Procured reliability?

Effects of competitive tendering processes on critical service reliability

by

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Preface

This thesis marks the end of a 3 ½-year process of research and learning, which was preceded by a much longer period of deliberation before embarking on the PhD. I first started thinking about doing doctoral research in 2009, while completing my master's degree in history. And although I abandoned that thought, it kept coming back. In 2016, I quit my job to do a master's degree in societal safety and had the opportunity to start a PhD degree in the research project *Public Procurement of Critical Services – Analysis of Effects on Societal Safety (ProCritS)* immediately after. I was, I admit, somewhat doubtful about the focus of the project. After all, how interesting could public procurement be? I decided to go ahead anyway, excited about the opportunity to study the air ambulance services and interested in societal safety overall. About a week into my research, I wondered why everyone didn't share my fascination with public procurement.

As you would expect, the journey from initial fascination to completed thesis has been long, and at times challenging. There are many people to whom I owe thanks for their contributions and support along the way.

I am particularly grateful to the research participants – thank you for sharing generously of your time, knowledge, and experiences.

Thank you to my supervisor, Associate Professor Kenneth Pettersen Gould, and co-supervisor Associate Professor Lillian Katarina Stene, for your continuous support and guidance. Some of the most inspiring moments of the past few years were during discussions the three of us had along the way. Thanks to Kenneth for pushing me towards broader and deeper analyses; you managed to convince me in the end. Thanks to Lillian for your encouraging feedback throughout the writing process, and for helping me find my way out of the jungle that a large empirical study can be. Thanks also to my overseas co-supervisor Professor Paul

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I am lucky to have been part of a group of skilled and enthusiastic researchers from Norway, Australia, the UK and the US. The ProCritS project has been a great space for launching and developing ideas. I am grateful to Professor Jan Hayes for your ever constructive input. Thank you also to Professor Petter Grytten Almklov for feedback on an early thesis version, and to Trygve Gudmund Harlem Losnedahl for your advice on procurement legislation.

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To Ingvill, Jonatan and Maia: thanks for your structuring impatience and much-needed distractions. Thank you Trond, for saying «Kjør på!» («Go for it! ») whenever I come up with dubious ideas like doing a PhD, and for not once – or at least not to me – expressing regrets. Thanks for your unwavering support, especially during demanding times of life. To my sister Gro, thanks for English translations at my initiative and for providing gallows humor and coffee at yours. Thanks also to family and friends for your patient listening. I have a feeling you might be even more relieved than me that this thesis is complete.

Stavanger, 16 May 2023

Tone Njølstad Slotsvik

Summary

This PhD thesis focuses on how the competitive tendering of publicly procured critical services affects the reliability of these services. Maintaining the supply of critical services, i.e., services that are essential for ensuring the basic needs of the population, is a core aspect of societal safety.

The thesis draws upon theories from organizational reliability literature and seeks to contribute toward the further development of this field. Initial studies of high reliability organizations (HROs) have identified organizational characteristics that are decisive, though not necessarily sufficient, for the safe and reliable provision of services by complex organizations in hazardous industries. Later organizational reliability research on critical infrastructure services has demonstrated that the restructuring of these services, involving a splitting of service provision between organizations and the introduction of new logics to service supply, has added to the complexity and challenges of reliable critical service provision. However, given that few studies have focused on the reliability of procured critical services, the effects of tendering processes on reliability remain to be further researched.

The thesis answers the following research question: How can competitive tendering processes affect the reliability of publicly procured critical services? In addressing this issue, the thesis aims to contribute new knowledge on how procurement and tendering processes affect organizational reliability. It additionally aims to contribute new knowledge on the relationship between reliable service deliveries (referred to as output reliability in the thesis) and organizational reliability (meaning the organizational structures and processes that enable this delivery). Finally, the thesis aims to explore whether specific governance forms can contribute to maintaining the reliability of publicly procured critical services.

This work draws on empirical material from air ambulance service procurement in Norway, where air ambulance transport is procured from commercial and non-profit operators by a national health trust. In the thesis, empirical findings from the most recent rotor-wing (helicopter) and fixed-wing (aircraft) tendering processes are discussed. Overall, the rotor-wing ambulance procurement resulted in a successful transfer of responsibilities between the outgoing and incoming service suppliers. By comparison, the fixed-wing ambulance procurement led to profound conflicts and negative effects on service deliveries.

The thesis consists of five articles, which all contribute towards answering the research question. Article I is a review of literature relevant for researching the effects of tendering on the resilience and reliability of critical services. The article explores how safety science has traditionally focused on individual organizations and discusses that interorganizational service provision can introduce interface challenges to critical service delivery.

Article II analyses empirical material from the fixed-wing ambulance procurement. The article establishes that tendering processes involve a 'temporal fragmentation' of critical service supply: service delivery is split into contract periods with potentially different contracted service suppliers. The article demonstrates that organizational factors related to the tendering process can affect output reliability negatively during the transition from one contract period to another, as well as in the immediate aftermath.

Article III broadens the analysis of the indicator used to assess output reliability in Article II and in this thesis. Approaching this indicator as a "boundary object", the article shows how the seemingly neutral indicator used by the procurer to monitor operator output is subject to interpretation, with actors attaching different meanings to it. Moreover, the procurer's indicator assessment is dynamic, reflecting both operator

responses to the indicator and the external attention towards the indicator during the conflicted fixed-wing ambulance tendering process.

Article IV discusses effects of the procurement cycle on the continuous change processes known from previous research to enhance reliability. The article complements organizational reliability literature with theories on temporality from the organizational research field. The article discusses how procurement cycles frame the timing and tempo of change processes. It demonstrates that the procurer acts as a "macro pacer", deciding the timing and speed of processes while simultaneously being restricted by procurement legislation. For service suppliers, the tendering processes can demand substantial organizational attention and cause instability, at the expense of quality development processes.

Article V discusses the contributions and limitations of relational governance towards the reliability of procured critical services. Relational governance, complementing the contractual governance that characterizes public procurement, involves a holistic approach to the procurer-supplier relation, thus encouraging flexibility and joint problem solving. In this sense, it resembles the reliability-enhancing approaches of HROs and high reliability networks (HRNs). In the article, relational governance is shown to be crucial in making the implementation of new contracts work. At the same time, the article identifies that in situations of profound conflict, neither contractual nor relational governance are necessarily sufficient to ensure reliability.

Overall, the thesis discusses that tendering processes can have several negative implications for critical service reliability. The fixed-wing ambulance procurement exemplifies that tendering processes can result in instability and conflicts, undermining conditions that are known from HRO research to enhance reliability. Procurement can also introduce new organizational interfaces between incoming and outgoing service suppliers. Unlike organizations in previously studied HRNs, these suppliers do not necessarily share a goal of continuous service supply.

On the contrary, the fixed-wing ambulance procurement exemplifies that conflict between suppliers and between procurer and supplier can affect output reliability negatively.

Not all effects of procurement are reflected in indicators of service output; tendering processes can also influence the quality developments that are important for critical service supply *outcomes*. On the one hand, procurement enables a thorough evaluation of the existing service and the introduction of systemic changes for each new contract period. At the same time, procurement legislation frames how continuous quality developments can take place, by defining limits to the introduction of changes in existing contracts. Moreover, tender participation can demand substantial organizational attention from tenderers and contracted suppliers and draw attention away from continuous change processes known to enhance reliability.

To achieve reliable service provision, the procurer can draw upon both contractual and relational governance. Governance options are however framed by procurement legislation and by procurer interpretations of this legislation. While relational governance, by encouraging flexibility and give-and-take attitudes, contributes towards reliability, the procurer must ensure that this flexibility does not come at the expense of stability. Also, if profound conflicts exist between the procurer and supplier, neither contractual nor relational governance may be sufficient to resolve these.

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PART I

1 Introduction

1.1 Framing the study

Critical services, whether 'invisibly' part of our ordinary days or arriving with flashing blue lights on the extraordinary ones, are the indispensable backbones of modern societies (DSB, 2016; NOU 2006:6, 2006). In recognition of our dependencies on these services, ranging from electricity and food supply to health services and law enforcement, European policy makers, as well as policymakers elsewhere, have launched policies aimed at ensuring critical service deliveries also when faced with unexpected disruptive events (e.g., European Commission, 2020). In the Norwegian context, the maintenance of critical functions and services is closely linked to the concept of societal safety (Olsen et al., 2007). As such, societal safety definitions encompass society's ability to protect itself against and handle events or stresses that threaten the functions needed to ensure the basic needs of the population (Justis- og beredskapsdepartementet, 2020; Morsut, 2021).

Critical service policies have partly shifted from a focus on the protection of (physical) critical infrastructures (Pursiainen, 2009) to the resilience of a broader range of critical services, thereby acknowledging the organizational and societal capabilities needed to maintain or restore critical service provision if protection against harm has been unsuccessful (European Commission, 2020). However, critical service policy documents describe the vulnerabilities of the services in relation to *external* stresses, such as natural hazards, larger accidents, or intentional acts of crime (Justis- og politidepartementet, 2006; DSB, 2016). This disguises how the very organizing of critical service provision potentially constitutes a vulnerability.

Within the safety sciences it is widely recognized that organizations can have inherent vulnerabilities that potentially result in accidents. Since the early 1980s several research traditions within more systematic safety

science have emphasized the role of organizational aspects for safety (Le Coze, 2020). Well-known contributions include research on the incubation of accidents within organizations (Turner, 1978) and on accidents as inherent to organizations that are both complex and tightly coupled (Perrow, 1984). One central research tradition that is highly relevant for understanding organizational vulnerabilities and capabilities for critical service provision is research on high reliability organizations (HROs).

Shifting the focus from accidents to safe operations in hazardous industries (an aircraft carrier, an air traffic control system, and a nuclear power plant), high reliability researchers were concerned with why organizations that could be expected to fail in fact did not (La Porte & Consolini, 1991; Roberts, 1990; Rochlin et al., 1987; Schulman, 1993). For HROs, safe and reliable service provision was a matter of meeting public expectations; if unable to perform at high levels, their failure would not go unnoticed (Rochlin et al., 1987). Reliability in this sense could refer to both the constancy of output and the safety of central activities and processes (La Porte, 1996). For HRO researchers, the focal point was identifying organizational characteristics that appeared vital, yet were potentially insufficient, to maintain safe and reliable processes.

Later research building on HRO theories (e.g., Almklov & Antonsen, 2010; Berthod et al., 2017; Cedergren et al., 2018; de Bruijne, 2006; Roe & Schulman, 2008) has shed light on organizational aspects particularly important for understanding the vulnerabilities of critical service provision. These studies broadened the scope to inter-organizational or networked arrangements, shifting from hazardous organizations to critical infrastructure services and emergency networks. While the initially studied HROs found themselves in favourable conditions (e.g., with public acceptance of the costs of ensuring reliability) (La Porte, 1996), subsequent studies noted substantial changes in external conditions. Some of the studies viewed inter-organizational critical service provision in light of the so-called New Public Management

(NPM) reforms that had altered public service provision since the late 1970s through deregulation, privatization, outsourcing, and internal buyer–supplier arrangements (Almklov & Antonsen, 2014; Cedergren et al., 2018; de Bruijne, 2006). In essence, the *fragmentation* of service supply that the NPM reforms led to resulted in new vulnerabilities, but also some new reliability-enhancing solutions.

However, a wide spectre of inter-organizational arrangements provide critical services, many of which remain to be researched more closely. For instance, although organizational reliability studies (e.g., Almklov & Antonsen, 2010; de Bruijne, 2006) and other organizational studies of critical service supply (e.g., Willems et al., 2018) have focused on outsourcing as a service provision arrangement, research on the organizational reliability implications of how outsourcing, in the form of public procurements, is carried out is lacking. This thesis aims to contribute towards filling this gap.

In Norway, due to the European Economic Area (EEA) agreement, public procurements are regulated by EU directives and national legislation in accordance with these directives. For procurements over a certain threshold, the standard procurement form is that of competitive tendering, with several possible procedural forms (European Union, n.d.). For critical services that are procured, the effects of the tendering processes on the involved organizations and the services they provide are important to understand.

1.2 Research question and aims

Building on HRO research and later studies of organizational reliability and applying the Norwegian air ambulance services as an empirical case, this study is set up to answer the following research question:

> *How can competitive tendering processes affect the reliability of publicly procured critical services?*

In line with the research question, the overall research purpose of this study is to provide new knowledge regarding the effects of competitive tendering processes on the organizational reliability of critical services. More specifically, the study aims to

I. Contribute new knowledge of how the procurement arrangement and tendering processes affect organizational reliability.

II. Contribute new knowledge of the relation between output reliability and organizational reliability.

III. Explore whether specific governance forms can contribute to maintaining the reliability of publicly procured critical services.

1.3 Research approach and limitations

Within the organizational reliability field, reliability has been used to refer to safety, service continuity, performance continuity, and resilience (Ramanujam, 2018). Given my focus on critical services, I discuss reliability in the meaning of service continuity. This is in line with how the concept is applied in other organizational studies of critical services (e.g., Almklov & Antonsen, 2010; Schulman et al., 2004). For the critical service used as a case in this thesis — namely, the Norwegian air ambulance service — operational safety is a precondition for service continuity. However, operational safety aspects are not the objects of study in the thesis.

