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ORGANIZATIONAL DETERMINANTS OF AIRPORT FIRE SAFETY EFFECTIVENESS: AN ANALYSIS OF FIRE AND RESCUE POLICE FUNCTIONS IN VIETNAM

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ABSTRACT

Organizational determinants of Airport Rescue and Firefighting effectiveness remain insufficiently examined despite the growing complexity of airport risk environments. The emphasis on governance structures, leadership systems, human resource capacity and safety culture offers more insight into the manner in which airport fire safety performance is influenced specifically within Vietnam based police-based fire and rescue system. The narrative review approach is a synthesizing approach that incorporates the interdisciplinary literature of aviation safety, organizational theory, governance research, and resilience literature. The theory of High Reliability Organization, institutional theory, Resource-Based View, and perspectives of resilience are incorporated to create a multilevel analysis system. The effective airport fire safety is an outcome of interdependent organizational determinants that work on the macro-level institutional arrangements, meso-level organizational systems, and micro-level operational behaviours. Analysis of the international governance models through comparison shows that there is a structural trade-off between centralized command and decentralized flexibility. In Vietnam, the centralized control is crucial to national consistency, but more inter-agency coordination, professionalization, and digital transformation are important to enhance the adaptive capacity. The conceptual framework, based on many levels, reshapes the ARFF effectiveness as the capability of the organization to be resilient instead of regulatory compliance. Results have policy implications for Vietnam and other similar governance frameworks that aim to improve the quality of airport fire safety.

KEYWORDS: Airport fire safety; ARFF effectiveness; Organizational governance; Safety culture; Organizational resilience.

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1. INTRODUCTION

Airports have become increasingly complex in socio-technical settings that are highly dense in traffic, have advanced technological infrastructure, interdependent infrastructure, and coupled operation processes. With the growth in air transportation around the world, the vulnerability to varied risk situations, such as aircraft crashes, fuel fires, terminal building incidents, and cascading system failures, has increased. The recent evidence reveals that the survivability of accidents and the efficiency of the emergency response systems are important determinants of the outcome of aviation safety (Woodman et al., 2024). In addition to the accident frequency, the ability to contain and control the post-impact fire events is one of the crucial factors of passenger survivability and protection of the infrastructure. At the same time, modern aviation safety studies emphasize the necessity to consider aviation risk in the context of the broader notions of reliability and resilience, incorporating the normal accident theory, the high-reliability theory, and the resilience engineering prism (Muecklich et al., 2023). Such changing theoretical understandings highlight the fact that airport fire safety cannot be narrowed down to technical compliance but rather be construed as an adaptive organizational capacity in high-risk systems.

The empirical studies of the emergency evacuation in airport terminals also contribute to the strategic significance of Airport Rescue and Firefighting (ARFF) systems because they demonstrate the logistical difficulties related to managing the large numbers of people in a time-sensitive and dangerous situation. (Bateman & Majumdar, 2020). Good ARFF systems should then be able to provide quick response, coordination and congruence in the decision-making process among various actors. In addition, resilience-based evaluations of worldwide airport systems indicate a large range of disparities in preparedness and recovery capacity, which implies that institutional and organizational structure can be a crucial factor in safety performance. (Wandelt et al., 2025). The existence of internationally recognized standards, e.g., issued by the International Civil Aviation Organization (ICAO), notwithstanding, the consistent gaps in fire safety performance can still be observed even within jurisdictions.To gain more insights into these disparities, more attention should be paid to the systemic causation of accidents and the issue of human factors. The analysis of accident scenarios in the complex systems indicates that failures are usually produced when the organizational structures, regulation systems and operational practices interact as opposed to single technical failures (Svedung & Rasmussen, 2002). On the same note, human error theories also underline that frontline errors are often the manifestation of underlying organizational factors such as faulty management processes, poor training infrastructure and poor safety cultures (Reason, 2000). The combined effects of these insights are that the effectiveness of airport fire safety is essentially determined by organizational determinants that are incorporated into governance structure, leadership structure, and inter-agency coordination systems.Although the world of aviation safety and resilience literature has grown significantly, the organisational basis of the ARFF effectiveness is rather under-explored. Current studies are more focused on technical standards, equipment suitability or regulatory requirements without taking into consideration the structural and cultural aspects that affect the operational preparedness. Such a gap is especially relevant in the context of developing and transitional settings, where the system of governance might be vastly different from Western civilian fire service patterns. This is a unique situation in Vietnam. Its airport fire and rescue services have a police organization structure in a centralized administration framework. This hierarchy can bring possible benefits in transparency in hierarchy and national standardization but can also create limits to bureaucratic inflexibility and inter-agency coordination.It is in this context that this narrative review attempts to reframe the airport fire safety effectiveness as a multidimensional organization phenomenon as opposed to a more technical operation. The article provides a theoretically based framework to understand the interaction between governance structure, organizational culture, leadership systems, and resource configurations to influence ARFF performance by synthesizing the insights of the accident causation theory, human factors research, the resilience scholarship, and aviation safety studies. (Muecklich et al., 2023; Woodman et al., 2024). By so doing, it brings the global safety theory closer to the institutional reality of the fire and rescue police operations in Vietnam.

