merged/renamed and boundaries tightened. We document edge conditions (incident severity/visibility, slot pressure, night vs. day) so the final account specifies when/where a pattern holds.

Define/Name Themes → Narrative Synthesis with Vivid Excerpts

For each final theme (target 3–6), we craft (i) a crisp name signaling the organizing concept, (ii) a definition and boundary notes, (iii) a short "how this answers the RQs" story, and (iv) role contrasts (cockpit/cabin/ground; core vs. outsourced). The write-up "shows its work" using anonymized excerpts (role & tenure only) that illustrate mechanisms (e.g., captain invitation → FO challenge), tensions (OTP vs. inspection thoroughness), and context (outsourcing boundaries). Each excerpt is followed by 1–2 sentences of analytic reading that link it to the theme and cross-role pattern. Credibility is reinforced via role triangulation with artifacts and a brief member-reflection round on a one-page theme summary.

Table 4 provides a concise roadmap for the Reflexive Thematic Analysis used in this study, outlining each phase, the specific actions undertaken, the core analytic artifacts generated, and the accompanying quality checks and outputs. The workflow is iterative rather than strictly linear; phases may be revisited as themes evolve and disconfirming evidence is examined. Reading across rows shows how familiarization memos and artifact summaries feed open coding and codebook v0; how clustered codes and theme maps are stress-tested with negative cases and edge-condition notes; and how named themes are refined against the research questions before narrative synthesis with vivid excerpts. The final column captures safeguards—anonymization checks, peer debriefs, audit trails, role-coverage reviews, brief member reflections—that support credibility and transparency from dataset map to final narrative.

transcripts to contrast *work-as-imagined* with *work-as-done*. We then conduct open, inductive coding

Table 4: Lean Reflexive TA Workflow

Phase	Key actions	Core artifacts	Quality checks & outputs
Familiarization	Read/listen twice; margin notes; reflexive memos; parallel artifact review	Familiarization memos; artifact summaries	Confirm anonymization; dataset coverage by role → Dataset map
Inductive coding	Open coding (semantic + latent); apply role/base/contractor attributes; code memos	v0 code list; code memos	Peer debrief to avoid premature theorizing → Coded corpus; codebook v0
Candidate themes	Cluster codes to organizing concepts; draft propositions & inclusion/exclusion; theme map v0	Theme boards; map v0	Rival explanations considered; thin clusters flagged → Candidate set

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Review (incl. negatives)	Search disconfirming cases; refine boundaries; mark edge conditions	Negative-case log; decision notes	Audit trail of changes; role coverage re-check → Theme map v1
Define/name	Name themes; write definitions, boundaries, role contrasts	Theme profiles	Read against RQs; remove redundancy → Final themes (3–6)
Narrative synthesis	Select vivid excerpts; write analytic linking text; finalize visuals	Excerpt bank; final map	Member reflections (brief); thick description → Final narrative

Excerpts are minimally edited (punctuation/ellipses only), masked by role and tenure (e.g., "FO, 3y; Base B/LCC"), and never include identifiable dates/tail numbers. We balance confirming and disconfirming extracts per theme and note boundary conditions explicitly. Credibility is supported through triangulation (cross-role + artifacts), a short member-reflection on the theme map with a balanced subset of participants, two peer-debrief checkpoints (candidate and final themes), and a dated audit trail (codebook versions, maps, decision memos) stored with a README describing folder structure and naming conventions.

V. FINDINGS

Theme 1 — Psychological Safety vs. Fear of Blame

Across cockpit, cabin, and ground, participants weighed *speaking up* against the risk of blame. "If I know I'll be backed when I call a pause, I speak early; if I expect a witch-hunt, I wait" (P1). Prior retaliation stories—extra audits or lost shifts after reporting—cast long shadows: "Two 'random' audits the week after my report—message received" (P19); "They thanked me, then kept me off premium flights" (P18). By contrast, small "safe-to-try" cues lowered the cost of voice: "Before taxi I say, 'Find the flaw in my plan,' and then I wait" (P1); "If anything feels off, I give the time-out signal and the clock stops" (P14). These episodes show psychological safety is produced in moments, not manuals, and that informal sanctions—not just formal discipline—sustain silence.

Peer norms and authority gradients further shaped the calculus. "On my crew, we fix things quietly to protect OTP; if you log it, you're 'dramatic'" (P12). Fear was strongest for junior and outsourced staff—"You don't want to look green challenging a captain" (P6)—unless leaders explicitly softened the gradient: "When the skipper opens with 'I am not infallible,' my input is welcome" (P3). Contractors felt the highest stakes: "Calling a stop on a core team's push feels risky, even if you're right" (P13). For our study, the implication is threefold: interrupt informal retaliation by auditing post-report experiences, institutionalize micro-routines that normalize voice (challenge invitations, time-out gestures, public kudos), and codify cross-boundary "stop-the-line" rights so hierarchy and contracting do not convert emerging hazards into silence.