Furthermore, I use a distinction provided by Martelli et al. (2018, p. 676) as a starting point for defining reliability in the context of this thesis:

> *The reliability of an organization can be assessed in terms of outcomes or in terms of the organizational structures and processes that are predictive of those outcomes.*

This distinction signals that there is — or at least can be — a direct relationship between organizational structures and processes on the one

hand and outcomes on the other hand. At the same time, there is a need to separate between *output* and *outcomes*. In the context of services delivered to society, output is the delivered service (e.g., health service) whereas outcome is the end result of that service (e.g., improved health) (Wilson, 1989). In this thesis, in line with the focus on service delivery, I primarily discuss reliability with reference to output rather than outcomes, which I refer to as "output reliability". I refer to the structures and processes needed to ensure this output as "organizational reliability". Consequently, for the purpose of this thesis, reliability is defined as the continuity of service delivery and the presence of organizational structures and processes enabling this continuity.

In this thesis, I focus on reliability rather than resilience, even though these concepts partially overlap (Pettersen & Schulman, 2016; Ramanujam, 2018). For instance, reliability can be used in the sense of organizational response to and improved recovery from incidents or failures (Ramanujam, 2018). However, building on the theoretical foundation of organizational reliability, I consistently use the concept of reliability. Organizational reliability has become a quite extensive and broad research field. While many studies have focused on operational environments, including cultural and cognitive capacities of individuals and groups, my data collection and analysis primarily concern the interplay between organizational levels and across organizational borders.

Competitive tendering *processes* are central to my study. In organizational reliability studies, the importance of processes is emphasized; achieving reliability is a matter of "organizing rather than organization" (Martelli et al., 2018, p. 676). Nevertheless, these processes seem described in terms of *variance*, as the fluctuating levels of specific attributes (Langley, 2009). For instance, HRO researchers have distinguished between the normal operation mode and high-tempo or crisis mode of HROs (La Porte & Consolini, 1991). An alternative is to apply a process perspective by analysing the processes as

chronological developments of events, where outcomes are explained by sequences of actions and the results of these (Langley, 2009). In this thesis, I apply a process view by analysing competitive tendering processes in terms of their actual developments.

To approach the research question empirically, I have carried out a multilevel and multiorganizational case study of the most recent procurements of operational air ambulance services in Norway. My PhD study is part of the research project Public Procurement of Critical Services – Analysis of Effects on Societal Safety (ProCritS), where the air ambulance services were selected as one of two empirical cases prior to my employment. The most recent rotor-wing (helicopter) service procurement (with a contract starting in 2018) and the most recent fixed-wing (airplane) service procurement (with a contract starting in 2019) form the empirical basis of my study.

I understand critical services as those vital for sustaining "critical societal functions". This concept is used in Norwegian policy documents (DSB, 2016; Justis- og beredskapsdepartementet, 2020) to identify functions essential for ensuring the basic needs of the population. In these policy documents, two main criteria are used to identify whether functions are critical for society as a whole: whether a failure of seven days or less may threaten the safety and security of the population and the assumed need for emergency response resources during the seven-day period. The Norwegian air ambulance services satisfy these criteria, as a considerably shorter downtime than seven days potentially affects the population's health outcomes negatively and alternative resources are needed to reduce this effect.

Furthermore, the case study is used to exemplify public procurement with a competitive tendering form. Several different concepts describe the arrangement where public organizations acquire public service provision from private or non-profit organizations, while the financing and control function remains public. Contracting out and outsourcing are

two such concepts (Greve & Ejersbo, 2011; Pallesen, 2011/2019). However, both can also describe how private companies buy services from other companies. In this thesis, the preferred concept is public procurement, which refers specifically to procurements conducted by public organizations subject to procurement regulations. Public procurements cover both goods and services, but in this thesis the term refers only to services.

However, the boundaries of the public procurement concept are not clearly defined in public policy documents in either the EU or Norway (Similä, 2011). While a narrow definition covers only the purchase per se, a broader definition covers the planning, the actual purchase, and the follow-up of the purchase (Similä, 2011). In this thesis, I apply this broader definition of the public procurement concept. When referring to the process of acquiring the service (i.e., preparations and purchase) I refer to this as the tendering process, whereas the procurement cycle also includes the contractual follow-up of the purchase.

1.4 Thesis structure

This thesis consists of two parts. Part I includes a description of the empirical case and context (Chapter 2), a presentation of the main theory used in the thesis (Chapter 3), a presentation of the methodology used (Chapter 4), an overview of the main findings (Chapter 5) and a discussion of these in relation to the theoretical field (Chapter 6), and a conclusion to the overall research problem (Chapter 7).

Part II includes the following research articles that form part of the thesis:

Slotsvik, T. N., Gauteplass, A., Haavik, T. K., Størkersen, K. V., Nilsen, B. T., & Almklov, P. G. (2020). How tendering affects the resilience of critical societal functions: a literature review. In *Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference.* Research Publishing Services.

Slotsvik, T. N., Gould, K. P., & Stene, L. K. (2021). Public procurement of critical services — Effects of service transfer on organizational reliability. In *Proceedings of the 31st European Safety and Reliability Conference.* Research Publishing Services.

Hayes, J., Slotsvik, T. N., Macrae, C., & Gould, K. P. (2023). Tracking the right path: safety performance indicators as boundary objects in air ambulance services. *Safety Science*, *163*.

Slotsvik, T. N., Gould, K. P., & Hayes, J. (2023). Adapting to the rhythm of the procurement cycle. Organizational reliability implications of temporal misfits in the Norwegian air ambulance service procurements. [Submitted for publication in *Journal of Contingencies and Crisis Management* April 2023].

Slotsvik, T. N., Gould, K. P., & Stene, L. K. (2023). Contributions and limitations of relational governance towards the reliability of publicly procured air ambulance services. *Safety Science*, *164*.

2 Context and case

This chapter starts with a broad framing of the Norwegian air ambulance service by describing two categories to which it belongs: it is a critical service and a (partly) procured service. I then briefly describe some aspects of the Norwegian healthcare system relevant to the case. Next, I outline the development and present the structure of the air ambulance service. At the end of the chapter, I provide quite substantial descriptions of the most recent rotor-wing (helicopter) and fixed-wing (airplane) tendering processes, as an understanding of the chronological development of these processes is decisive for understanding how organizational reliability was affected.

2.1 Critical services: ownership and control

The ownership and control of services critical to the public have varied across service categories, state borders, and time (Pierre & Peters, 2000, p. 46). However, one general development has been that many critical infrastructure services were established and provided by private or non-profit entities from the late 19th century onwards. In the decades leading up to the 1960s they were nationalized, in part as a response to the experiences with two world wars, where the importance of infrastructure services as part of the defence of the nation became apparent (Clifton et al., 2011, p. 661). However, starting in the 1970s, a third wave began, with a publicly initiated transformation towards increased participation by the private sector. In many respects this period of market-based solutions to public service provision still exists today (Clifton et al., 2011, p. 661). However, what was meant to be a deregulation of infrastructures has been described by some as more of a "reregulation", as the numerous independent regulatory agencies established on a transitory basis resulted in a complex and seemingly permanent set of regulatory arrangements (Clifton et al., 2011, p. 664). Interestingly, the

conceptualization and identification of critical services can be understood as one aspect of this reregulation.

As an authorized policy concept, "critical infrastructures" has its roots in the United States in the mid-1990s and later spread to European countries (Pursiainen, 2009, p. 722). The identification of critical infrastructures relates to both the increased interdependency of infrastructures (Little, 2005, p. 266) and the severity of society's vulnerability to a loss of supply (Pursiainen, 2009, p. 722). The experiences with terrorist attacks in the first decade of the 21st century, where some infrastructures (transportation and postal services) were goals of the attacks and others (internet and mobile telephony) were means, led to an increased political focus on identifying and protecting strategic sectors and critical infrastructure (Clifton et al., 2011, p. 664). Policymakers initially focused on the protection of (physical) critical infrastructures (Pursiainen, 2009), yet they also recognized the need to maintain the organizational and technical resilience of a broader range of critical services (European Commission, 2020).

The Norwegian policy development regarding critical services has been parallel to — and drawn upon — policy developments in North American and European countries (NOU 2006:6, 2006). At the same time, some aspects are more specific to Norwegian policies. In Norway, policies maintaining critical functions is central to the societal safety concept (Morsut, 2021). Norway and other Nordic countries have focused more on resilience (as opposed to protection), all-hazards approaches (as opposed to security approaches), and cross-sectorial approaches than other European countries (Pursiainen, 2018).

2.2 Public procurement of services

In the 1970s and 1980s, political reforms were initiated in many western countries to reorganize the public sector. Commonly referred to as New Public Management (NPM), the reforms were partly a critique of

bureaucracy as the organizing principle (Hood, 1991). Applied as a collective term to a range of reforms, NPM can be said to rest on two pillars (Klausen, 2011, p. 53). The first pillar is managerial and transfers management principles such as financial management and target management from the private sector to the public sector. The second is based on neo-institutional economic theory, such as public choice theory and principal agent theory. It advocates a market-oriented management and results in organizing forms such as outsourcing, privatizing, and the establishment of public–private partnerships. Public procurement using competitive tendering as a procurement method fits well with the NPM philosophy (Greve & Ejersbo, 2011).

Establishing a common European market was one of the central aims behind the creation of the European Union (EU). Two strategic plans have been central for achieving this: the removal of tariff and non-tariff barriers between member states and the establishment of a regime of competition within the common market (Bovis, 2018). Following the European Economic Area (EEA) agreement, EU regulations concerning public procurements are binding for Norway as well. Public procurements currently constitute 14 percent of the GDP in EU countries and 16 percent of the GNP in Norway (European Commission, 2017; Nærings- og fiskeridepartementet, 2019).

In Norway, the public procurement act and regulations (The Public Procurement Act, 2016) seeks to implement the EU directive 2014/24/EU on public procurement (Directive 2014/24/EU, 2014) and related directives while simultaneously being the result of national policy considerations. The fundamental principles guiding the law are those of competition, equal treatment, predictability, verifiability, and proportionality. Different parts of the procurement act and regulations take effect when public organizations (e.g., national or local authorities and public administration organizations) enter into contracts above certain monetary thresholds regarding goods, services, or building and construction (The Public Procurement Act, 2016). The standard

procurement form is generally that of competitive tendering, with several possible procedural forms (European Union, n.d.). Some exceptions to this main rule of competitive tendering exist, such as in cases of extreme urgency that the procurer could not be expected to foresee (The Public Procurement Administrative Regulation, 2016, paragraph 5-2(1)(c)).

Public procurement is said to have the potential to increase economic efficiency, improve public services, and contribute towards reaching strategic goals (Similä, 2011). Yet research on the overall effects of procurement has reached opposing conclusions. Some studies have indicated that the use of procurement lowers costs and improves service quality; others have identified increased costs (including transaction costs), decreased service quality, and additional negative effects, such as the deterioration of work conditions, governance and accountability challenges, and a fragmented service delivery without a common goal (Greve & Ejersbo, 2011, p. 123). Policy documents and research literature alike have recognized that, on a general level, the efficiency and quality potentials of public procurement have not been fully achieved (Similä, 2011).

2.3 The Norwegian healthcare system

A main objective of the Norwegian healthcare services is to provide good and equal specialist health services to those who need them at the time they need them, regardless of place of residence, age, economic background, or other individual factors (Health Authorities and Health Trusts Act, 2001). The establishment of a publicly financed healthcare system was interwoven with the growth of the welfare state in the aftermath of World War II (Schiøtz, 2003). The welfare state model, which exists in various forms across the Nordic countries, is based on a principle of universal rights and sees the provision of social benefits as a public responsibility (Pedersen & Kuhnle, 2017).

The current structure of the public healthcare system has existed since 2002 and can be described as semi-decentralized (Ringard et al., 2013). The Ministry of Health and Care Services holds the overall responsibility for the healthcare sector. The ministry prepares and oversees legislation, is overall responsible for implementing national health policies, and decides how funding should be distributed within the sector. Primary care is organized through the municipalities. Secondary care (specialist health services) is organized through four regional health trusts underlying the Ministry of Health and Care Services. In total, the regional health trusts own 27 local health trusts, 21 of which are hospitals (Ringard et al., 2013).

Although providing equal health services regardless of geographical location is a main policy objective, this is challenging in a sparsely populated country and is not fully achieved (Ringard et al., 2013). Relevant to the air ambulance case, the geographical dimension of equal access to health services is a source of political debate. The geographical divide between the centre (the capital) and the periphery has historically been an important conflict line in Norway (Rokkan & Valen, 1964) and remains so today as well (Eidheim & Fimreite, 2020). One recent example of a centre–periphery debate within the health sector is the closing of local maternity wards and the subsequent protests initiated by "bunadsgeriljaen" ("The national costume guerrilla") in 2019 (Eidheim & Fimreite, 2020). Another is the founding of the political party "Pasientfokus" ("Patient focus") in 2021: with the establishment of a fully functioning hospital in Alta (in Finnmark, Northern Norway) as their only campaign issue, they succeeded in gaining one representative in Parliament in the national elections in 2021.

2.4 The Norwegian air ambulance service

Norway is a sparsely populated country with challenging topography and weather conditions; thus, the air ambulance service is a vital supplement to road ambulances for achieving the objective of equal access to health services. At present, the air ambulance services assist approximately 20,000 patients per year (Helse vest RHF, 2021).

2.4.1 Historical background and present structure

The following historical outline of the Norwegian air ambulance service is based on the white paper entitled *The air ambulance service in Norway* (Sosial- og helsedepartementet, 1998) and a report regarding fixed-wing ambulance services from 1994 to 2003 (Helseforetakenes nasjonale luftambulansetjeneste ANS, 2004).