The objectives of this review are:

1. To integrate and critically evaluate the organizational factors that have a bearing on the effectiveness of fire safety in high-risk aviation systems at airports
2. To investigate the operations of these determinants in the police based ARFF system

of Vietnam and suggest a conceptual basis of governance and performance reform

2. CONCEPTUALIZING AIRPORT FIRE SAFETY EFFECTIVENESS

2.1 Traditional Performance Metrics in ARFF

Historically, Airport Fire Safety Effectiveness has been measured using compliance-based measures, specifically response time standards and equipment adequacy requirements. Among the measures of output that are highlighted in regulatory frameworks are the arrival time on the incident sites, extinguishing agents discharge capacity, and adherence to aerodrome category classifications. Although these metrics are important as they offer a baseline level of standards, they tend to indicate compliance with procedures as opposed to actual system performance. Recent modeling studies indicate that the effectiveness of emergency response activities at civil airports needs more integrative evaluation methods, which go beyond the mere time thresholds. (Sun et al., 2025). Likewise, it is pointed out in performance-based studies of airport infrastructure resilience that fixed measures are unable to dynamically reflect adaptive and recovery ability in stressful conditions. (Horton et al., 2025).The optimal fire design optimization research also demonstrates that technical sufficiency is not a sufficient condition to ensure the effectiveness of operations; the interdependence of fire spread modeling, infrastructure layout, and response coordination is essential. (Chang et al., 2025). Response time, therefore, though essential, is only one aspect of effectiveness and does not fully indicate preparedness, quality of coordination or adaptive capacity.

2.2 Limitations of Compliance-Based Evaluation

Compliance-based evaluation models presuppose that the safety outcomes are provided by adherence to standards. These strategies can however not consider variability in organizational performance when faced with complex and uncertain emergencies. The utilization of decision-optimization models of airport firefighting resilience demonstrates that the effectiveness is determined by the dynamism of allocation strategies, logic of resources distribution and coordination mechanisms as opposed to the compliance with rules. (Zhu et al., 2025).

Risk-based evacuation modeling also confirms that the context of airport emergencies is nonlinear, uncertain, and requires the algorithmic risk evaluation to take into consideration cascading hazards (such as toxic gases dispersal and/or congestion of people) (Luan et al., 2025). These results indicate that rule-based forms of governance can be inadequate in the representation of operational reality. In organizational terms, safety rules are not only compliance tools, but also coordination and transfer of knowledge (Weichbrodt, 2015). Rules can hinder the flexibility of making decisions during crises when they are too strict. In turn, the effectiveness of airport fire safety needs to be reformulated in the organizational perspective that is flexible, learning, and resilient.

2.3 A Multidimensional Framework of Effectiveness

The multidimensional concept of airport fire safety effectiveness incorporates four related elements:

1. **Structural Capacity** – Infrastructure design, equipment adequacy, and resource configuration (Chang et al., 2025).
2. **Operational Processes** – Decision-making protocols, coordination mechanisms, and response optimization (Sun et al., 2025; Zhu et al., 2025).
3. **Incident Outcomes** – Evacuation success, hazard containment, and casualty reduction (Luan et al., 2025).
4. **Organizational Resilience** – Adaptive capacity, learning systems, and continuous improvement (Horton et al., 2025; Nemeth & Hollnagel, 2016).