Theme 2 — Feedback Loop Quality

Participants drew a sharp line between feedback that is timely and specific versus the "black box" experience of submitting a report and hearing nothing useful back. "I get the auto-reply in minutes, but real closure never comes—so next time I think twice" (P2). A senior cabin attendant put it bluntly: "If all we get is 'thanks for your input,' it feels like throwing notes into a well" (P7). Ground staff echoed the gap: "We flag a load-sheet anomaly and weeks later a generic bulletin appears—no reference to our case, no fix we can see" (P19). When specificity was present, motivation changed: "The best ones quote our wording, say what was found, and what changed—then I believe reporting works" (P10). Taken together, timeliness and specificity functioned as the currency of trust; without them, the SMS defaulted to a perceived black box that quietly taxes future speaking up.

Visibility of change—and whether learning signals *travel*—made or broke the loop. "When a SOP tweak lands in the briefing pack with 'you said, we did' and a date, people start pointing out issues more" (P14). By contrast, siloed fixes stalled diffusion: "A hazard spotted on Base B never reaches us at Base A; we only hear after a near-miss of our own" (P11). Leaders acknowledged the optics: "If we fix it quietly in a meeting room, crews assume nothing happened" (P21). Flight deck perspectives matched: "Show me the line in the EFB change log tied to a report ID, and I'm sold; otherwise it's just PR" (P3). For our study, the implication is clear: implement feedback SLAs (acknowledge fast, close with specifics), publish visible "you said → we did" change notes linked to report categories, and push route/base-relevant lessons into pre-flight and turnaround briefings so learning actually moves with the work.

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Theme 3 — KPI & Time Pressure Trade-offs

Participants repeatedly described a tug-of-war between on-time performance (OTP) targets and defect detection, intensified by turnaround pauses vanish" (P14). Flight deck accounts echoed slot pressure: "You weigh a two-minute re-check against a ten-minute delay—the metric wins too often" (P3). Cabin staff felt the same trade-off during service: "When recovery timing becomes the headline, pre-landing checks get squeezed around it" (P10). A station manager noted the structural bias: "We track A14 hourly but we don't have a turnaround-integrity index with the same visibility" (P21). Together these accounts show how KPI emphasis shapes cognitive attention: the more visible OTP becomes, the easier it is for small safety buffers to erode.

"Silent fixes" and workload peaks compounded the drift. "On short turns we tape the panel and 'properly' log later—everyone knows it's to protect OTP" (P12). Catering described similar workarounds: "We swap carts and paperwork catches up after push—keeping the wheels turning" (P18). Pilots linked time pressure to creeping tolerance: "By leg four on a high-tempo day, you're more likely to accept marginal items as 'good enough'" (P2). Captains warned about metric coupling: "Pair OTP with 'zero defect returns' and you basically teach people to under-report" (P1). For our study, the implication is clear: pair punctuality with leading safety-process indicators (e.g., documented hold-point compliance, exception closure SLA), grant explicit "no-blame" protection for safety-driven delays, and resource peak periods (extra hands, green-time buffers) so crews can detect and resolve defects without resorting to silent fixes that hide risk while preserving the metric.

Theme 4 — Tool Usability & Anonymity

Participants stressed that *how* they report matters almost as much as *whether* they report. Mobile access was decisive: "If I can't file it from my phone on the walk back from the aircraft, it probably won't get filed later" (P10). Ground leaders echoed the tempo issue: "Turnarounds are moving targets—give me a two-tap mobile form with photo upload and I'll use it; a desktop portal after shift change, I won't" (P14). Flight deck voices wanted reliable offline capture: "The EFB app should cache a draft when connectivity drops at the stand; losing a report because Wi-Fi hiccupped kills the habit" (P3). Coordinators emphasized quick context capture: "A picture of a latch and a tail stand speaks better than ten dropdowns; we need camera-first reporting" (P19). Ops control added that alerts should route compression. "If we miss A14, it's a meeting; if we find a loose latch, it's 'handle it on arrival'" (P19). A crew chief put the moment-to-moment squeeze bluntly: "When the board flashes red, micro-

without extra effort: "If I flag fuel slips in the OCC tool, it should auto-notify the base list—don't make me email three groups after submitting" (P15). Collectively, these accounts position *mobile-first, offline-tolerant, attachment-friendly* design as the baseline for sustained reporting in high-tempo environments.