Private companies and non-profit organizations have always played a central role in air ambulance transport in Norway. The first fixed-wing ambulance transports were carried out in the 1920s by private companies. Following World War II, the air force became involved in the transport of critically ill and injured patients, supplementing, rather than substituting, the private operators. Starting in 1984, the National Insurance Administration ("Rikstrygdeverket") contracted 9 civilian, private fixed-wing (airplane) airlines. Payment was calculated based on a combination of preparedness, a fixed number of hours, and additional costs. Rotor-wing (helicopter) ambulance transport, with medically equipped helicopters crewed by teams of pilots, rescuers, and medical doctors, was initiated in 1978 by the privately funded non-profit foundation Stiftelsen Norsk Luftambulanse. The state refunded transport costs according to the social security regulations but did not initially finance a preparedness arrangement. However, in 1983, an agreement was reached between the National Insurance Administration and Stiftelsen Norsk Luftambulanse regarding this matter.

Starting in 1988, both fixed-wing and rotor-wing transport became part of a national air ambulance service, where private/non-profit organizations were awarded contracts for five years at a time. The national air ambulance plan that defined this arrangement was created partly as a reaction to increased expenditures and a lack of state control over locally initiated air ambulance bases (Sosial- og helsedepartementet, 1998, p. 16). In this sense, it resembles the *reregulation* of critical services that followed in the aftermath of NPM reforms (Clifton et al., 2011, p. 664). Since Norway was not an EEA member before 1992, EU/EEA procurement rules did not apply.

The current structure of the air ambulance service has existed (with some modifications) since 2004. As shown in Figure 2-1, the air ambulance involves numerous actors, including several coordination centrals. The air ambulance services overlap with the rescue services for some missions. With the exception of the fixed-wing and rotor-wing operators and some road ambulance transport providers, all the actors in the overview are public. As Figure 2-1 indicates, the regional health trusts own a national health trust called Luftambulansetjenesten helseforetak ("The air ambulance service health trust", abbreviated LAT HF).[1] LAT HF has the overall responsibility for the operational air ambulance services, including the procurement and contract management of the air ambulance transport services. In addition, among other core tasks, they run the flight coordination central that coordinates fixed-wing operations.

[1] "Helseforetakenes nasjonale luftambulansetjeneste ANS" before 2017.

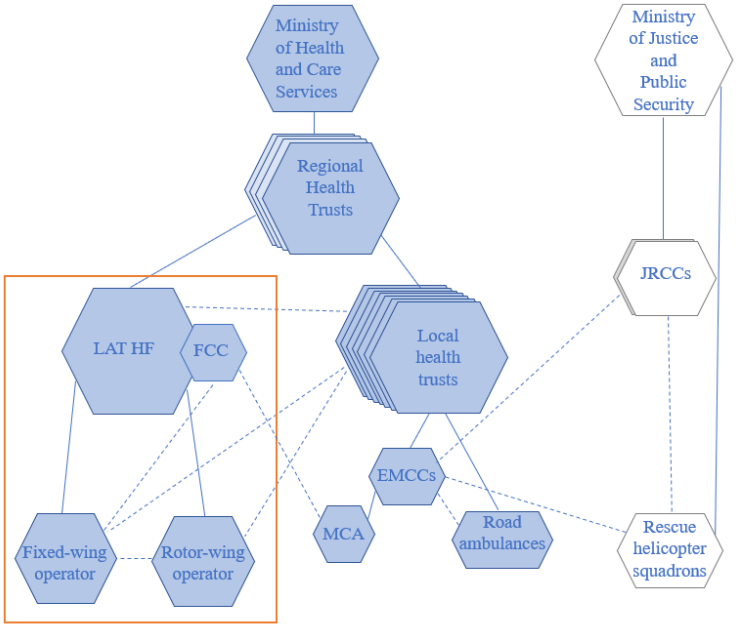

Figure 2-1 Overview of central air ambulance service actors.
In the figure, lines indicate hierarchical relationships and stapled lines indicate organizational interaction. The frame shows the air ambulance actors that are most relevant to this thesis. The white boxes show rescue service actors that for some operations overlap with the air ambulance services. Sources: Statens helsetilsyn, 2021; Helse- og omsorgsdepartementet, 2021.

Abbreviations: EMCCs - Emergency Medical Communication Centres;
FCC – Fixed-wing coordination central;
JRCCs - Joint Rescue Coordination Centres;
LAT HF – Luftambulansetjenesten helseforetak (The air ambulance service health trust);
MCA – Medical coordination of fixed-wing ambulances.

The fixed-wing ambulance service is used to transport patients over larger distances, including from municipalities far from the nearest hospital and between local and regional hospitals. In northern Norway, where 5 of the 7 fixed-wing bases are situated, the fixed-wing ambulance

service is to a large degree used for emergency missions, whereas the majority of the missions in southern Norway are planned (Luftambulansetjenesten HF, 2018c). The aircraft are manned by pilots supplied by the contracted operator and specialist nurses (and, on some occasions, medical doctors) supplied by the corresponding local health trust.

Rotor-wing services are primarily used for emergency missions, including in areas difficult to reach by road ambulance. The 12 (2019 figure) bases are spread across the country and are in most cases located at or close to hospitals. A rotor-wing crew consists of a pilot and a rescuer employed by the contracted operator as well as a medical doctor employed by the corresponding local health trust.

2.5 Air ambulance tendering processes

In the following section, the most recent air ambulance procurements are described.

2.5.1 Procurement aims and specifications

The operational fixed-wing and rotor-wing services are procured by LAT HF using tender competitions with prequalification and two negotiation rounds. For the most recent procurements (contract start in 2018 for rotor-wing and 2019 for fixed-wing), the overall strategical aims were decided upon by the regional health trusts three years in advance of the start of the contract. The aims concerned, among other things, aviation safety, strengthening of the reserve capacity of the service, and the assurance of a "high focus on costs" (Helse- og omsorgsdepartementet, 2021). The strategy allowed LAT HF to contract more than one operator, provided that this did not lead to a "considerable increase in costs" (Helse- og omsorgsdepartementet, 2021). In the rotor-wing tender evaluation, the health trusts did not accept contracting two operators on

the grounds that this was calculated to require a 4.5 percent cost increase (Helse vest RHF, 2021).

The tender specified requirements to preparedness and to the quality of the service and included the provision of aircraft/helicopters with medical equipment as well as operational staff and the organizational structures and procedures needed to operate the service. Some of the requirements were compulsory whereas others were used to score the quality of the tender proposals (Luftambulansetjenesten HF, 2016b). In the evaluation of proposals, price was weighed at 40 percent and quality at 60 percent.

Of relevance to this thesis, it was unclear whether a change of operator would constitute a transfer of undertaking under the Working Environment Act (Luftambulansetjenesten HF, 2018a). Somewhat simplified, the Working Environment Act specifies that, when an undertaking or parts of an undertaking are transferred from one employer to another, the new employer is required to employ the undertaking's employees on the same conditions as before (Working Enviroment Act, 2005, chapter 16). LAT HF did not require a new operator to employ operative personnel from their predecessor or treat the change of operator as a transfer of undertaking under the Working Environment Act (Luftambulansetjenesten HF, 2016a).

2.5.2 *Procurement cycle phases*

In the most recent procurements, services have been procured on 6-year contracts, with an option for prolongation for 2+2 years (rotor-wing) or 2+3 years (fixed-wing). The phases of a procurement cycle are typically delimited and labelled to reflect the process from the procurer's point of view. In this thesis, I have adapted the phase delimitation and labelling used by LAT HF to reflect the operators' involvement in the tendering processes as well. In Figure 2-2, this is demonstrated using the fixed-wing procurement as an example.

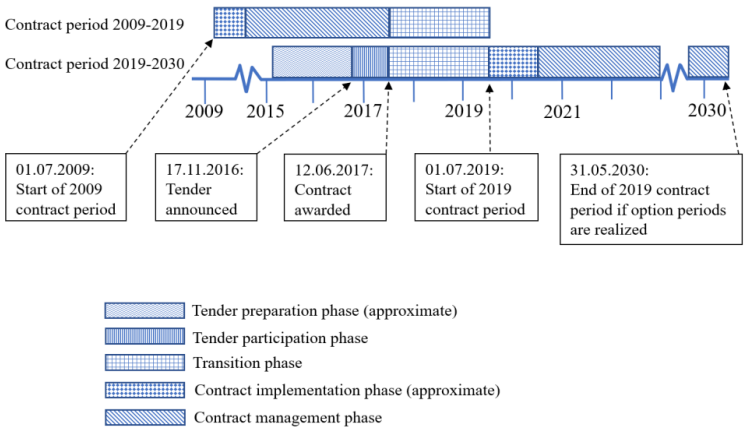

Figure 2-2. Procurement cycle phases as exemplified by the fixed-wing ambulance procurement.

As shown in Figure 2-2, the tender preparations start 1 to 2 years before the tender is announced. For LAT HF, this phase involves setting the strategy together with the regional health trusts and a health trust specialized in procurements (Sykehusinnkjøp HF), gathering information from the suppliers through requests for information (RFIs) and consulting relevant actors regarding the tender's specification of requirements. For the operators, the phase involves preparations to tender participation (Slotsvik, Gould, & Hayes, 2023). In the tender participation phase, prequalified operators submit tender proposals and are invited to two rounds of negotiations before submitting final proposals. In the transition phase, starting when the new contract is awarded, the contracted operator and LAT HF start preparing for the next contract period. Parallel to this, the ongoing contract period approaches its end. When the new contract period starts, approximately the first year

is needed for adjustments to the contract (Slotsvik et al., 2021) before the ordinary contract management phase starts.

2.5.3 Rotor-wing service tendering process

Before 2018, the rotor-wing bases had been operated by different operators. In the 2008–2018 contract period, Norsk Luftambulanse AS (owned by the foundation that initiated rotor-wing patient transport in 1987; from now on referred to as NLA) was contracted at 9 of the bases, while Lufttransport FW AS (from now on: Lufttransport) was contracted at the remaining 3. In the tender competition for the 2018 contract, five operator companies were considered prequalified, and four of these delivered a total of 34 tender proposals (Helse- og omsorgsdepartementet, 2021). Following two rounds of negotiations, NLA was awarded the contract starting 1 June 2018 at all bases.

Overall, the implementation of the 2018 contract, including the transition from Lufttransport to NLA at three bases, was deemed successful (Helse- og omsorgsdepartementet, 2021). One central issue, however, was the employment of personnel. At the beginning of the transition phase, NLA invited the operative personnel at the bases to apply for positions, eventually contracting most of them. Some of the operative personnel were dissatisfied with the employment conditions and claimed that the change of operator had been a transfer of undertaking (thereby entitling them to the same employment conditions as before). Taking the question to court, the personnel group lost in the district court in 2018 but appealed the court ruling and won in the Courts of Appeal in 2020.

2.5.4 Fixed-wing service tendering process

Prior to 1995, fixed-wing base contracts were split between several operators. In 1995, two of the operators, Mørefly and Lufttransport, merged, and the merged company (named Lufttransport) was awarded

all the bases. All subsequent contracts, until 2019, were awarded to this operator.

In the tender process for the 2019 contract, four contractors applied for prequalification, and three of these were considered qualified. Eventually, two operators, Babcock Scandinavian Air Ambulance (from now on referred to as Babcock) and Lufttransport, delivered two proposals each. In June 2017, Babcock was awarded the contract for all fixed-wing bases.

During the transition phase (see Figure 2-2), conflicts developed among several of the involved actors. The first conflict line relevant to this thesis involved LAT HF and Babcock on the one side and Lufttransport on the other. Lufttransport was dissatisfied with how the tender competition had been carried out. One reason was that they had been requested to share information regarding their salary costs with LAT HF, who saw this as relevant information for competitors in the case that contracting a new operator could be defined as a transfer of undertaking under the Working Environment Act. Another reason was that Lufttransport claimed that Babcock had presented an unrealistic progress plan for contract period preparations, thereby affecting the total quality evaluation score in Babcock's favour. The conflict affected the cooperation between Babcock and Lufttransport regarding the handover of bases. In the aftermath of the fixed-wing service transition, evaluation reports identified a more detailed specification of the responsibilities of the outgoing and incoming operators, as well as a gradual transfer of bases, as central learning points for future contracts (Helse- og omsorgsdepartementet, 2021, p. 63).

The second conflict line developed between Babcock on one side and the pilots and their trade union on the other. Babcock was not obliged by LAT HF in the tender documents to employ Lufttransport's pilots (Luftambulansetjenesten HF, 2016a, p. 15). However, as the ambulance transport involves landings on short fields under unfavourable

conditions, there was a need for pilots with this experience, some of which necessarily had to be Lufttransport's employees. Babcock's plan to employ pilots on an individual basis failed because the pilots' trade union convinced their members to reject individual job offers and instead aim for a collective transfer from Lufttransport to Babcock. This significant development reflects a distinctive feature of the Norwegian employment context. In Norway and other Nordic countries, labour unions hold a relatively strong position (Bieler, 2012).

Negotiations between Babcock and the pilots' trade union were carried out in the spring of 2018, but initially failed. On the day that negotiations collapsed, all on-duty pilots were declared "unfit for flight" by Lufttransport's Nominated Person Flight Operation on the grounds of aviation safety. Following extensive media coverage and political debate, on 7 June 2018, Parliament instructed the government to "ensure that experience and competence in the present air ambulance service is carried on, either through negotiations with the operator, through a new public procurement process where a transfer of undertaking is required or in another suitable way" (Stortinget, 2018, resolution 862. My translation). Two weeks later, Babcock and the trade union reached an agreement where all the pilots were offered a job in Babcock.