The resilience engineering scholarship underscores the fact that resilient systems do not simply fail slowly; instead, they evolve under stress and come back online quickly. (Nemeth & Hollnagel, 2016). This view switches the analytical emphasis of deviation prevention to adaptive performance. Table 1 summarizes the multidimensional elements of effectiveness, which illustrates that airport fire safety is not limited to procedural conformity to adaptive system performance.

Table 1. Dimensions of Airport Fire Safety Effectiveness

Dimension	Core Focus	Key Supporting Studies
Structural Capacity	Infrastructure & fire design optimization	(Chang et al., 2025)
Operational Processes	Response coordination & resource allocation	(Sun et al., 2025; Zhu et al., 2025)
Incident Outcomes	Evacuation & hazard containment	(Luan et al., 2025)
Organizational Resilience	Adaptive capacity & recovery performance	(Horton et al., 2025; Nemeth & Hollnagel, 2016)

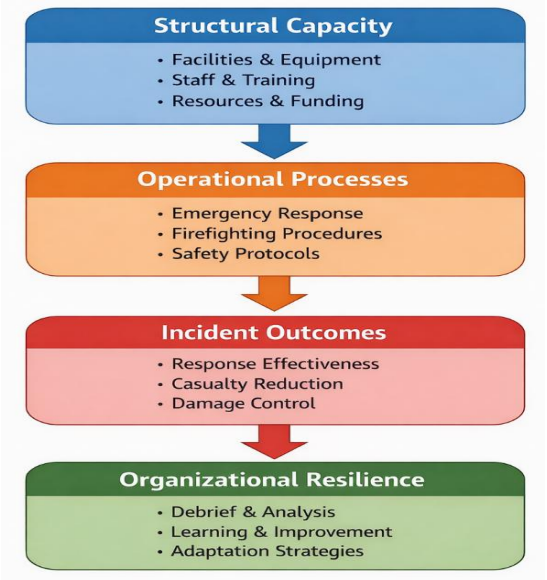

Figure 1. Multilevel Model of Airport Fire Safety Effectiveness

Figure 1 shows how the structural capacity facilitates operational processes that determine outcomes of incidents and organizational resilience, which offers feedback to enhance continuous adaptation.

2.4 Toward an Organizational Lens

Combined, the modern models of evaluation and resilience frameworks suggest that the effectiveness of airport fire safety should be evaluated as an emergent property of organizational systems instead of individual technical performance (Horton et al., 2025; Sun et al., 2025). Institutional environments are dynamic as rules, infrastructure, algorithms, and coordination protocols interact (Nemeth & Hollnagel, 2016; Weichbrodt, 2015). Thus, to further improve the ARFF performance assessment, structural design, operational decision-making, and adaptive governance must be incorporated into a single organizational system.

3. THEORETICAL FOUNDATIONS: ORGANIZATIONAL PERSPECTIVES ON SAFETY

3.1 High Reliability Organization (HRO) Theory

Airport fire safety exists in systems of high risk, low-coupled systems and where failure may have disastrous effects. The theory of High Reliability Organization (HRO) offers a theoretical framework to conceptualize the perception of the way organizations operate in risky conditions and remain almost free of failures. The major idea in HRO thinking is the notion of collective mindfulness, which is a constant focus on operational detail, concern with failure and reference to expertise. (Weick et al., 1999). In the fire and rescue setting of airports, this is translated to vigilance at all times, training based on scenarios, and adaptation to uncertainty.Literature on organizations that are virtually free of failure underscores the necessity of ensuring a sense of reliability in the form of a "bubble" of reliability by exercising disciplined communication as well as redundancy. (Roberts & Rousseau, 2002). Sutcliffe also contends that HROs institutionalize learning processes and develop cultures that pick up weak signals before a crisis turns out of control. (Sutcliffe, 2011). Nevertheless, the arguments between the normal accident theory and the high reliability theory indicate that structural complexity and tight coupling beyond human control may also result in the occurrence of accidents. (Shrivastava et al., 2009). In the case of airport fire safety, such tension brings out the necessity of achieving a balance between structural control and adaptive flexibility.