Friction in e-forms—and whether the language fits the role—shaped use just as strongly. "Half the categories are maintenance jargon; as load control I'm guessing where a balance issue goes" (P16). Cabin crew described cognitive load from ill-fitting taxonomies: "Service-related hazards don't map cleanly; I spend minutes hunting the 'right' category and give up on busy sectors" (P8). A ramp agent noted that required fields often miss the point: "It demands aircraft hours but not stand number or bay congestion—that's what explains the risk" (P13). Senior load control highlighted how free-text helps but needs structure: "A short narrative with two or three role-specific tags would beat twenty dropdowns any day" (P22). Senior cabin crew asked for plain language and progressive disclosure: "Start simple—what, where, risk level—and only open detailed fields if we choose; don't force a dissertation at door close" (P11). Across roles, participants converged on the same design logic: keep the first screen minimal, make tagging role-aware, allow photos/voice-to-text, and let users save a draft to complete post-push.

Trust in *anonymity*—or lack of it—was the biggest wildcard. "Our base is small; even 'anonymous' feels traceable from the details—people put less and less in" (P12). A purser described "soft unmasking": "Managers say they don't look, but style and route give you away; folks self-censor names and times to stay safe" (P7). Security staff, often contractors, felt this acutely: "If I flag a screening shortcut and it gets back to the team lead, my next roster won't be kind" (P17). Station management recognized the perception gap: "We think we've built trust, but if a report's content can reveal the author, anonymity needs more than a checkbox" (P21). A captain underscored the design stakes: "Give me true options—anonymous, shielded identity until closure, or fully open—and make the choice visible in the report header so nobody feels tricked" (P1). For our study, these accounts imply three concrete enablers: (1) mobile, low-friction capture (offline drafts, photo/voice attachments, two-tap submit) to meet operational tempo; (2) role-aware, plain-

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language taxonomies with progressive disclosure to minimize search and cognitive load; and (3) privacy-by-design anonymity (author-shielding, usability lowers effort and anonymity features lower perceived personal risk, reporting moves from exceptional to routine—directly strengthening safety voice where it is most time-critical.

Theme 5 — Local Leadership Micro-Climates

Participants consistently framed local leaders—captains, crew chiefs, station/line managers—as "climate setters" whose moment-to-moment style made speaking up feel routine or risky. "If I open with 'challenge me if something doesn't add up,' the whole day runs differently—people actually point out weak spots before they grow teeth" (P1). First officers noticed the contrast: "Some captains brief the plan like a verdict; others brief like a draft. With the second type, you feel licensed to edit" (P2). On the ramp, style showed up as pacing: "You can hear it in the radio—some chiefs sprint the team, others leave two beats for checks. Those two beats are our safety margin" (P14). Station leadership echoed the intentionality: "I ask, 'What would make today hard?' in the morning brief; it surfaces hazards early and signals we're not just chasing A14" (P21). Senior cabin crew tied style to service pressure: "When pursers normalize pausing a cart for a safety concern, juniors take that option without fear of looking slow" (P7). These accounts position leadership style—invitational, paced, reflective—as the first lever of micro-climate quality.

Briefing and debriefing rituals translated style into repeatable practice. "We run a two-minute 'red flags' round before push—each role says one thing to watch. It's fast, and it catches stuff" (P19). Flight deck crews valued explicit close-outs: "A 60-second debrief at stand—what went well, what to change—keeps learning fresh and prevents grudge cycles" (P3). Ground teams asked for predictable checkpoints: "A named 'hold-point' before doors close makes it clear anyone can stop the rush if something smells wrong" (P13). Recognition sealed the loop: "When someone calls a time-out and we find a real issue, I post a 'golden catch' note in the group chat with what we changed. It's public and specific, not just 'thanks'" (P21). Cabin crew confirmed its effect: "Those shout-outs change behavior; after my name was mentioned for pausing service, three juniors started flagging things earlier" (P11). Together, short, structured rituals plus visible recognition turned isolated good calls into shared norms.

small-base redaction, delayed identity release, and visible "you said → we did" status) so users see that reporting is both *safe* and *effective*. When tool

Leaders also mediated conflict so voice didn't curdle into friction under time pressure. "If the FO challenges me on taxi routing, I thank them first, then we decide. That order matters—acknowledge before adjudicate" (P1). Crew chiefs used tactical cooling: "When tempers climb on the headset, I switch to names and short asks—'Ali, read me the latch number'—it drops the heat and keeps focus on facts" (P14). Dispatch highlighted private repair over public reprimand: "If someone misses a step, we take the fix on channel and the coaching off channel. Public blame kills the next report" (P15). Contractors flagged the importance of cross-boundary protection: "If I stop a load as an outsourced lead, I need the station manager to back me in the moment; otherwise my team won't risk it again" (P18). For our study, these narratives imply three actionable micro-climate levers: (1) codify invitational briefs and fast debriefs that preserve "beats" for checks; (2) institutionalize specific public recognition for prudent pauses tied to concrete changes; and (3) train leaders in conflict mediation sequences (acknowledge → fact-find → decide) with explicit, on-the-spot backing for cross-boundary stop calls. Where leaders do these small things consistently, safety voice becomes the path of least resistance.