The pilots were required to complete a training program before flying the aircraft models of the new contract. In part, due to the EASA regulations on pilots' rest requirements, it was not possible for the pilots to complete the training program when not on duty for their Lufttransport schedule. Lufttransport, Babcock, LAT HF, and the pilots' trade union were not able to reach any agreements on how the pilots could be trained during their work periods. As a result, the majority of the pilots were not ready when the contract period started on 1 July 2019.

As will be further presented in Chapter 5, the conflicts described here affected the output of the fixed-wing ambulance service in the transition period and the contract implementation period. The effect of these

conflicts on patient outcomes has not been subject to an overall evaluation (Statens helsetilsyn, 2021). To compensate for reduced preparedness, LAT HF acquired alternative resources, including from the Norwegian Armed Forces and private operators (Luftambulansetjenesten HF, 2018b). In addition, Babcock provided extra resources from the parent company.

2.6 Summarizing reflections

Describing the air ambulance system and unwinding the air ambulance service procurements involve a balancing act of including sufficient detail without losing sight of the bigger picture. From an analytical perspective, one interesting aspect of the case is that the rotor-wing and fixed-wing tendering processes, which involved the same procurer and the same outgoing operator, developed in different directions, with decisively different outcomes. In other words, this situation raised a question of whether the features of the processes and the organizations and groups involved in them played a decisive role for creating different outcomes.

At the same time, the developments must be seen in light of the contexts in which they occurred. For instance, the Norwegian public healthcare system aims to provide equal services to the population regardless of geography; when it appeared that the air ambulance service failed to do so, public and political involvement was strong. Another example is the relatively powerful role of trade unions in Norway. Without the heavy involvement of the pilot trade union, the fixed-wing ambulance procurement might have developed otherwise. Such contextual factors are relevant to take into account when considering whether the case findings are transferrable to other critical services.

3 Theory

My study builds on organizational reliability research and aims to contribute to this field. In this chapter, I first (Section 3.1) review HRO research and show how this provides a theoretical foundation for my study. Then (Section 3.2), broadening the scope to inter-organizational arrangements, I assess more recent contributions to organizational reliability literature in relation to my study. Last (Section 3.3), corresponding to my aim of exploring whether specific governance forms can contribute to maintaining reliability (see Section 1.3), I include some theoretical perspectives on how procurement legislation frames critical service governance possibilities.

3.1 Organizational reliability in a critical service context

High reliability organization (HRO) research started at the University of California, Berkeley, in the 1980s. In the 1970s and 1980s, several industrial accidents, such as the nuclear power plant accidents of Three Mile Island (1979) and Chernobyl (1985), raised the question of whether such accidents could be avoided. According to the sociologist Charles Perrow's Natural Accident Theory (NAT), they could not: when systems were both tightly coupled (i.e., highly time-dependent and with little slack) and complex (i.e., with highly interacting components), smaller errors could develop uncontrollably into disasters (Perrow, 1984). Against this backdrop, HRO researchers were driven by the question of why some hazardous organizations that were both complex and tightly coupled appeared to counter NAT; the organizations were "working in practice but not in theory" (La Porte & Consolini, 1991). Following organizational studies of an air traffic control system, nuclear aircraft carriers and a nuclear power plant, "HRO" was the name given to organizations that could have failed, with catastrophic outcomes, but did not (Ramanujam & Roberts, 2018). These organizations shared some

characteristics that the researchers identified as decisive — although not necessarily sufficient — for safe and reliable operations (La Porte, 1996).

From the beginning, reliability could refer to both the constancy of output and the safety of central activities and processes (La Porte, 1996). Following decades of scholarly interest towards organizational reliability, the definition of reliability has evolved (Ramanujam, 2018). According to Roe and Schulman (2008, p. 5), reliability increasingly means "both anticipation and resilience; the ability to plan for shocks as well as to absorb and rebound from them in order to provide services safely and continuously". Ramanujam (2018) noted that four distinct but overlapping notions of reliability can be detected — namely, reliability as safety, as performance consistency, as continuity of service, and as resilience. In a critical service context, reliability as service continuity is particularly relevant.

HRO research and later studies building on this foundation concerned the organizational structures, relationships, and processes that are preconditions for reliable and safe outcomes (La Porte, 1996; Martelli et al., 2018; Ramanujam, 2018). This distinction between outcomes and the organizational features that are argued to be decisive for maintaining such outcomes allows for an assessment of each of them (Martelli et al., 2018, p. 676) and for a discussion of the relationship between them.

However, the studies of HROs were never meant to produce an exhaustive list of organizational features needed for reliable operations (La Porte & Consolini, 1991; Roberts, 1990). Nor were they meant to result in an overall theory; the label "high reliability theory" was attached to the studies in retrospect (Schulman, 2021, p. 152). Furthermore, they were not prescriptive; HRO researchers emphasized that the organizations they studied were situated in favourable — and increasingly atypical — conditions (La Porte, 1996).

Nevertheless, the rich empirical descriptions and analytical findings of HRO studies has provided a foundation for other studies, whether used

as receipts of features that high reliability-*seeking* organizations should nurture (e.g., Weick & Sutcliffe, 2007) or as a reference point and comparison for how reliability can be obtained in other contexts. The research conducted for this thesis builds on HRO studies in the latter way. Therefore, in the following section, I review HRO findings that are relevant to this research.

3.1.1 Relevant findings from HRO studies

An underlying feature of the studied HROs was their commitment to reliability at all levels of the organizations (La Porte, 1996). At a managerial level, this implied that reliability was seen as "non-fungible", meaning that other considerations, such as economic efficiency, could not be taken at the expense of reliability (Roe & Schulman, 2008, p. 56). One aspect of this was that the organizations valued redundancy, such as technical backup solutions and skills redundancy (La Porte, 1996, p. 63; Roberts, 1990, p. 168). HROs also demonstrated what has been characterised as "mindful" organizational management, implying — amongst other things — that management was sensitive to the operational end of the organization with an attentiveness towards warnings and smaller failures that could signal systemic errors (Weick & Sutcliffe, 2007; Weick et al., 1999).

The HROs' commitment to reliability manifested in the recognition of operational personnel's competence (e.g., La Porte & Consolini, 1991; Roberts, 1990). Implicit in this, HROs accepted the financial costs of investing in human resources (Roberts, 1990). HROs recruited persons with "premium skills" and ensured continuous training to maintain and develop operational competence (La Porte, 1996, p. 63). The recognition of operational expertise had implications for decision-making structures: while relying on hierarchical structures during normal times, HROs would switch to sharp-end decision-making in high-tempo situations (e.g., Schulman, 1993).

Furthermore, the commitment to reliability was reflected in an "organizational culture of reliability". This concept referred to high levels of personal engagement and to the shared norms, perceptions, and workways of operational personnel (La Porte, 1996, p. 64). Implied in this was a willingness to report errors and to avoid blame placing (La Porte, 1996). Moreover, the potential introduction of changes (e.g., new work routines or new technology) involved cross-departmental, cross-level negotiations to ensure that changes did not negatively increase reliability overall (Schulman, 1993). Sharing norms and perceptions did not mean that work processes were friction free; on the contrary, tension between different professional groups, such as tension related to decision making in high-tempo situations, existed (La Porte, 1996, p. 64; Roberts, 1990, p. 168). However, such tension could be resolved because the overall goals were clear to everyone (Roberts, 1990, p. 172).

Although characterized by flexibility and adaptability — manifested as short-run performance variability (Roe & Schulman, 2008) and continuous searches for improvements to ensure long-term reliability (e.g., La Porte & Consolini, 1991) — the HROs also had remarkable stable structures, both internally and with the outside environment (Pettersen & Schulman, 2016, p. 463). In fact, the reliability-enhancing innovation and improvements characterizing HROs depends on some degree of stability within the organization (Farjoun, 2010).

The contextual differences between the organizations studied by HRO researchers and publicly procured services are striking. For instance, HROs could develop enduring structures and could prioritize reliability over all other considerations. The logics of procurement point towards other mechanisms, including economic efficiency and contract periods of finite duration. HRO studies serve as a reflexive background precisely because of this: for instance, if enduring structures are recognised as important for reliability, how does the less-enduring procurement arrangement affect reliability?

HRO researchers recognised that the organizations they studied not only depended on the inner organizational workings, but also on favourable outer conditions. For instance, HROs were characterized as likely to be faced with public expectancy towards producing essential services without operating failures, but also with a public acceptance of the economic costs associated with this (La Porte, 1996). This awareness was also a warning: altering the conditions could have consequences for reliability (La Porte & Consolini, 1991, p. 75).

3.2 New conditions and added lessons

In the 1990s, the conditions of many public service providers changed fundamentally from those in which HROs had been situated. As described in Section 2.1, a growing concern with public expenditures and a call for economic efficiency led to the restructuring of a large spectre of services, including some critical to society. The new conditions triggered a shift in organizational reliability research which the research conducted for this thesis should also be seen as part of. Not surprisingly given the historical context of the 1980s, the initial studies of high reliability focused on single organizations (de Bruijne, 2006, p. 71). In the aftermath of the restructuring reforms, several theorists recognized that reliable service provision from critical infrastructures had to be achieved *across* organizations (Schulman & Roe, 2018). By now, it is widely recognized that critical service provision is often split between organizations, and that this leads to reliability conditions which differ from single-organization service provision (e.g., Almklov & Antonsen, 2014; Cedergren et al., 2018; de Bruijne, 2006; La Porte, 1996; Martelli et al., 2018). Despite this recognition, research on how critical service reliability is achieved across organizations remains scarce (Cedergren et al., 2018). This includes studies on how networks are governed to ensure reliable service provision (Berthod et al., 2017, p. 352; Clark-Ginsberg et al., 2021, p. 2).

The following review presents contributions from studies identified in a systematic literature search (see Section 4.3.1). They all discuss aspects of critical service reliability following restructuring reforms in the 1980s and 1990s. The review focuses on findings relevant to the research question and the aims of this thesis.

3.2.1 Relevant findings from organizational reliability studies of critical services

Organizational reliability studies of organizations forming part of tightly coupled networks, such as the California Independent System Operator (CAISO) (e.g., Roe & Schulman, 2008; Roe et al., 2005; Schulman et al., 2004) and the Dutch mobile service KPN (de Bruijne, 2006; de Bruijne & van Eeten, 2007), have been important for extending the scope of organizational reliability to inter-organizational critical infrastructures. The studies focused on the role of high reliability management conducted from control rooms and concluded that the increased complexity of the systems in fact provided new grounds for reliability management. For instance, whereas reliability in HROs depended on anticipatory management, the cases demonstrated that the complexity allowed for multiple strategies and performance modes to balance input variability (Schulman et al., 2004). This is relevant to this thesis, showing that reliability can be achieved through other means than those of the initial HROs. Moreover, the studies identified that the existence of multiple, informal communication channels between operators of the involved organizations was decisive for real-time management and flexible switching between performance modes (de Bruijne, 2006; de Bruijne & van Eeten, 2007; Roe et al., 2005). The identification of the reliability-enhancing aspects of informal communication and cooperation across organizational interfaces has been important for the development of the studies conducted for this thesis.

Based on case studies of two Norwegian network companies (Almklov et al., 2008) and two water supply systems (Almklov & Antonsen, 2014), Almklov and Antonsen (2010, 2014) found that the restructuring of these services altered the logics of operational work process. Almklov and Antonsen (2010) introduced the concepts of "modularization" and "commoditization" to describe this. "Modularization" conceptualizes that work within an organization is split between discrete units so that work processes are carried out by an internal value chain where each unit has a specialized role. This implies an introduction of new interfaces within the organization requiring management through standardization, performance indicators, incentives, and contracts. "Commoditization" refers to how part of a work process is filtered out as a commodity that can be bought and sold. According to Almklov and Antonsen (2010), modularization and commoditization may in some ways strengthen day-to-day reliability, by giving organizations a better overview and control over work processes. However, in the case studies, this formalisation and splitting of tasks came at the expense of trust-based and informal relations and a reduced holistic knowledge of, and a feeling of responsibility for, the system. This affected the esprit-de-corps needed in emergency situations; in addition, some of the latent informal structures that could be called upon in emergencies had been removed (Almklov & Antonsen, 2010, 2014). The discussion of how new logics can alter conditions provides an analytical reference point for investigating how the logics of procurement affect critical service reliability.

In a case study of the Swedish railway, Cedergren et al. (2018) focused on the multi-actor response and recovery operations following two types of failure events. They argued that, although the splitting of functions between organizations may work during normal operations, it can be problematic when disturbances and failures occur. The challenge lies in achieving reliability or resilience at a system level: while the individual organization may demonstrate flexible adaptations to the situation and achieve individual goals ("micro-efficiency") it can happen at the

expense of reliability and resilience at the system level ("macro-inefficiency") (Cedergren et al., 2018, p. 56). This pursuit of individual goals combined with the existence of overall system goals appears relevant for procured critical services. Moreover, the authors problematized the use of contracts as the only or main means for creating resilient critical infrastructures: given that not all situations can be foreseen, contractual requirements covering disturbances and requiring the contributions of multiple actors are difficult to specify (Cedergren et al., 2018). This observation will be further discussed in Section 3.3.