3.2 Institutional Theory: Regulation, Legitimacy, and Isomorphism

Institutional theory is a theory that explains how organizations respond to regulatory expectations and normative pressures to gain legitimacy. According to DiMaggio and Powell, institutional isomorphism refers to the process through which organizations copy similar structures and practices due to coercive, mimetic and normative pressures. (DiMaggio & Powell, 2000). The international regulatory systems promote uniformity in compliance with the jurisdictions in the context of

airport fire safety.Although institutional conformity is a legitimizing factor, it can also create formal arrangements that seem to conform, but do not ensure operational efficiency. According to this view, airport fire services can implement established procedures to meet the inspection authorities, as performance deviations remain as a result of existing organizational circumstances. The institutional theory thus places fire safety in the airport in the context of the wider governance systems, whereby the alignment of the regulations is not enough to guarantee reliability.

3.3 Resource-Based View (RBV): Capabilities and Strategic Assets

Resource-Based View redefines effectiveness as a result of valuable, rare, inimitable, and organizationally embedded resources (Barney, 2000). When applied to fire safety in the airports, the key resources are the specialized training, technical expertise, interoperability in communications, and the built-in emergency coordination routines. RBV focuses on long-term capability building as opposed to observing the rules since such models are not compliance-based.

ARFF units do not just have strategic assets as physical equipment, but also as tacit knowledge and experiential learning within teams. This view reinforces the view that effectiveness is a factor of internal capability set up instead of just external regulation.

3.4 Safety Culture and Complexity-Based Resilience

The analysis of the organization is further enhanced by safety culture and complexity perspectives. Complexity theory emphasizes the fact that failures are caused by nonlinear interactions in socio-technical systems. (Dekker et al., 2011). This method not only considers safety as an emergent quality of interconnected structures, but also puts accidents on the shoulders of isolated mistakes.The intersection between HRO scholarship and complexity thinking is the identification of adaptive capacity as a key to resilience. (Shrivastava et al., 2009; Sutcliffe, 2011). The capability of the airport fire services to respond in case of uncertainty is reinforced by organizational learning, open communication, and loose distribution of authority. Table 2 is a summary of the contribution of each of the theoretical lenses to the overall explanatory power, which confirms the impossibility of reducing the effectiveness of airport fire safety to a single conceptual approach.

Table 2. Theoretical Foundations and Their Relevance to Airport Fire Safety

Theory	Core Assumption	Relevance to ARFF
HRO Theory	Reliability through collective mindfulness	Vigilance, training, adaptive response (Roberts & Rousseau, 2002; Weick et al., 1999)
Institutional Theory	Legitimacy through conformity	Regulatory alignment and structural standardization (DiMaggio & Powell, 2000)
Resource-Based View	Competitive advantage via capabilities	Strategic assets and specialized competencies (Barney, 2000)
Complexity & Resilience	Safety as emergent property	Adaptive learning and systemic interaction (Dekker et al., 2011; Sutcliffe, 2011)

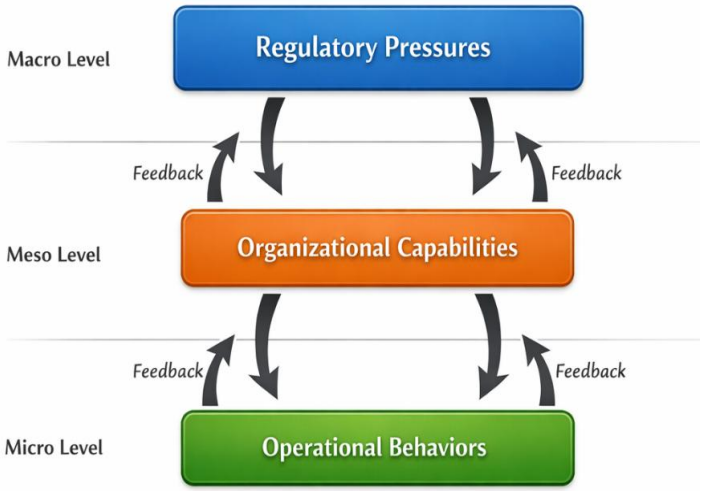

Figure 2. Multilevel Theoretical Integration Model

The interplay between macro-level regulatory pressures and meso-level organizational capabilities, which subsequently affect micro-level operational behaviors, is shown in Figure 2 and forms looping feedback.