Theme 6 — Role & Contract Differences

Cockpit accounts centered on how authority gradients shape when and how concerns are voiced. "You don't want your first challenge of the day to be in front of the door crew—it feels like a public test" (P2). Junior pilots described a "hesitation tax" that grows with visibility and time pressure: "I rehearse the wording twice before I say it; by then we're already taxiing" (P6). Captains who softened the gradient reported earlier input: "I brief the plan as a draft and ask the FO to improve it—when I do that, I get two or three small corrections that matter" (P1). Another captain linked tone to timing: "If I thank the challenge before I decide, it keeps the air clear for the next one" (P3). Together these cockpit narratives show that rank and setting (e.g., open L1 door, headset on) amplify or dampen voice; explicit invitations and acknowledgment sequences reduce the social cost of speaking up without undermining command authority.

Cabin crews highlighted customer-facing pressure as a distinct constraint on safety voice. "When service is hot, stopping the cart feels like announcing failure to the whole cabin" (P10). Juniors were especially sensitive to optics: "You'll get marked as

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'slow' if you pause for something that doesn't become an incident" (P8). Senior pursers described pause; if I push time, they swallow doubts" (P7). Service recovery windows also competed with pre-landing checks: "When recovery timing becomes the headline, the checks get squeezed around it" (P11). These accounts indicate that service KPIs and public visibility can crowd out discretionary stops unless leaders legitimize safety pauses as success, not delay—making "speak up, then serve" the accepted order of operations in the cabin.

Ground and contractor perspectives emphasized incentives and integration gaps across organizational boundaries. "As outsourced ramp, you're second class—calling a stop on a core team's push can cost you the next roster" (P13). Load control echoed KPI misalignment: "Our SLA is wheels-off; there's no metric for 'caught a bad index,' so you learn to fix quietly" (P16). Security staff noted exposure when anonymity is thin: "Flag a shortcut and it travels back to your team lead; the next week your breaks move" (P17). Catering described paperwork lag as a normalization: "We swap carts to keep time and fix the forms after push—everyone nods because OTP is the scoreboard" (P18). Integration gaps compounded the risk: "I can't see the flight deck change log or the safety chat—lessons don't reach contractors" (P19). A station manager acknowledged the structural hole: "If escalation rights and comms channels stop at the company boundary, we've already biased against early warnings" (P21). For our study, the implication is to equalize rights and routes to speak up—shared "stop-the-line" authority, aligned KPIs that reward defect detection, and common feedback channels—so rank, role, and contracting status do not selectively silence those closest to emerging hazards.

Integrative Theme Map

Safety voice rides on an interaction of six themes across repeating phases of work. Local leadership micro-climates (T5)set the tone at the start of the cycle (briefings), either seeding psychological safety (T1) through explicit invitations and paced rituals or priming fear of blame (T1) under hurry and critique. As the operation unfolds, KPI & time-pressure trade-offs (T3) act as a cross-cutting stressor that narrows attention and erodes "beats for checks," while tool usability & anonymity (T4) raise or lower the effort/risk of reporting in the moment. After a report, feedback-loop quality (T2)determines whether people see timely, specific change; this either reinforces the belief that voice works (virtuous loop) or deepens the "black box" perception (vicious loop). Throughout, role & contract differences (T6) modulate who pays the higher social/contractual cost of speaking up—junior, cabin, and contractor roles are more exposed unless escalation rights and recognition travel across boundaries. In practice, the same event can move in opposite directions depending on these interactions: a captain's "challenge me" brief (T5→T1), a two-tap mobile report with photo (T4), and a visible "you said → we did" note (T2) create momentum for voice even under OTP pressure (T3); remove any one of these and silence becomes the path of least resistance—especially for outsourced teams (T6).