Berthod et al. (2017) studied the management of an emergency network in a German city, using this case to exemplify a "high reliability network". In their study, they found that the network applied different governance modes (Provan & Kenis, 2007) in the process of "layering" (meaning the use of several governance modes simultaneously) and "switching" (changing temporarily to a centralized governance structure in the event of crisis or in situations requiring quick responses) to be able to address two different sides of reliability: anticipating and containing critical incidents. Importantly, the grounds for switching to the assertive mode applied during crises, including the establishment of informal relations and knowledge of the other organizations of the network, were laid during quiet periods. Berthod et al. (2017) noted that the dynamic switching and layering of governance modes mostly happened without conflict, which they attributed to the interactions in quiet periods. Berthod et al.'s (2017) study is relevant for research on the governance of procured critical services as it highlights the complexity of network governance and identifies the need to combine different governance modes. At the same time, as will be elaborated on in Sections 3.2.2 and 3.3, the network they analysed is significantly different from a procurement arrangement.

3.2.2 Gaps in critical service reliability research

The organizational studies reviewed in Section 3.2.1 have brought substantial attention to aspects concerning critical service reliability. They provide rich empirical and analytical insights into some of the challenges of organizational reliability in fragmented critical infrastructures as well as some reliability-enhancing solutions. At the same time, the studies are limited in number and some important organizational reliability themes remain to be researched.

One aspect is that the studies, except for Berthod et al. (2017), cover critical *infrastructure* services and do not provide examples from the broader category of critical services. Given that a broad spectre of services are critical to society, future organizational reliability research should encompass a wider variety of these services, particularly when discussing the outcomes of the services. For some critical infrastructures (e.g., water and electricity supply), outcomes appear relatively easy to define. Expanding the scope to critical services means including services whose outcomes are dynamic. For instance, for healthcare system services, achieving an overall outcome of improved health depends partly on the healthcare quality (Donabedian, 1980; WHO et al., 2018). Quality changes as the knowledge base underlying it grows (OECD/WHO, 2019).

Furthermore, although the HRO studies and organizational reliability studies assessed in Sections 3.1 and 3.2 concern processes, the analyses of these processes appear to concern *variance*; they are not chronological processes that involve irreversible change from one state to another. To be fair, the studies reviewed in Section 3.2 concern the departure from pre-restructuring to post-restructuring conditions. Nevertheless, they do not analyse the chronological change processes per se. As noted by Berthod et al. (2017), process-oriented studies appear to be a way forward for organizational reliability research.

In addition, the studies do not thematize the role of conflict between organizations or groups involved in critical service supply. Some studies emphasize the relevance of conflicting interests between organizations (e.g., Cedergren et al., 2018; de Bruijne & van Eeten, 2007) while others acknowledge the existence of tension between professional groups or within networks (e.g., Berthod et al., 2017; Schulman et al., 2004). Nevertheless, these tensions appear to be resolved within the context of a shared commitment to reliability and do not result in more profound conflict. It is therefore important to do more research on the role of conflict in inter-organizational service supply arrangements and the potential effects on reliability.

Moreover, research on high reliability network (HRN) governance is scarce (Berthod et al., 2017, p. 352; Clark-Ginsberg et al., 2021, p. 2). Also, partly due to the restructuring reforms of the 1980s onwards, critical services have been provided through a wide variety of arrangements (see Section 2.1). Precisely because these arrangements are so different, generalisations among different types of networks should be avoided. In other words, there is a need for research on the reliability governance of different types of networks.

Last but not least, although some of the studies acknowledge the relevance of regulatory framing for critical services (e.g., Roe & Schulman, 2016, p. 5), this acknowledgement has tended to be at quite an abstract level. This also concerns the role of law (being one central regulatory measure), which is hardly problematized in the reviewed literature in Sections 3.1 and 3.2. One exception is de Bruijne (2006), who described some legal aspects related to electricity and mobile telephony delivery; these are, however, not discussed at a more profound level.

3.3 Procurement legislation and governance options

Given the scarcity of organizational reliability studies on governance options and the lack of focus on the role of legislation for organizational reliability, the research conducted for this thesis draws upon theoretical contributions outside the organizational reliability field. In doing so, I focus on quite specific aspects concerning publicly procured services. The following account of procurement legislation and procurement governance particularly relate to the aim of contributing new knowledge on governance options (see Section 1.2).

3.3.1 Implications of procurement legislation for procurers

Procurement legislation is the result of several — at times opposing — considerations. On the one hand, the establishment of a regime of competition was central to the creation of the EU and the EEC agreement (Bovis, 2018). To this end, the EU directive 2014/24/EU on public procurements and related directives build on the principles of competition, equal treatment, predictability, verifiability, and proportionality (Directive 2014/24/EU, 2014). The judicial precedent of the EU Court of Justice has shown that these principles are central to the interpretation and application of the procurement directive (Arnesen et al., 2022, p. 317). On the other hand, public procurement has a long history of being used as an instrument to achieve desirable social policy outcomes (McCrudden, 2004, p. 257). In the Public Procurement Act, some of these outcomes, like environmental and human rights considerations, are specifically mentioned. However, social considerations must be weighed against the possibility that they limit competition (Dragsten, 2020, p. 31).

Public entities procuring goods or services thereby become instruments for reaching overall policy goals while at the same time their own aims are related to the organization's raison d'être (Storsjö & Kachali, 2017,

p. 353). From the point of view of the public entities, some of the main reasons for procuring services include (the aims of) cost reduction, increased service quality, and the acquisition of services that the public entities are unable to provide themselves (Greve & Ejersbo, 2011, p. 123).

On a general level, procurers balance between fulfilling their own aims for procurement and complying with procurement legislation. In some ways, the procurer has a quite wide scope of action. Procurement legislation does not specify what can be bought; moreover, the procurer has quite extensive possibilities for deciding contract terms (Arnesen et al., 2022). On the other hand, the specification of requirements (i.e., requirement to the good or service that is bought) and contractual requirements must be in line with procurement principles.

From an organizational reliability perspective, where the possibilities for making flexible adjustments when faced with changing outside conditions is considered important, procurement legislation can be seen as restricting behaviour options. This relates particularly to whether changes can be made to published requests for tenders and to running contracts. Some relevant aspects of this are outlined here.

Firstly, once a request for tender has been announced, procurement legislation sets limits for adjustment possibilities. As a main rule, the procurer cannot make 'significant changes' to the request for tender before the tender submission deadline. Changes are considered significant if "other suppliers could have participated in the competition if the changed conditions formed part of the initial announcement" (Arnesen et al., 2022, p. 340, my translation). In tender competitions with negotiations (like the air ambulance service tenders) changes can be made after the submission deadline, but the changes cannot be significant and must be accessible for all participants before the deadline of the revised proposals (Arnesen et al., 2022, p. 340).

Similarly, procurement legislation can impede changing a running contract. Three types of significant changes cannot be made to contracts (Arnesen et al., 2022, p. 357). Firstly, changes are considered significant if they include new conditions which could have enabled others to participate in or win the tender competition. Secondly, the contract cannot be extended to include deliveries that were not part of the announced agreement. Thirdly, the economic balance of the contract cannot be changed in favour of the supplier. At the same time, the procurement directives allow the inclusion of a change clause in procurement contracts, given that the type and extent of the change and the conditions for applying the clause are included in "a clear, precise, and unequivocal way" and that the overall character of the procurement remains the same (Arnesen et al., 2022, p. 359). In addition, in some circumstances, changes can be made if they are necessary due to conditions the procurer could not have foreseen (Dragsten, 2020, p. 934).

However, for the procurer, assessing whether they are acting in compliance with procurement legislation (e.g., whether a desired change to a contract should be regarded as significant or not), can be difficult. Applying procurement law correctly is a concern for many procurers (Storsjö & Kachali, 2017, p. 351). Due to the fear of making mistakes and risking complaints, cancelled competitions, or — as a last resort — legal disputes, many procurers become more concerned about carrying out correct processes than ensuring the quality of the procurement (Nærings- og fiskeridepartementet, 2019b). In other words, procurement legislation can result in a double constraint on procures: the actual limits as defined in procurement legislation and the strict interpretations procurers can have of these limits.

3.3.2 The governance of procured services

The role of procurement legislation for shaping governance options of procurers underscores that, although there is a call for more research on the governance of high reliability networks (Berthod et al., 2017),

research on governance effects on reliability should reflect the many different ways in which public services can be provided by networks of services.

The concept of governance is, amongst other applications, used to describe the coordination and management of service delivery following the restructuring reforms of the 1980s and 1990s (Kersbergen & Waarden, 2004, p. 143; Pierre & Peters, 2000, pp. 2-3). Emphasis is placed on the *process* of governing (as opposed to the structure of government) and on the limits of governmental power (Klijn, 2008, p. 508). Here, "governance" is applied in accordance with Klijn (2008) to describe the process of governance, but with an understanding that the structure of the inter-organizational arrangement is highly important for how this governance process can take place.

Berthod et al. (2017) discussed governance modes related to a specific type of networks. Their discussion is based on an understanding of inter-organizational networks "as a group of three or more organizations connected in ways that facilitate achievement of a common goal" (Provan et al., 2007, p. 482). In such networks, the connections between organizations can be quite loose, and the networks do not necessarily involve that one organization takes a lead role. Berthod et al. (2017) discussed a network which applies a *combination* of shared governance (i.e., without central governance structures), governance via a lead organization, and governance where one organization takes the administrative role of coordinating (but not leading) network activities.

By contrast, governance in a procurement setting undoubtedly involves the procurer as a lead organization. In procurement, *contractual governance* is applied. Contractual governance involves governance by means of a formal contract (Cao & Lumineau, 2015). Contracts specify deliveries, the roles and responsibilities of each party, contract-monitoring procedures, and penalties for noncompliance (Poppo & Zenger, 2002, p. 708). Although contractual governance can reduce

opportunism and safeguard inter-organizational relationships (Williamson, 1985), there are several challenges associated with this governance form. In particular, and highly relevant in a critical service reliability context, it is impossible to anticipate all contingencies, making contracts incomplete (Grossman & Hart, 1986; Williamson, 1979). Moreover, ambiguity in concrete contract terms can lead to differing interpretations and enable opportunism (Cao & Lumineau, 2015, p. 17). Furthermore, the overall application of contracts may be rigid or more flexible, potentially creating a mismatch between the involved organizations' understanding of how the contracts should be applied (Cao & Lumineau, 2015, p. 17).

Organizational reliability studies have discussed some challenges of contractual governance. Cedergren et al. (2018) concluded that the inherent incompleteness of contracts is particularly challenging in relation to disturbances (rather than day-to-day performance) involving many actors. Suppliers may also deliver at the minimum requirements specified in the contract, including "work-arounds" to fulfil them (Cedergren et al., 2018, p. 56). Cedergren et al. (2018) offered a telling example of this: railway maintenance contractors, who are obliged to be on site within a set time limit in cases of traction power line failures, send unskilled staff to the site to comply with the contract if qualified staff are unavailable. This results in a situation of "micro efficiency but macro inefficiency" where contract terms are fulfilled but the overall goals are not reached (Cedergren et al., 2018, p. 56). At the other end, the use of contracts may result in over-monitoring. One consequence of this is mutual distrust (Almklov & Antonsen, 2014, p. 484).

The above-mentioned organizational reliability studies have not discussed specific alternatives to contractual governance for outsourced or procured critical services. A complimentary governance form which will be discussed in this thesis is that of relational governance. Although there are several roots to theoretical perspectives on relational governance, the research for this thesis has focused on governance based

on relational exchange theory (RET) (Macneil, 1980). The essence of the behavioural norms described in RET is that the relationship between two parties is approached in a holistic give-and-take manner, implying flexibility and joint problem solving. Relational governance is not a substitution for contractual governance. Rather, the governance forms should be seen as complementary (Cao & Lumineau, 2015; Zheng et al., 2008). Moreover, contractual governance can be seen as enabling relational governance by framing behaviour, whereas relational governance compensates for some deficits of contractual governance (Benítez-Ávila et al., 2018, p. 439). Relational governance can play a facilitating role for both enforcing contractual obligations and engaging in joint problem solving when faced with unforeseen contingencies, making it particularly relevant for complex contracts of long duration (Zheng et al., 2008, p. 44).

The holistic approach of relational governance, and the flexibility displayed in line with this approach, resembles HROs' and HRNs' approaches to the overall goal of reliability (Slotsvik, Gould, & Stene, 2023). Therefore, an assessment of relational governance is core to this thesis' aim of contributing new knowledge on how specific governance forms can contribute to maintaining the reliability of publicly procured critical services.

4 Methodology

This chapter starts with a presentation of the philosophy of science foundation on which my research builds (Section 4.1). I then move on to describe my research strategy and design (Section 4.2). In Section 4.3, I describe the data collection and data analysis in a relatively chronological manner, acknowledging that in my own work, just as much as in the procurements I have studied, the process has been important.

4.1 Philosophy of science foundation

My PhD project is founded on the critical realism philosophy of science, which in essence holds that the world exists independently of our consciousness of it and that our knowledge of it is tentative rather than absolute. The critical realism philosophy was originally formulated by the Indo-British philosopher Roy Bhaskar and further developed by primarily British social theorists (Bhaskar, 1975; Gorski, 2013).

Critical realism offers a middle way between the positivist search for universal laws on the one side and the epistemic relativism of social constructivism's and interpretivism's search for meaning rather than explanation on the other (Gorski, 2013, p. 661). In fact, it has similarities with both (Elder-Vass, 2012, p. 33). On the one hand, it shares with realism the notion that the world exists independently of our knowledge of it; on the other hand, like moderate constructivism it acknowledges how for instance language, culture, and prior knowledge affect our understanding of the social world (Elder-Vass, 2012, p. 3).