4. CORE ORGANIZATIONAL DETERMINANTS OF AIRPORT FIRE SAFETY EFFECTIVENESS

The technical standards are not the only determinants of the effectiveness of airport fire safety, but also the organizational structures, leadership systems, human capabilities and inter-agency coordination mechanisms. This part summarizes the fundamental determinants that impact ARFF performance.

.1 Governance and Institutional Structure

Governance structures determine the allocation of authority, the system of accountability and supervision. A centralized organization can guarantee uniformity and hierarchy, whereas a decentralized one can guarantee flexibility and localization. Safety climate studies focus on the fact that the organizational policies and managerial commitment play a significant role in the safety outcomes (DeJoy et al., 2004). Cross-level studies show that the institutional structures influence the frontline safety behaviors based on the leadership and supervisory practices (Hofmann & Stetzer, 1996).Regarding performance, the system of occupational safety management is positively related to the organizational effectiveness in case it is entrenched in the coherent governance structures (Fernández-Muñiz et al., 2009). Therefore, the ARFF preparedness is directly influenced by the governance models, which define the distribution of resources, observation of compliance, and the responsibility of the operations.

4.2 Leadership and Command Systems

High-risk situations like airport fire emergencies require effective leadership in the case of crisis management. Leadership determines the level of safety motivation, clarity of communication and compliance of behavior (Neal & Griffin, 2006). Safety climate models associate managerial activities with knowledge sharing and performance (Griffin & Neal, 2000).

Incident Command Systems need to have a hierarchical structure as well as autonomy of decisions in the face of uncertainty. The meta-analytic results show that the leaders behaviors are strong predictors of the safety performance in different settings (Christian et al., 2009). Thus, the command systems should be able to balance between procedural and adaptive flexibility to provide quick and coordinated responses.

4.3 Human Resource Capacity

The key to maintaining the safety performance lies in professionalization and training regimes. Empirical research indicates that there is a mediating effect of safety knowledge and motivation between organizational climate and safety behavior. (Griffin & Neal, 2000; Neal & Griffin, 2006).Moreover, cross-level research indicates that the perceptions of supervisory commitment among employees have a direct effect on compliance and participation behaviors. (Hofmann & Stetzer, 1996). The use of simulation-based training, ongoing skill development, and experience-based learning can be added to the increased operational preparedness, supporting the claim that ARFF performance relies on the amount of human capital investment.

4.4 Organizational Culture and Safety Climate

Safety climate is the mutual perceptions of priorities in the field of safety and commitment of the management. Basic research establishes that communication patterns, reporting systems, and management support are some of the vital climate indicators. (Flin et al., 2000).The meta-analysis data support the existence of a strong association between safety climate and safety performance outcomes. (Clarke, 2006). Furthermore, climate determinants, leadership practices, and employee engagement have to be systemically combined to create safer workplaces. (DeJoy et al., 2004). These results emphasize that the ARFF success is driven more by alignment of culture than compliance with the procedures.

4.5 Resource and Technological Capability

Resource adequacy, such as the quality of equipment, compatibility with infrastructure and stability of funding, is a structural basis of performance. Nonetheless, studies confirm that safety management systems should be instilled in the larger organizational processes to result in quantifiable performance benefits. (Fernández-Muñiz et al., 2009).Person situation interactions also play a role in determining safety outcomes, which implies that the effect of technological capability alone cannot be effective without favourable organizational environments. (Christian et al., 2009).

4.6 Inter-Agency Coordination

Airport fire response usually includes various players such as police services, aviation authorities, and medical services. A coordinated effort relies upon the congruence of perceptions of safety climate and consistency of communication. (Flin et al., 2000).The research studies on the association of climate with behavioral outcomes depict that collaborative norms result in improved compliance

and proactive safety participation. (Clarke, 2006). Effectiveness in inter-agencies thus needs to be in terms of congruent leadership expectations and unified operating guidelines. Table 3 summarizes the most important organizational determinants and shows how each of them leads to ARFF effectiveness in a variety of, yet interconnected, ways.