Figure 1 presents a schematic of how the six themes interact across the operational cycle—Pre-brief, Push/Taxi/Turnaround, In-flight/Service, and Post-event/Closure—to enable or suppress safety voice. Read left to right: local leadership micro-climates (T5) set the initial tone, KPI and time-pressure trade-offs (T3) apply cross-cutting stress during execution, tool usability and anonymity (T4) raise or lower the real-time cost of reporting, and feedback-loop quality (T2) determines whether visible, specific change returns to the next pre-brief. Psychological safety versus fear of blame (T1) and role/contract differences (T6) operate as global moderators that amplify or dampen these effects at each phase. The closing arrow ("you said → we did") denotes how lesson signals feed forward, creating either a virtuous loop (voice → visible change → stronger voice) or a vicious loop (silence → opacity → more silence).

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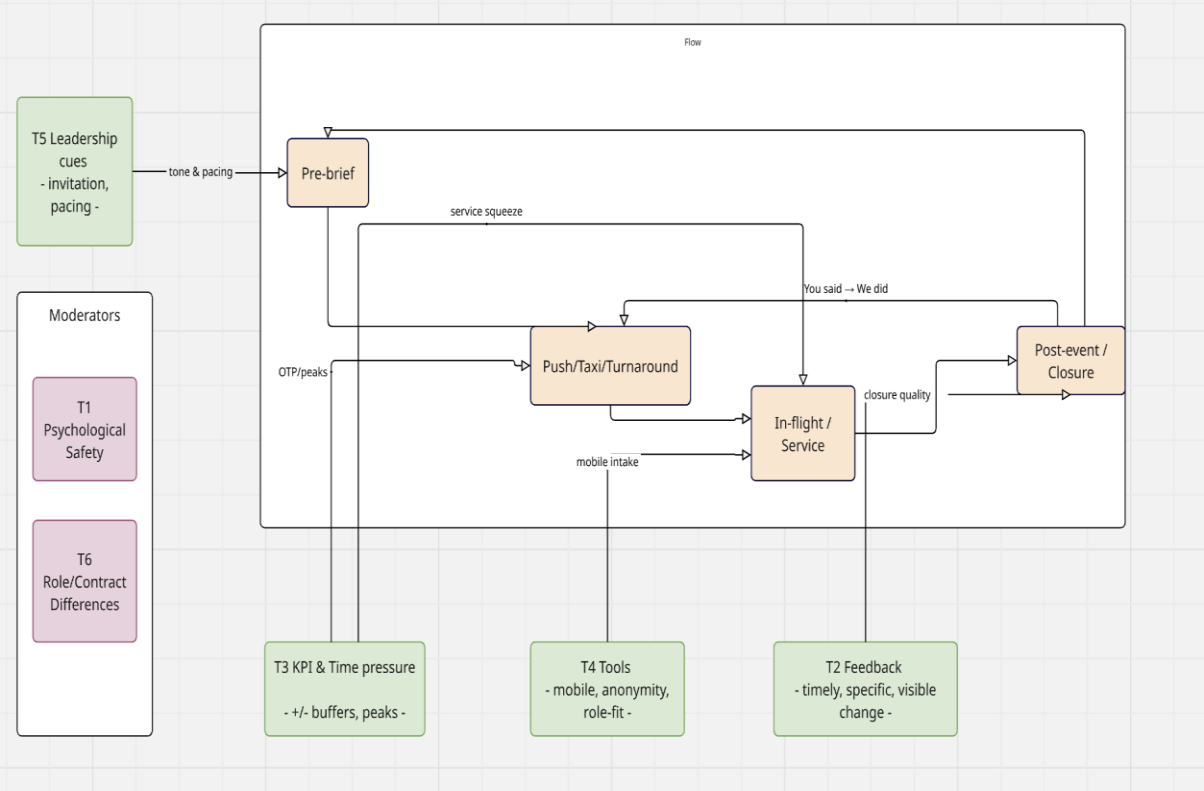
Figure 1. Theme interaction across an operational cycle



VI. DISCUSSION

Theoretical Implications

Our findings suggest that safety voice in airline operations is best understood as a role-sensitive, cycle-bound process shaped by interactions among (a) just-culture signals (fairness and proportionality), (b) psychological safety (moment-to-moment interpersonal risk), and (c) operational tempo (KPI/time pressure across pre-brief → push/turn → in-flight/service → post-event/closure). At the start of each cycle, local leadership micro-climates (briefing tone, pacing, explicit challenge invitations) set the prior for psychological safety. As the operation unfolds, KPI emphasis (OTP, turnaround compression, service recovery) acts as a situational moderator that narrows or expands the "beats for checks," thereby altering the perceived cost of voice. Tool usability and anonymity serve as mechanism enablers that convert weak signals into actual reports (or not), while feedback timeliness/specificity determines whether voice recalibrates beliefs ("reporting works here") for the next cycle. These effects are uneven by role and contract: junior, cabin, and outsourced staff face higher social/contractual penalties for speaking up; without explicit, shared escalation rights, the very people closest to hazards carry the greatest voice cost.