According to Bhaskar's (1975) depth realist ontology, reality is layered, or stratified (hence the name). According to this ontology, three layers exist and can be separated from each other. First, there is the world as we experience it, which Bhaskar referred to as "the domain of the empirical". Second, there is "the domain of the actual", meaning events which happen independently of our experience of them. Last, there is

"the domain of the real", meaning the mechanism which (potentially) causes these events. One of the reasons why the critical realist ontology is appealing is how these three domains help explain causality. Events are seen as "multiply determined" by several causal mechanisms interacting in a complex manner (Bhaskar, 1975; Danermark, 2002, p. 47; Elder-Vass, 2012, p. 16). Furthermore, the underlying mechanisms do not necessarily manifest themselves within a given context. Mechanisms produce latent conditions and tendencies, not absolute regularities.

The epistemological implication of critical realism ontology is that our knowledge of the world is tentative and not absolute (Blaikie, 2007, p. 24). The social world exists, but our interpretations of it are affected by culture, language, and theories (Blaikie, 2007, p. 24). However, although knowledge is fallible and may evolve and change over time, this does not imply that all knowledge is *equally* fallible (Danermark, 2002, p. 15; Elder-Vass, 2012, p. 231). For me, this was an important realization at a stage when my data analysis appeared to me as only an interpretation, alongside numerous other plausible interpretations.

In critical realist epistemology, theory plays a central role for our scientific interpretations of the world. As elegantly phrased by Brannan et al. (2017, p. 15), explanations need to be "theoretically informed and empirically substantiated". Finding a suitable theoretical approach may necessitate a comparison of different theoretical perspectives (Danermark et al., 2019, p. 130). This effectively describes my approach to theory in Articles II–V, as the empirical material triggered a back-and-forth search for theoretical contributions that could supplement organizational reliability theory.

4.2 Research strategy and design

To provide a foundation for answering the research question, I have used a case study approach. In line with Yin (2018), I view this approach as a

research strategy allowing for the use of multiple methods and not as a method on its own. Case studies allow for in-depth empirical explorations of a phenomenon as situated in a particular context, especially when boundaries between the phenomenon and context are blurred (Yin, 2018, p. 15). Thus, the approach is well-suited for organizational research (Fitzgerald & Dopson, 2009, p. 468). In case studies, gaining a thorough understanding of the context is particularly important (Hartley, 2004, p. 325). This is also recognised in organizational safety research, where in-depth case studies (including HRO studies) have been decisive for developing theories (Antonsen & Haavik, 2021, p. 70).

The term "case" can apply to both the empirical unit and the theoretical construct or concept to be analysed (Antonsen & Haavik, 2021, p. 70). In this thesis, I use the term both ways. However, when referring to the study as an empirical unit (i.e., "the case of the air ambulance service"), this is more of a linguistic term. What makes my research a *case* study is that it is a study of a theoretical construct — reliability — in the empirical setting of the air ambulance services.

As the thesis focuses on completed procurements, it can be characterized as a retrospective case study (Langley, 2009). Understanding the processes as they have been experienced by the involved actors has been fundamental to my research project. Using a case study is suitable in this sense as they are "tailor-made" for exploring not only new processes, but also those about which we have incomplete knowledge (Hartley, 2004, p. 213). Focusing on tendering *processes*, my study exemplifies process research (Langley, 2009). In process research, the sequence of events is critical: outcomes are explained in terms of the chronological development of actions and events, not in terms of varying levels of a specific attribute (Langley, 2009, p. 409). In this sense, process research resembles historical studies, where mapping events chronologically is a principle for explanation: causality implies chronology (Kjeldstadli, 1999, p. 104).

Case studies need theoretical perspectives to guide the data collection and analysis (Yin, 2018). This approach fits well with a critical realist foundation, as critical realism presumes that the empirical enquiry is "theoretically informed" (Brannan et al., 2017, p. 15). How theoretical perspectives interplayed with my empirical investigation and shaped my analysis will be described in the following section.

4.3 Data collection and analysis

The data collection and analysis processes are summarized in Figure 4-1. The purpose of the figure is to show that the research process has really been a *process*, with an iterative switching between theory, data collection, and analysis.

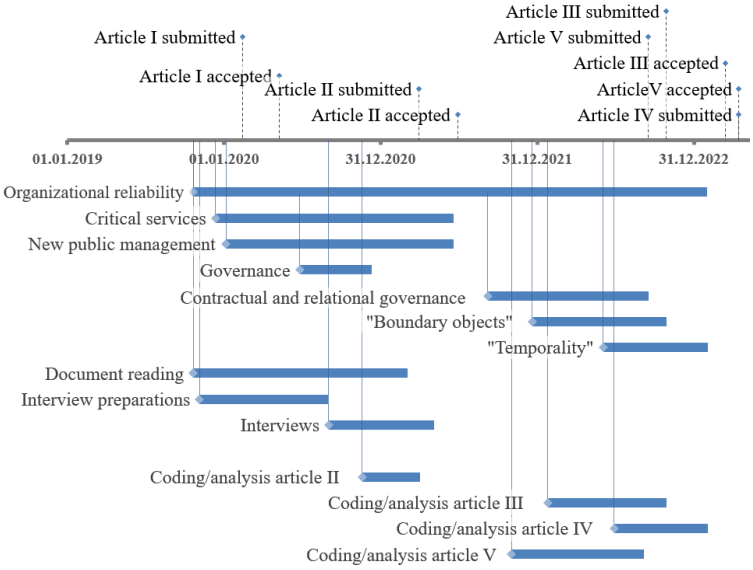

Figure 4-1 Gantt diagram showing the data collection and analysis process.
The points above the timeline show when articles were submitted and accepted by journals. The lines below the timeline show the main periods of reading theory and working with data collection and analysis.

4.3.1 Review of theoretical literature

Between November 2019 and January 2020, I conducted a literature search together with researchers in the ProCritS project. The search on Google Scholar included a variety of combinations of the following search words: outsourcing, tendering, procurement, contracting, private–public partnership, trust, industry fragmentation, reliability, resilience, and transport (Slotsvik et al., 2020). The aim was to find studies that could enhance the understanding of the relationship between tendering and resilience. The search gave an introductory overview of relevant literature, but I came to realise that it was neither systematic nor refined enough to provide a sufficient theoretical starting point for my work.

For this reason, from April to June 2020, I carried out a new literature search that was more accurately developed for my study. The aim was to gain an overview of studies that discussed how the restructuring or fragmentation of critical services had affected organizational reliability. Using Scopus as the search engine, I combined three concepts: critical services, reliability/resilience, and the effects of restructuring reforms. The operationalization of these concepts is shown in Table 4-1.

Concept	Search words
Critical infrastructure/service	"critical infrastructure", "critical function", "vital function", "essential function", "critical service", "essential service", "vital service"
Reliability/resilience	reliability, resilience
Restructuring/ Fragmentation	Initial: "new public management", deregulat*, restruct*, outsourc*, fragment*, privati*, liberali*
	Added: inter-organization*, interorganization*, inter-organisation*, interorganisation*, "large scale system", "socio-technical"

Table 4-1. Concepts and search words used in literature search.

The Scopus search produced 992 results. It was narrowed down by limiting the subject areas to "social sciences", "decision sciences", "business, management and accounting", and "health professions". Although "social sciences" was the subject area which best described my field, I included the other three categories so that relevant studies with an organizational or societal perspective within these subject areas would be included in the results.

With the limitation on subject areas the search gave 139 results, all of which were revised. This was a stepwise process, in which I initially analysed titles, then the abstracts of papers with relevant titles, and finally full papers where these had relevant abstracts. For results to be regarded as relevant, they needed to have an organizational or societal perspective and to thematize effects of restructuring or similar processes on critical service reliability or resilience.

The result of the revision process is summarized in Table 4-2. In order to narrow down to peer-reviewed contributions, only articles were selected. Conference papers, books, and other publications were left out. As Table 4-2 shows, the literature search gave relatively few results. The choice of search words may have excluded relevant organizational reliability and resilience literature. In particular, this applies to the concept of "critical services", as the literature search left out studies that concern critical services but do not apply this concept. At the same time, the advantage of my approach is that results are confined to studies that see service reliability in light of the importance of the services to society.

Authors	Year	Title
Almklov & Antonsen	2010	The commoditization of societal safety
Almklov & Antonsen	2014	Making work invisible: New public management and operational work in critical infrastructure sectors
de Bruijne & van Eeten	2007	Systems that should have failed: Critical infrastructure protection in an institutionally fragmented environment
Cedergren, Johansson & Hassel	2018	Challenges to critical infrastructure resilience in an institutionally fragmented setting
Cedergren, Lidell, & Lidell	2019	Critical infrastructures and the tragedy of the commons dilemma: Implications from institutional restructuring on reliability and safety
Donehue, Baker & Washington	2012	Importance of a resilient air services network to Australian remote, rural, and regional communities
Newlove-Eriksson, Giacomello & Eriksson	2018	The invisible hand? Critical information infrastructures, commercialisation and national security
Roe, Schulman, van Eeten & de Bruijne	2005	High-reliability bandwidth management in large technical systems: Findings and implications of two case studies
Schulman, Roe, van Eeten & de Bruijne	2004	High reliability and the management of critical infrastructures

Table 4-2. Results from the literature search.

In a refined review of the articles, Donehue et al. (2012) and Newlove-Eriksson et al. (2018) were excluded; the former theorizes resilience at the community level while the latter does not have resilience or reliability as a main theme.

As the project matured, I became aware that that the Scopus search had been too restrictive. For instance, limiting the literature search to peer-reviewed journals meant that some relevant contributions (in the form of books or PhD dissertations) were left out. Nevertheless, the systematic

search was important as a foundation for the further exploration of literature. For instance, I used the reference lists in the studies I had identified to find other contributions. In addition, I expanded the thematic scope somewhat. For example, I realized that "networks" should have been among the search words, and therefore included organizational reliability studies of networked services in my literature assessment. The assessment presented in Section 3.2 is the result of the systematic literature search and the enlarged search which built on it.

4.3.2 Initial selection of units of analysis

I initially decided upon the empirical units of analysis based on the proximity to the tendering processes. There were two different sides to this: whether they had been directly involved in the tendering processes and whether they had been affected by the same processes. LAT HF was included in the study due to their direct involvement in the procurements. Regarding the operators, I differentiated between a management/administrative level (directly involved in the tendering processes but also affected by them) and an operational level (affected by the tendering processes). Although this differentiation is a simplification of the organizational structures, it is suitable for the purpose of the study.

I included medical units at the operational level due to their close cooperation with operational air ambulance staff. I also included the pilot trade union due to their decisive role in the transition phase of the fixed-wing procurement. In addition, I considered including the regional health trusts (LAT HF's owners) and the national health trust specialized in procurements (Sykehusinnkjøp HF). However, their roles in the tendering process were more peripheral than that of LAT HF. The regional health trusts decided on the economic frames and anchored the strategy and content of the procurement but were mostly not directly involved in the process. Sykehusinnkjøp HF, with their specialized, juridical competence on procurement, were important in the formation

of the specification of requirements and the evaluation of tenders, but did not have the same holistic role as LAT HF. Initial units of analysis, including those considered but left out, are shown in Figure 4-2.

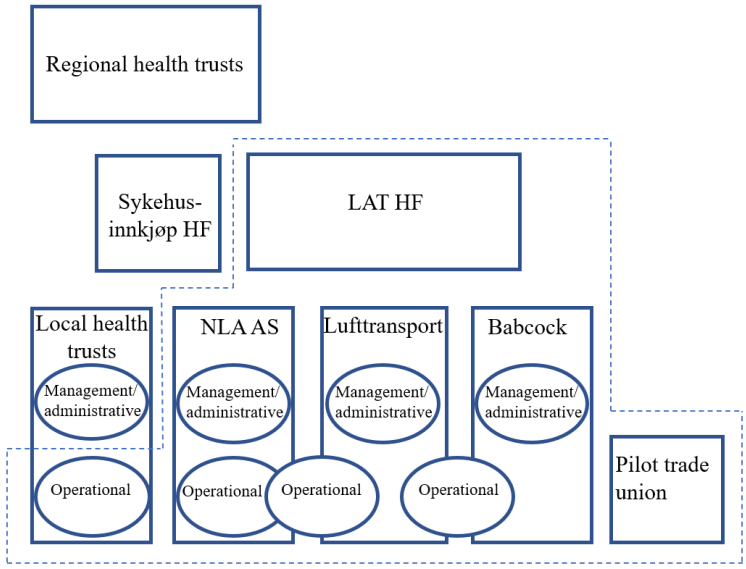

Figure 4-2 Relevant units of analysis to the air ambulance procurement case study.

Operational personnel that were transferred from one operator to another are presented between the operators in the figure. The stapled line shows units of analysis that were selected in the first round.

Given my decisions on who to include, my case study research design is between a single-case embedded design and multiple-case embedded design (Yin, 2018, p. 48). Embedded cases, as opposed to holistic cases, involve units of analysis at more than one level. As shown in Figure 4-2, my study covers several levels of the operational air ambulance service

system. In this sense, it has a single-case embedded design. However, by following two different tendering processes involving somewhat different actors, it also shares characteristics with multiple-case studies.

4.3.3 Document analysis

At an early stage of the research process, I used documents to gain an overview over the air ambulance system, especially the most recent procurements. The following outline shows the type of documents used and the purpose for using them. For a more detailed overview, see Appendix 1.