Table 3. Organizational Determinants of ARFF Effectiveness

Determinant	Core Mechanism	Key Supporting Studies
Governance Structure	Accountability & oversight	(DeJoy et al., 2004; Fernández-Muñiz et al., 2009)
Leadership Systems	Safety motivation & command	(Christian et al., 2009; Neal & Griffin, 2006)
Human Resource Capacity	Knowledge & training	(Griffin & Neal, 2000; Hofmann & Stetzer, 1996)
Safety Climate	Cultural alignment	(Clarke, 2006; Flin et al., 2000)
Resource Capability	Structural adequacy	(Fernández-Muñiz et al., 2009)
Inter-Agency Coordination	Communication & integration	(Clarke, 2006; DeJoy et al., 2004)

Figure 3. Integrated Organizational Determinants Model

Figure 3 illustrates how governance and leadership affect human capacity and safety climate through a cascading effect, which eventually impacts operational performance, and feedback mechanisms enhance system learning.

The world safety research as a whole affirms the existence of the interdependent organizational determinants of the effectiveness of fire safety in airports. Accountability is introduced through the structure of governance; motivation is promoted by leadership; competence is established in the human resource system; the cultural alignment in the safety climate is encouraged by the coordination mechanisms; and multi-agency efforts are integrated by the coordination mechanisms. These dimensions have a dynamic relationship, which supports the argument that the ARFF performance is an emergent organizational phenomenon and not necessarily a technical process. (Clarke, 2006; DeJoy et al., 2004).

5. INTERNATIONAL GOVERNANCE MODELS OF AIRPORT FIRE SERVICES

Airport fire services are part of larger airport governance systems that define the allocation of authority, accountability, and integration of operations. It is necessary to understand the model of international governance to place the model of police-based structure in Vietnam in global institutional arrangements.

5.1 Civilian Fire Service Model (European Context)

Airport fire services are often part of civilian or municipal fire departments in a number of systems across Europe. This structure is indicative of more general tendencies in the corporatization and governance restructuring of airports, in which ownership and management forms determine the structure of operation (Gillen, 2011). Civilian models are normally focused on professional specialization, training that is standardized and that is integrated with municipal emergency networks.The privatization and commercialization of airports also influenced the organization of governance, mostly improving the flexibility of managers and performance orientation. (Graham, 2020). It has been

empirically indicated that the ownership type influences the efficiency and quality of the services offered at the airports, and that the corporatized or privatized aircrafts prove to be more efficient in their operations. (Oum et al., 2006). In these systems, the ARFF units are favored with professionalism in fighting the fire, but have to work closely with the aviation authorities to maintain compliance with regulations.

5.2 Aviation Authority–Integrated ARFF Model (United States Context)

Airport fire services are often incorporated into airport authorities in the United States or aviation management bodies. This combined model is aligned with operational control that is in line with the airport management and may improve the structural coherence and speed of decision-making. Studies in governance reveal that the operational performance results are affected by ownership and corporatization especially in sectors that are highly infrastructure-based. (Oum et al., 2006).

Emergency network scholarship focuses on the fact that boundary-spanning actors are vital in ensuring that there is effective coordination in case of crisis, as they mediate between institutional domains. (Kapucu, 2006). In aviation authority integrated systems, the ARFF units will be closely aligned with the operations of the airport; however, they have to be connected with the municipal, medical, and federal agencies in a collaborative way. The collaborative emergency management models illustrate that networked governance systems enhance the effectiveness of disaster response in the case where coordination mechanisms have been established as an institution. (Kapucu et al., 2010).

5.3 Police-Based Fire Service Model

Fire service systems based on police, like those that are used in some centralized administrative environments, incorporate ARFF functions into national security or law enforcement systems. This structure provides strict hierarchical control and national control. Nevertheless, according to governance studies, the effectiveness of disaster response is determined by the network structure and the ability to work together, but not by hierarchy alone. (Nowell et al., 2018).Centralized command may lead to an improvement in accountability and uniformity, but it might also lead to a decrease in structural flexibility in comparison to decentralized or corporatized. (Gillen, 2011). The arguments about privatization suggest that the managerial discretion and the independence of operations can impact the efficiency outcomes. (Graham, 2020). Consequently, systems that are police-based have to strike a balance between command transparency and responsive coordination processes in order to guarantee the effectiveness of their operations. Table 4 shows the governance structure of different models and points to structural trade-offs in flexibility, specialization and accountability.