Theoretically, this integrates micro (team/leader), meso (tools, KPIs), and macro (governance/contracting) layers into a closed-loop model. We propose four testable propositions for future research: P1 (Micro-to-Micro): Invitational briefing rituals raise psychological safety and increase early, low-stakes challenges, especially for junior roles. P2 (Meso Moderation): The relationship between psychological safety and voice weakens as OTP/turnaround pressure rises unless paired safety-process KPIs and buffers are present. P3 (Mechanism): Mobile, low-friction, privacy-preserving tools mediate the link between intention to speak and actual reporting behavior. P4 (Macro Feedback): Timely, specific, and visible closure (you said → we did) strengthens just-culture perceptions and increases subsequent voice—particularly among contractors—by lowering expected retaliation and raising expected efficacy. Together, these propositions connect just culture (fair accountability), psychological safety (interpersonal risk), and operational tempo

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(time/KPI stress) into one role-aware account of why voice flourishes on some crews and evaporates on others.

Practical Implications

The findings indicate that safety voice is sustained by the interaction of six, mutually reinforcing themes across the recurring phases of airline operations. Local leadership micro-climates (Theme 5) set the initial tone during pre-briefs: leaders who pace the briefing, explicitly invite challenge, and frame plans as drafts seed psychological safety (Theme 1). Conversely, hurried or critical openings prime fear of blame and elevate the perceived interpersonal risk of speaking up. As the operation proceeds, KPI and time-pressure trade-offs (Theme 3) act as a cross-cutting stressor that narrows attention and erodes the "beats for checks" required to notice and surface weak signals. In parallel, tool usability and anonymity provisions (Theme 4) raise or lower the *transaction cost* of reporting in the moment; mobile, role-fit, privacy-preserving tools make reporting feasible under tempo, whereas frictional or opaque systems discourage it.

Once a report is filed, the quality of the feedback loop (Theme 2) determines whether participants observe timely, specific, and visible change. High-quality closure reinforces the belief that voice is efficacious and initiates a virtuous loop into the next cycle; perfunctory or delayed responses deepen the perception that the Safety Management System is a "black box," thereby discouraging future reporting. Throughout all phases, role and contract differences (Theme 6) modulate who bears the higher social and contractual costs of speaking up: junior personnel, cabin crews in public view, and outsourced teams are systematically more exposed unless escalation rights, recognition practices, and learning signals traverse organizational boundaries.

Practically, the same operational event can evolve in opposite directions depending on these interactions. A captain's "challenge me" brief that normalizes dissent (Theme 5 → Theme 1), a two-tap mobile report with photo evidence that minimizes effort and exposure (Theme 4), and a visible "you said → we did" change note that demonstrates impact (Theme 2) together create momentum for voice even when on-time performance pressures are salient (Theme 3). Removing any one of these components makes silence the path of least resistance, a tendency that is especially pronounced for outsourced teams lacking equal escalation rights and shared learning channels (Theme 6). Accordingly, practical efforts to strengthen safety voice should target the bundle—leadership routines, paired KPIs with buffers, usable and private tools, rigorous feedback standards, and contractor integration—rather than any single element in isolation.

Policy Implications for SMS

Safety Management Systems should codify feedback timeliness as a formal service-level obligation rather than a discretionary courtesy. Policies ought to specify tiered timelines—human acknowledgement within 24–48 hours, a provisional finding or action plan within 7–10 days, and a closure note within 30 days for routine events, with risk-based acceleration for high-severity items. Each report should have a named owner, a visible status bar (received → under review → actioned → closed), and a requirement to include concrete "you said → we did" details at closure. Exceptions to timelines must trigger automatic escalation to the station or safety lead. Compliance should be audited and displayed on an SMS dashboard alongside leading indicators (e.g., exception-closure SLA, recurrence rates), with confidentiality safeguards maintained for reporters. Embedding these standards in policy shifts feedback from ad hoc to predictable, making efficacy of voice observable and, therefore, sustainable.

SMS policy should also mandate role-specific safety voice training that reflects the distinct constraints of cockpit, cabin, and ground—extending explicitly to contracted personnel. For flight crews, curricula should emphasize graded assertiveness, advocacy-inquiry phrasing, and authority-gradient management during high-tempo phases. Cabin training should address customer-visibility pressures, scripted "service pause for safety" language, and de-escalation sequences that protect both dignity and tempo. Ground training should center on turnaround compression, shared hold-points, and cross-team handoffs (ramp–load control–dispatch), including how to initiate and receive stop-the-line calls. For all roles, brief, repeatable micro-routines—one-minute "red flags" rounds at pre-brief and 60-second debriefs—should be practiced in scenario-based sessions and evaluated via observational checklists. Contractor modules must guarantee equal escalation rights and clarify non-retaliation protections, with joint

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airline–vendor sessions to align expectations and metrics.