Media articles. I used the digital media archive Atekst from Retriever to find articles covering the air ambulance service procurements. The articles were used to establish a timeline of events, with the aim of providing background information and preparing for interviews. Information from approximately 90 articles from the national broadcaster *NRK*, the Norwegian news agency *NTB*, and newspapers like *Aftenposten*, *Finansavisen*, and *Nordlys* were used to set up the timeline.

Parliament documents. Documents from Stortinget (the Norwegian parliament) were used to get insight into the political hearing regarding the fixed-wing service procurement.

LAT HF documents. I have used publicly available LAT HF board meeting protocols, activity reports, and statutes, as well as requests for tender, to gain an overview of the air ambulance service. I did not have access to (the part of the) protocols exempt from public disclosure. The board meeting protocols were also used to find overviews of the availability of resources (used as a proxy for output in this thesis). A description of how I assessed availability is included in Appendix 4.

Written correspondence between LAT HF and operators. I used the public post journal available on LAT HF webpages to get an overview of potentially relevant correspondence between LAT HF and the

operators. I requested a total of 84 documents and received 62 of these. The remaining documents were classified as exempt from public disclosure. The correspondence was used to prepare interview guides.

Legal documents. I have used the Norwegian Public Procurement Act and the Public Procurement Regulation to examine aspects of the procurement regulations that were referred to in interviews and to get a broader understanding of these regulations.

Evaluation reports. Evaluation reports regarding the air ambulance procurements were used to retrieve background information and to assess the public evaluations of the procurements.

4.3.4 Interviews

I carried out interviews from September 2020 to May 2021 (see Figure 4-1). The timing of the interviews, relatively soon after the new contract periods started (in 2018 and 2019), appeared to be ideal. On the one hand, the processes were concluded and allowed the actors to reflect on them in retrospect; on the other hand, as these were recent processes, the actors remembered their experiences well.

Interview participants were recruited based on my initial setup of units of analysis (see Figure 4-2). The recruitment was done using a combination of contact persons acquired through the ProCritS project and by snowballing. As part of the ProCritS project, we had digital meetings with LAT HF and each of the operators. This was advantageous for the preparation of interview guides. An overview of the interviews is shown in Table 4-2. For a complete, chronological overview of the interviews, see Appendix 2. Interviews were semi-structured and lasted approximately 1,5 hours.

Organization	Number of interviews	Number of research participants
LAT HF	4	8
NLA AS (M/A)	3	3
NLA AS (operational)	9	9
Lufttransport (M/A)	3	3
Babcock (M/A)	4	4
Babcock (operational)	6	6
Pilot trade union	2	2
Local health trusts (operational)	9	9
Total	40	44

Table 4-3 Organizational affiliation of research participants.

M/A refers to the management/administrative level of the organization directly involved in the tender process.

The first three interviews with LAT HF representatives were conducted as group interviews with three interviewers (all of whom were from the ProCritS project) at their headquarters in Bodø in September 2020. These interviews had the aim of gaining broad knowledge of the air ambulance service, including how procurements were carried out and contracts were monitored.

During the Covid-19 situation at the time, the remaining interviews (with one exception) were conducted via digital means; all but one were individual interviews. Based on knowledge from LAT HF interviews and document analyses, the interview guides for these interviews were structured around the different phases of the tendering processes. To capture the interview participants' experiences and descriptions, for each phase (see Figure 2-2), the introductory question was "Can you describe the period from xx to xx?" This was followed by questions regarding events and actions in this phase, the challenges they encountered, and how they viewed this part of the tendering process. The interview guides

were slightly adapted and updated between every interview. For instance, if one interviewee highlighted an aspect of the process as very important, the next interviewees were asked about this same aspect. For examples of interview guides, see Appendix 3.

The final interview with LAT HF representatives was a thematic interview focusing on availability, as I needed to clarify my understanding of this concept and its relevance for assessing the output of the air ambulance operators.

4.3.5 Revision of units of analysis

During the data collection period it became apparent that the initial plan for units of analysis (see Figure 4-2) had to be revised. One reason for this was that it proved difficult to access rotor-wing personnel who had experienced a change of operator. As these were a central subgroup of the rotor-wing personnel, I decided not to focus on the operational level of the rotor-wing tendering process. Interviews with rotor-wing personnel who had not experienced a change of operator, as well as the medical personnel associated with the rotor-wing ambulance service, were thereby downplayed in the further analysis. Nevertheless, they made important contributions to my overall knowledge of the service and background for the analysis of the interaction between pilots and operators in the fixed-wing service. The revised units of analysis are shown in Figure 4-3.

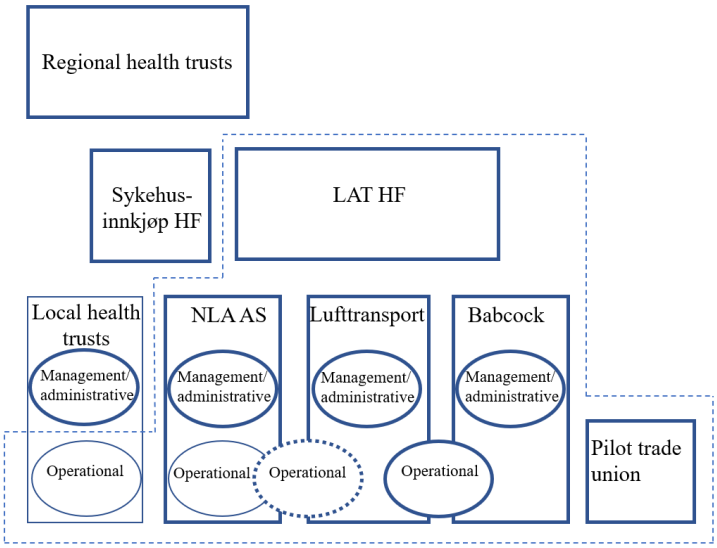

Figure 4-3. Revised units of analysis.

Bold lines indicate main interviews in the analysis. Thin lines show actors who were interviewed but not included as main units of analysis. The dotted circles shows a group I intended to interview but did not. The dotted line shows units of analysis that were selected in the first round.

4.3.6 Interview data analysis

All main interviews and some background interviews were transcribed in NVivo. Sixteen of the interviews (including two incomplete transcriptions) were transcribed by an external transcriber contracted by the ProCritS project (see Appendix 2).

The initial coding process can be characterized as a first stage or first cycle of coding (Saldaña, 2009). This coding was done in NVivo using nodes to differentiate among the different themes occurring in the data material. The first round of coding resulted in more than 60 nodes.

Although useful for familiarizing me with the material, the nodes covered a wide spectre of non-overlapping themes and were difficult to synthesize to a higher level. The second approach was therefore more holistic and guided by the question "What is most striking about this material?" This approach served as a way of moving from chaos to themes (Malterud, 2012). One important realization was that the tendering processes were described very differently by the different groups of research participants. Following this realisation, I synthesized the main statements of each group for each period of the tendering process. Each synthesized statement was followed by extracts from the NVivo transcriptions that supported my analysis. This analysis was the basis for Article II.

The analyses conducted for Articles III–V were to a larger extent guided by theory. The main theoretical fields are shown in Figure 4-1. For instance, at the start of the analytical process leading up to Article V, I was interested in the role of governance in the fixed-wing ambulance procurement. I gradually narrowed the theoretical focus to contractual and relational governance and used relational exchange theory (RET) (Macneil, 1980) as my concrete theoretical starting point. Having identified five main norms in RET, the coding of interviews was done according to an operationalization of these norms (see Slotsvik, Gould, & Stene, 2023).

Article IV followed a similar approach. One central theme which emerged from the interview material was how the tendering processes created substantial time pressures on the operators. Having familiarized myself with literature on temporality, I used concepts from this literature to select and structure the relevant findings.

Article III had a different starting point. I was introduced to boundary object theory by a ProCritS member and was asked whether this could apply to safety performance indicators in the air ambulance services. I immediately recognized that boundary object theory gave an opportunity

to explore the different uses of availability (a central performance indicator in the air ambulance services) by the research participant groups. The coding processes started with the coding of all text sections which could be related to availability and preparedness. Further analysis led to an identification of three themes: what availability implied for the research participant groups, how availability was perceived in the transition phase and contract implementation phase, and how the reduced availability could be explained according to them.

4.4 Research quality

Research quality concerns the entire research process, from the design of the study to the presentation of the results (Flick, 2018; Kvale & Brinkmann, 2018; Seale, 1999). Originally, the assessment of qualitative research quality was based on criteria developed for quantitative research — namely, *objectivity*, *reliability*, and *validity* (Lincoln & Guba, 1985, p. 290). *Objectivity* refers to that the results do not reflect the individual dispositions of the researcher. *Reliability* concerns whether a repetition of the same procedures in similar settings would produce the same results; reliability is a precondition for validity. *Internal validity* concerns how accurately the study answers the research question or hypothesis (i.e., that there is a causal relationship between the examined variables and that other factors are controlled for or randomized). *External validity* concerns the generalizability of a study's results to other contexts.

Some authors have adapted these criteria to a qualitative setting. For instance, Kvale and Brinkman (2018) used *reliability* and *validity* in relation to their everyday use, referring to reliability in terms of whether qualitative research results are consistent and trustworthy and to validity in terms of whether the results appear right, sensible, and convincing. Others, like Lincoln and Guba (1985), have argued for a more marked departure from quantitative, positivistic research and instead propose a

different set of criteria to establish the *trustworthiness* of qualitative studies:

- Credibility, instead of internal validity. Credibility concerns whether the study is done in a way that makes it convincing that the results are correct.
- Dependability, instead of reliability. Dependability concerns whether the findings are consistent independent of the method and researcher.
- Confirmability, instead of objectivity. Confirmability concerns whether findings are unbiased and reflect the stance of the research participants.
- Transferability, instead of external validity. Transferability refers to whether the results are valid in other contexts as well.

Although Lincoln and Guba's (1985) combination of a constructivist view of reality with "attempts to establish truth" have been criticised for being contradictory, their procedures can nevertheless serve to enhance research quality (Seale, 1999, p. 46). Lincoln and Guba (1985) proposed several techniques for establishing the trustworthiness of qualitative studies. In the following, I use their techniques as a starting point for assessing my research approach:

Prolonged engagement, meaning that sufficient time is spent in the field to become acquainted with the culture, build trust, and be able to test misinformation. My plan for data collection was to visit organizations' headquarters and bases. The Covid-19 situation imposed a constraint on this. Nevertheless, my process was one of prolonged engagement, in terms of a long period of familiarizing myself with the organizations by reading documents, participating in pre-interview meetings, and processing new information throughout the data collection period. Being able to visit prior Lufttransport rotor-wing bases might have allowed for me to build sufficient trust to recruit personnel for the study (see Section 4.3.5). In terms of the other interview groups, my experience was that

meeting in person was not a precondition for building trust. To test misinformation, I used data triangulation (e.g., cross-checking interview statements with findings in reports) as well as member checking (see further down in this section).

Interviewing participants in their surroundings to get a broader understanding of their work and work environment likely would have enriched the study. Nevertheless, in terms of guiding my attention in a multilevel study, digital interviews may have been a strength: the work of the rotor-wing and fixed-wing ambulance crews is attention grabbing and could have made me focus on their roles even more. Instead, the less eye-catching work of the administration and management was allowed to come more to the forefront.

Persistent observation, meaning an in-depth study sufficiently identifying the details. In my study, this did not mean direct observation, but the close study of documents prior to and during the interview phase.

Member checking, meaning to verify with research participants that they have been correctly understood. I strived to double-check my understanding of the interview statements by rephrasing those about which I was uncertain (e.g., "If I understand you correctly, you said that…."). Some statements were rearticulated as questions to research participants from the same interview group. In addition, procurer and operator representatives were invited to a ProCritS workshop where findings were presented. They also received copies of early articles from the project and were invited to comment on these. However, a limitation was that not all the groups/interviewees were given these possibilities.

Triangulation, in this context meaning the use of different data collection modes (e.g., interviews, documents) and multiple sources of the same information (i.e., several interview respondents). At a general level, the use of multiple sources is central to case studies (Yin, 2018) and is a way for ensuring rigour as well as depth and complexity in qualitative studies overall (Flick, 2002). In my research, the combination of a variety of

document types and interviews has provided quite substantial empirical material on which to base my analyses. Data triangulation involved assessing which sources give valuable information about which aspects of the case. For instance, dates and figures were found in documents, whereas research participants' perceptions and reflections came from interviews. I interviewed several representatives from each of the groups involved to ensure that research findings do not reflect individual stances.

Peer debriefing, meaning external checks on the research process. This step was integrated into the research process. A strength of the methodological approach was that two or more interviewers attended several of the interviews (see Appendix 2). Having at least two interviewers was advantageous, as it made it easier to double-check the interview guide and ask for clarifications when necessary. It also made it easier to discuss and systematize the findings. In addition, it was important for my learning process, as it gave me an opportunity to learn from others and reflect on my own techniques with them. Related to this, being part of a larger research team in the ProCritS project offered me the opportunity to present and discuss findings and analyses with a wider group. This was important for how the analyses matured and allowed for a way to "create a wider analytical space" (Malterud, 2012, p. 797).

Negative case analysis and *referential adequacy* relate to having a critical approach to one's own interpretation and double-checking results. *Negative case analysis* concerns revising the hypothesis based on information obtained through the data collection and data analysis process. In the research conducted for this thesis, this has been a question of reflecting over whether important aspects which could help answer the research question were covered. *Referential adequacy* means going back to the data to ensure that they have been correctly used. This was important to me while coding the material, where there is a risk that text sections are removed from their context. I reread transcripts or parts of

transcripts at several stages to ensure that I used the text sections correctly.