Table 4. Comparative Governance Models of Airport Fire Services

Model	Structural Features	Strengths	Limitations	Key References
Civilian Fire Service	Municipal integration	Professional specialization	Coordination with the aviation authority is required	(Gillen, 2011; Oum et al., 2006)
Aviation Authority–Integrated	Embedded within airport management	Operational coherence	Multi-agency coordination complexity	(Kapucu, 2006; Kapucu et al., 2010)
Police-Based Model	Centralized national oversight	Hierarchical clarity	Reduced structural flexibility	(Graham, 2020; Nowell et al., 2018)

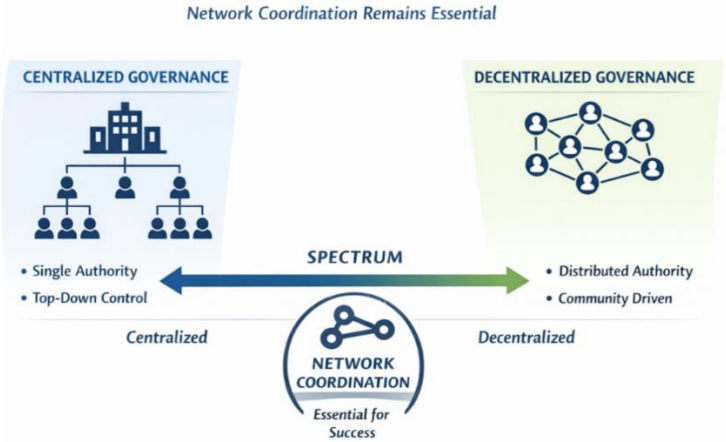

Figure 4. Governance Trade-Off Framework

Figure 4 demonstrates the continuum of centralized and decentralized models of governance, and that network coordination is vital irrespective of structural form.In the global settings, the effectiveness of airport fire services is not due to structural form only, but rather, the manner in which governance systems facilitate professionalization, accountability and coordination. Privatization and corporatization could improve efficiency in operations due to managerial flexibility (Graham, 2020; Oum et al., 2006), whereas centralization systems could improve oversight and standardization (Gillen, 2011)(Gillen, 2011). Nevertheless, literature on disaster governance has always emphasized the relevance of collaborative networks and boundary-spanning leadership in ensuring effective emergency response (Kapucu, 2006; Nowell et al., 2018).

Consequently, the lessons that can be transferred to Vietnam are the enhancement of the inter-agency coordination systems, the establishment of collaborative governance systems, and the promotion of balancing between the centralized control and operational flexibility. Finally, the effectiveness of governance is not in the structural model but the combination of accountability, specialization, and adaptive network coordination (Kapucu et al., 2010).

6. THE VIETNAMESE CONTEXT: ORGANIZATIONAL DYNAMICS AND REFORM PATHWAYS

6.1 Institutional and Legal Framework

The emergency response system in Vietnam has a centralized system of administration, with the Fire and Rescue Police being integrated under the national administration. Emergency management policy formulation and institutional framework have been continuously changing, although it is heavily influenced by the centralized systems of governance. (To & Kato, 2018).The studies of the decentralization of centralized systems emphasize the conflict between national control and local execution capacity. (Garschagen, 2016). Although some of the areas have witnessed the emergence of decentralization efforts, command in the emergency services is still in a hierarchical form. Combined disaster and environmental management strategies imply that intersectoral coordination is an ongoing institutional issue. (Tran & Shaw, 2007). So, the ARFF governance in Vietnam is one of the hybrid dynamics: centralized legal power with the growing demands for responsiveness at the local level.

6.2 Structural Strengths

The police-based model offers a number of structural benefits that are centralized. Accountability and clarity in operations are reinforced by national consistency in standards, a single command chain and well-established lines of authority. (To & Kato, 2018).Empirical research of the Vietnamese firefighter training practice shows that the efforts of standardizing the rescue planning and drills with units are systematic. (Le Tien, Van, et al., 2023). The functional exercises with better results due to the analysis of the specialists in the framework of expert assessments are evidence of the increased interest in the optimization of performance in the framework of the organized command system. (Le Tien, Pham Van, et al., 2023).These competencies are compliant with high-reliability principles of the clarity of authority and standardized procedures. The centralized control can thus promote preparedness at the baseline in terms of airport systems.