Finally, governance for lesson dissemination should ensure that learning travels at least as reliably as flights do. Policy should require that every material change generated by reports be published as a short, role-targeted artifact: EFB change notes for the lineage from signal to action. A cross-functional Safety Learning Board (airline and contractor representation) should meet on a fixed cadence to review dissemination coverage, identify "learning debt" (bases or roles that have not received relevant updates), and assign owners to close gaps. Uptake metrics (e.g., read-receipts, briefing quiz hits, spot-check compliance) should be monitored, and dissemination performance included in station and vendor reviews. By turning closure and spread into governed processes—with accountable owners, measurable reach, and role-appropriate formats—the SMS converts individual reports into organizational memory that reliably informs the next pre-brief.

Robustness Checks

We conducted a structured negative-case analysis throughout coding and theme development. After drafting each candidate theme, the analyst searched the full corpus for disconfirming extracts (e.g., junior staff speaking up decisively under high power distance; contractor-led stop calls that were supported in the moment; rapid, specific feedback cycles that contradicted the "black box" pattern). When a negative case re-specified the phenomenon, we revised boundaries, split or merged themes, and recorded the decision in the audit trail. This procedure ensured that the final account accommodates variation rather than smoothing it away, and that stated regularities hold with clearly identified edge conditions (e.g., slot constraints, peak workload, base size).

To address rival explanations, we explicitly probed whether patterns could be attributed to stable individual differences (e.g., personality, tenure, self-confidence) rather than organizational features. Three checks were used. First, cross-role contrasts examined whether the same individual logic appeared differently under distinct KPI regimes and authority structures (cockpit vs. cabin vs. ground), which would indicate situational—not dispositional—effects. Second, artifact triangulation (e-reporting templates, feedback bulletins, SMS notices) tested whether claimed practices had visible procedural correlates (e.g., hold-point checklists; "you said → we did" notes). Third, sensitivity reads re-viewed themes after temporarily excluding outlier bases or high-visibility incidents; themes that persisted across these exclusions were treated as more robust. Where personal style clearly mattered (e.g., captains' invitation habits), we framed it as a mechanism operating within structural conditions (time pressure, tool friction, KPI salience) rather than a competing explanation.

We also ran a role-by-role saturation review to ensure adequate coverage across the 22 participants. Using a simple emergence matrix, we tracked whether new codes relevant to each theme appeared in the final two interviews within each role stream (cockpit, cabin, ground; core vs. outsourced). Saturation was declared for a stream when no substantively new codes emerged across two consecutive interviews and previously identified codes recurred with richer detail. Where gaps were detected (e.g., fewer contractor examples for feedback closure), we returned to the corpus for targeted re-reads and prioritized those extracts in theme refinement to prevent cockpit-centric or legacy-carrier bias.

Finally, we maintained a reflexive appraisal of researcher influence in line with reflexive thematic analysis. Before and after interviews, the analyst logged positionality memos (assumptions about KPI trade-offs, expectations about power distance), noted moments of resonance or surprise, and recorded how these shaped coding choices. Two peer-debrief checkpoints (after candidate themes; before final themes) challenged premature closure and tested alternative framings (e.g., "KPI erosion" vs. "tempo misalignment"). We did not compute inter-rater reliability—consistent with an RTA stance that prioritizes depth, transparency, and coherence over coder consensus—but we ensured auditability through dated codebooks, theme maps, and decision logs. Together, these checks increase confidence that the account is credible, contextually grounded, and sensitive to counter-patterns rather than artifacts of method or standpoint.

Limitations

This study's findings should be interpreted with caution due to several limitations. First, generalizability is constrained by the number and type of sites included and by cultural/contextual factors (e.g., carrier model, base size, national

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power-distance norms), which may shape safety voice dynamics differently elsewhere. Second, the data rely primarily on self-reports from interviews; while triangulated with selected artifacts, accounts are subject to recall, attribution, and social investigations, confidential SMS case files, detailed roster decisions) was restricted, limiting our ability to observe some mechanisms directly and requiring inference from participant narratives and available documents. Together, these constraints may attenuate external validity and introduce blind spots in the causal pathways we propose; future work should broaden site diversity, incorporate more direct observational and behavioral data, and secure deeper access to closed-loop SMS records.