6.3 Organizational Constraints

Structural rigidity has its drawbacks, even though it has strengths. The studies of the decentralization of disaster risk management in Vietnam show that there are continuous coordination failures between central directives and local implementation realities. (Garschagen, 2016).The case studies of integrated disaster governance indicate that coordination between the sectors and adjusting to policy changes efficiently is quite challenging. (Tran & Shaw, 2007). The training-based research also shows the aspects in which rescue plans could be improved to be more realistic and representative of operational realities (Le Tien, Van, et al., 2023).The unequal distribution of resources across the regions also makes the uniform preparedness levels even more problematic (To & Kato, 2018). Therefore, although the centralized command provides standardization, flexibility and responsiveness at the operational level could be constrained.

6.4 Emerging Reform Pressures and Digital Transformation

Vietnam is going through more extensive modernization of the public sector, including digital government involvement in improving coordination and institutional capacity (Duy & Anh, 2025). Digital transformation presents the possibility to enhance communication networks, sharing information between agencies and real-time support of decision-making during fire emergencies in airports.The capacity-building frameworks focus on enhancing the institutional flexibility by integrating technology

and administrative reform (Duy & Anh, 2025). These trends leave reform avenues where the ARFF systems can move away to compliance-based governance to performance-based models that are capability-based. Table 5 summarizes the organizational strengths and weaknesses of Vietnam, which shows areas where centralized governance has played to its advantage in maintaining consistency, but is limiting to adaptive flexibility.

Table 5. Organizational Dynamics of Vietnam's ARFF System

Dimension	Strengths	Constraints	Supporting Studies
Institutional Framework	Centralized oversight	Limited decentralization	(Garschagen, 2016; To & Kato, 2018)
Training & Professionalization	Standardized rescue planning	Need for enhanced simulations	(Le Tien, Pham Van, et al., 2023; Le Tien, Van, et al., 2023)
Coordination	National command clarity	Cross-sector gaps	(Tran & Shaw, 2007)
Reform & Innovation	Digital modernization initiatives	Implementation capacity challenges	(Duy & Anh, 2025)

The ARFF model of the police of Vietnam is characterized by structural robustness and challenges to adaptability. The centralized power ensures similarity and responsibility, and the new transformative forces, especially the digital revolution, provide the chance to improve coordination and flexibility (Duy & Anh, 2025). The institutional evolution should hence be aimed at incorporating the standardized command systems with the decentralized responsiveness of operation. Connecting the determinants of governance, the process of professionalization, and digital modernization to the performance results, Vietnam will be able to enhance the effectiveness of airport fire safety in the context of its specific administrative environment (Le Tien, Van, et al., 2023; To & Kato, 2018).

7. CONCLUSION

This study has summarized the main organizational variables that influence the effectiveness of airport fire safety and redefined Airport Rescue and Firefighting (ARFF) performance as an organizational competence and not a technical or compliance-based role. The effectiveness is the result of the interaction between structural and cultural processes at a macro-level, meso-level, and micro-levels in terms of governance arrangements, leadership systems, human resource capacity, safety climate, resource configuration and inter-agency coordination mechanisms. The review shows that regulatory standards and adequate infrastructures are the foundations of the required safety performance, but adaptive leadership, professionalization, collaborative governance, and learning-oriented organizations cultures are the pillars of the sustained safety performance. The study combines high-reliability, institutional, resource-based, and resilience frames, to further a conceptual framework of multilevel, which makes airport fire safety a capability-enhancing process in multi-layered socio-technical systems. In the case of Vietnam and the similar centralized governance environment, the results emphasize the need to balance the clarity of hierarchical commands and flexibility of operations, reinforce cross-sector coordination, and use digital transformation to be more responsive and transparent. The reforms of the policy should then focus on the areas of institutional integration, training through simulation, data-driven decision systems, and organized feedback mechanisms that stimulate continuous improvement. The proposed framework needs to be empirically tested in future studies, carry out comparative analyses based on ASEAN, and come up with quantitative models that would be used to quantify ARFF organizational performance in different governance contexts. Finally, compliance does not ensure airport fire safety efficacy but the nurturing of organizational resilience, a permanent ability to predict, adjust, react and learn when faced with uncertainty.

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