Future Research

Future studies should prioritize longitudinal, role-sensitive evaluations of the interventions implied by this model—e.g., invitational briefing scripts, paired KPI dashboards (OTP plus turnaround-integrity), mobile/anonymous reporting upgrades, and feedback SLAs. Designs could include stepped-wedge rollouts by base or station, with interrupted time-series and multilevel growth models to track changes in voice frequency, time-to-closure, hold-point compliance, and "silent fix" proxies across cockpit, cabin, and ground (core vs. contractor). A mixed-methods program is essential: quantitative trends from SMS logs, EFB change notes, and roster/turnaround data should be integrated with qualitative diary studies and follow-up interviews to understand mechanism drift under peak workload and slot pressure. Mediation tests can examine whether improvements in psychological safety and perceived just culture transmit the effects of leadership routines and tool redesign to reporting behavior, while moderation tests can assess whether contracting status or power-distance norms condition those effects.

Complementary experiments can isolate active ingredients and optimize implementation. Field or online message-framing experiments should compare feedback closure styles (e.g., "you said → we did" specificity, timelines, and visibility) on future reporting intent and trust; A/B tests within reporting tools can evaluate the impact of anonymity modes, photo/voice capture, and plain-language taxonomies on completion rates and quality of detail. Finally, cross-country comparisons using harmonized measures and measurement-invariance checks can map how national culture, regulatory regimes, and labor-market structures shape the costs of voice and the returns to paired KPIs. Comparative analyses across legacy and low-cost models would clarify boundary conditions for generalization and inform policy templates that travel. Together, this agenda would move the field from plausible, role-aware mechanisms to causal evidence on which combinations of leadership routines, KPIs, tools, feedback standards, and contractor governance reliably create a durable virtuous loop for safety voice.

desirability biases, especially when discussing sensitive topics such as retaliation or "silent fixes." Third, access to certain high-sensitivity artifacts and events (e.g., active

VII. CONCLUSION

Concrete levers differ by context but can be applied without carving the operation into silos. Flight crews begin each day with a 60–90-second invitational brief that frames the plan as a draft, asks each role for one red flag, and preserves two beats before taxi for checks; challenges are acknowledged before decisions are made and are named in the stand debrief to normalize early input. Cabin teams use standardized "service-pause for safety" language, exercise authority to halt service without performance penalties, and record a single learning point at door close to keep lessons fresh. Turnaround teams work to two shared hold-points—pre-push and pre–door-close—where anyone can stop the flow; the turnaround coordinator posts a same-shift "golden catch" note describing what was seen and what changed. Personnel working under vendor contracts act under the same stop-the-line authority, see the same briefing packs and closure notes, and are evaluated with metrics that reward defect detection and exception integrity alongside time.

Implementation proceeds in three bounded phases with owners and measurable targets. In the first 90 days, station leadership and safety publish the brief/debrief scripts and hold-point SOP, institute feedback SLAs (human acknowledgment ≤48 hours, provisional finding ≤10 days, closure ≤30 days), enable minimal mobile intake (photo/voice plus three core fields: what, where, risk), and issue specific public recognition through briefing packs or OCC chat; the aim is ≥80% acknowledgments within 48 hours, at least one recognition per shift, and a baseline for hold-point compliance. Between days 90 and 180, operations and IT deploy paired dashboards that show on-time performance alongside a Turnaround-Integrity Index (hold-point compliance, exception-closure SLA, inspection-time minima), add privacy modes to the reporting tool (open, shielded-until-closure, anonymous) with

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small-base redaction, stand up a searchable knowledge base linking closure notes to SOP and EFB changes, and run a monthly 20-minute cross-organization review of two closed cases; targets are to twelve months, safety, HR, and procurement extend coverage to all bases, monitor rostering for post-report retaliation patterns, and fold vendor metrics into joint reviews; expected effects include a ≥25% increase in voice reports per 100 turns, a ≥15-point rise in hold-point compliance, a 30% reduction in silent-fix proxies, and ≥85% SLA adherence with ≥75% of feedback notes citing a specific change.

Taken together, these steps create a tight loop: invitational leadership and paired KPIs preserve time and permission to speak; low-friction, privacy-controlled tools convert weak signals into reports; timely, specific, and visible feedback proves impact; and equalized rights ensure early warnings are surfaced by those closest to emerging hazards. Stations that meet the stated targets should see earlier escalation, fewer late-cycle surprises, and sustained reporting from previously quiet parts of the operation.

≥70% exceptions closed within 30 days, ≥90% crews receiving route/base-relevant "you said → we did" notes before repeat operations. From six

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