Lincoln and Guba (1985) explained that *dependability* is a premise for credibility, meaning that there is an overlap between techniques used to establish credibility and dependability. Nevertheless, they argued that dependability is a separate aspect of research quality, reflecting the process of the inquiry. They suggested the use of inquiry audits, or an examination and presentation of the research process. *Inquiry audit* refers to establishing a transparent audit trail which displays the research study design, data collection and analysis, and final product so that others can examine it. In such an audit trail, reflexivity and a self-critical assessment are important. The (semi-)chronological overview I have given of the methodology of my study in this chapter is aimed at fulfilling these criteria.

The use of an inquiry audit is also useful for examining the *confirmability* of the study, albeit with a focus on the product (e.g., data and findings) rather than the process (Lincoln & Guba, 1985). The technique aims to ensure that data and interpretations are not a result of the inquirer's personal constructions and involve a stepwise double-checking of the product: a sample of the findings are first traced back to the raw data, and the author then assesses whether the categorizations and interpretations of the data are appropriate, clear, and have explanatory power, especially when compared to other plausible explanations. This double-checking has been integrated in my processes, such as when I revised the categorization and coding of data. In addition, an important aspect of this has been to ask open-ended questions and encourage research participants to reflect on both negative and positive aspects of the procurement arrangement and tendering processes. Towards the end of analysis processes, this has been particularly important when I have questioned my initial conclusions. For instance, when I concluded that neither relational governance nor contractual governance was sufficient to resolve conflicts in the fixed-wing procurement (see Section 5.5.5), I

went back to the interviewees' account of the process to double-check the support for my conclusion.

Establishing whether findings are *transferrable* to other contexts involves providing a thick description of the empirical basis of the analysis so they can gain an understanding of which conditions are necessary for the analysis to hold (Lincoln & Guba, 1985). According to Lincoln and Guba (1985, p. 316), the researcher only provides the thick description, thereby enabling the *reader* to transfer the findings to other contexts. In line with Kvale and Brinkman (2018), I argue that transferability (or what they refer to as analytical generalization) cannot be left to the reader alone. Rather, the researcher must argue for why her findings can hold in other contexts as well. Furthermore, the research quality is decisive for transferability: a high research quality is a precondition for being able to transfer the results to other contexts (Kvale & Brinkman, 2018, p. 294).

In my analyses, I have accounted for contextual factors to show that not all aspects of the cases are transferrable to other settings. I have also used the case material to discuss how critical service procurement *can* impact reliability. This approach has enabled me to highlight aspects which are relevant to other settings without claiming that my conclusions will be true under all circumstances.

4.4.1 Ethical considerations

Research ethics includes formalized aspects, such as complying with established codes of ethics and using review boards (Flick, 2018, p. 112). My study has complied with the formal ethical criteria. The ProCritS project, including my PhD project, has been reported to the Norwegian Centre for Research Data (NSD). Data collection and data storage were conducted in line with university recommendations. Participants received written information regarding the project and their participation prior to each interview. At the start of every interview, I repeated the

main points regarding participation and acquired oral consent from the participant. During the interviews, I avoided sensitive themes such as health issues.

However, ethical considerations go beyond the formal criteria (Flick, 2018; Kvale & Brinkman, 2018). For instance, this concerns how research participants are treated during the interview process (e.g., that they get a reasonable opportunity to present their version of the topic that is investigated) and how they are conveyed in end products. Such consideration have been important to me throughout the process.

The ethical soundness of research projects also depends on their *relevance* (Flick, 2018). Ensuring relevance has been a guiding principle for my study, influencing the choice of the overall topic of my PhD as well as the process. The relevance has a theoretical as well as practical side. On the one hand, my research aims to fill concrete gaps in the organizational reliability field. On the other, my aim is that the findings can be relevant for considerations of whether, and in which case how, critical services should be acquired through tendering competition.

4.5 Summarizing reflections

My approach to the research question can be characterized as broad and explorative; such an approach is both a strength and weakness. The multilevel design and the initially broad scope of interview groups has allowed for analyses of how tendering processes can be experienced by groups who play very different roles. The disadvantage of the approach is the time demanding data collection and quite chaotic data analysis process.

The same assessment applies to the use of theoretical perspectives. Again, the abundancy is in one way a disadvantage. Applying several different theoretical perspectives to complement organizational

reliability is time consuming and includes the possibility that each perspective is treated at a more superficial level than it would have been if the same theories were applied in several articles. At the same time, the analysis has remained true to the critical realist view of the theoretically informed interpretation of the material: I have attempted to use different theories, discarding some and applying others. As an example, I attempted to use general governance literature to analyse the governance of the procurement arrangement but discovered that it was too broad to be relevant. Instead, I found that literature from the narrower theoretical fields of contractual governance and relational governance was highly applicable. Overall, the quite extensive search for theoretical perspective that could complement organizational reliability literature has enabled me to contribute towards the further development of the organizational reliability field.

5 Findings

This chapter presents the overall findings from each article. An overview of the relationship between research aims and articles is presented in Figure 5-1. As shown in the figure, Articles I–V provide foundations for fulfilling the first aim of this thesis regarding the effects of the procurement arrangement and tendering processes on organizational reliability. Articles II and III establish the basis for the second aim regarding the relationship between output reliability and organizational reliability. Articles IV and V relate to the third aim of examining whether specific governance forms can contribute to maintaining the reliability of publicly procured critical services.

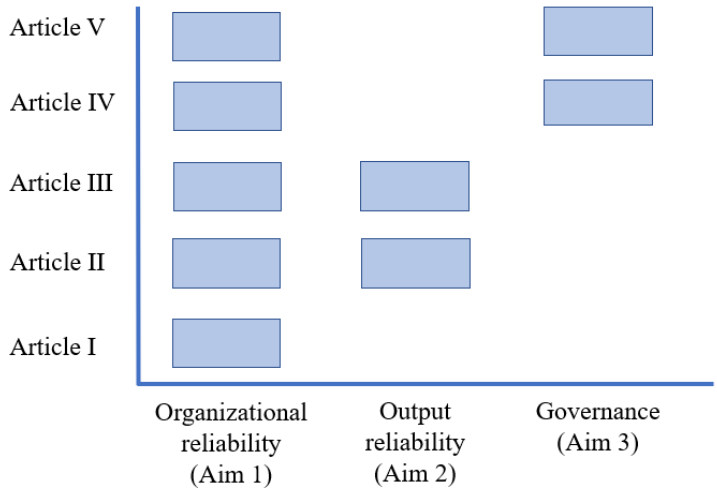

Figure 5-1. Overview of relationships between articles and research aims.

5.1 Article I: Effects of tendering on the resilience and reliability of critical societal functions

The article "How tendering affects the resilience of critical societal functions — a literature review" discusses findings from a literature search that were relevant for establishing an understanding of how tendering could affect critical service resilience and reliability. The literature review identifies three ways in which organizational research on critical services, and more specifically on tendered critical services, can build on and expand organizational safety theory from amongst other HRO studies (e.g., La Porte & Consolini, 1991; Roberts, 1990) and resilience engineering (cf. Hollnagel et al., 2006).

The article discusses that organizational safety theory has tended to cover developments within organizations, whereas critical infrastructures typically involve interactions between organizations. Previous research on critical infrastructure reliability (e.g., Almklov & Antonsen, 2010; Schulman et al., 2004) has recognised that critical infrastructure services are often provided across organizations and that this can lead to new challenges (e.g., in terms of coordination and collaboration). The article argues that research on tendered critical services can further expand this knowledge.

Related to this, the literature analysis documented in the article identifies that, although organizational safety theory has problematized the relationship between procedures and practice (e.g., Hale & Borys, 2013), this quite extensive body of research has largely been confined to individual organizations. Tendering leads to the distribution of procedures and practices across organizations, with a potentially long way between rule formation and practical application. One possible consequence of tendering is that, as a response to accountability requirements, procedures within each organization are more formalized — and resilience-enhancing adaptations at an operational level are more restricted — than in single organizations.

Lastly, the review includes organizational studies that have discussed the relationship between tendering and safety. One relevant aspect is that several studies have highlighted the economic pressures of tendering, including how the focus on price has direct negative consequences for safety (Eriksson & Laan, 2007; Oswald et al., 2020) and leads to minimalized safety investments (Størkersen et al., 2017) .

5.2 Article II: Effects of service transfer on organizational reliability

The article "Public procurement of critical services — Effects of service transfer on organizational reliability" focuses on the fixed-wing service transition phase and contract implementation phase. The article establishes that organizational factors related to the tendering process negatively affected output reliability. Given the page limitations for Article II, the empirical findings underlying the analysis are somewhat expanded in the following subsections and in Appendix 4.

5.2.1 Phases and temporal fragmentation of procurement cycles

Given that tendering *processes* have not previously been thematised in organizational reliability literature, one contribution of Article II is to provide a preliminary delimitation of procurement cycle phases. In the article, the period between the awarding of a contract and approximately the first year after contract start is labelled the transition phase, reflecting that this phase was a period when one contract period was reaching its end while the following period was being prepared for. The length of this phase was later modified to the period between awarding the contract and contract start (see Slotsvik, Hayes et al., 2023 and Section 2.5 of the thesis).

Moreover, the article conceptualises that the splitting of service delivery into contract periods results in a temporal fragmentation of service

provision. Several organizational reliability studies (e.g., Almklov & Antonsen, 2010; Cedergren et al., 2018; de Bruijne & van Eeten, 2007) have discussed reliability implications of structural fragmentation (i.e., into a permanent arrangement where organizations fulfil different roles). By comparison, temporal fragmentation involves suppliers fulfilling the same role at different times. The concept of temporal fragmentation is further defined and described in Section 6.1 of this thesis.

5.2.2 Availability as a proxy for output reliability

The article establishes availability, meaning the proportion of time operators have available standby resources (crewed aircraft/helicopters) to be acquired by the Emergency Medical Communication Centres (EMCCs), as a proxy for operator output.

As a contract management tool, availability only covers conditions within the operator's control (such as planned maintenance and lack of on-duty crew). Weather conditions, unforeseen technical issues, and crew work schedule issues (such as work shifts coming towards an end) are left out. Explained in a somewhat simplified manner, in the fixed-wing contract ending in 2019, the average required availability was set at 95 percent for each base over a three-month period (Luftambulansetjenesten HF, 2019e) while the 2019 contract had a more fine-meshed availability assessment not directly related to a fixed percentage (see Appendix 4).

5.2.3 Output reliability during the fixed-wing transition phase

The article identifies that reductions in output (availability) during parts of the transition phase were partly caused by factors related to the tendering process. This is outlined in this section and elaborated on in Appendix 4.

In 2018, output reliability was negatively affected by factors related to the tendering process. At the time, availability reductions caused by sickness-related absences, crew shortages (due to pilots resigning), and pilots reporting "unfit for flight" were overall higher than in 2017, whilst out-of-service periods for technical reasons remained at approximately the same levels in both 2017 and 2018 (Luftambulansetjenesten HF, 2019d). Between March and July, availability fell below acceptable levels (see Figure 5-2).

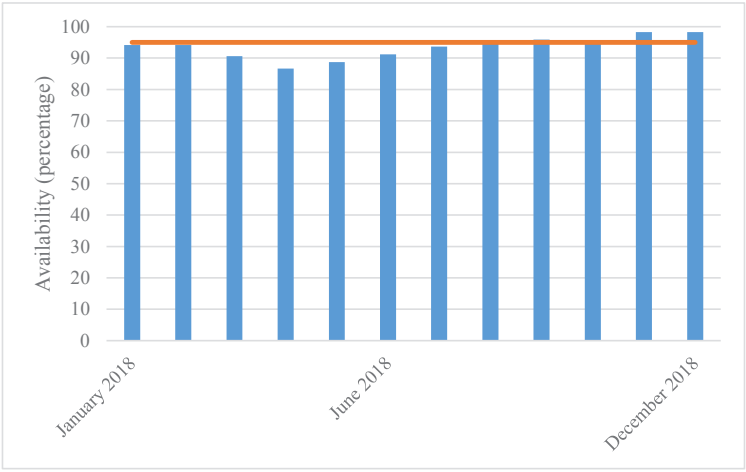

Figure 5-2. Fixed-wing availability in 2018.

The horizontal line indicates the average availability requirement of 95 percent. The figure is based on percentages obtained from LAT HF board meeting documents. In the cases where the board documents do not state the percentage of each month, I used the average for that period. See Appendix 4 for further details.

Three crew-related factors influenced availability reductions. Firstly, there was an increase in pilots reporting or being declared "unfit for

flight", especially after the collapse of negotiations between Babcock and the pilot trade union over the collective employment of pilots on 27 April 2018 (see Section 2.5.4). When this was announced, the Lufttransport Nominated Person Flight Operation declared pilots "unfit for flight" on the grounds of aviation safety. Secondly, there was an increase in sickness-related absences. Although many explanatory factors are possible, pilot interviewees described the period prior to the agreement being reached between Babcock and the pilot trade union as demanding and stressful, and it is plausible that the increase in sickness-related absences were partly related to the unsettled situation. Thirdly, LAT HF reported that crew shortages (caused by pilots resigning from the service) affected availability (Luftambulansetjenesten HF, 2019a).

5.2.4 Output reliability during the fixed-wing contract implementation phase

The findings from Article II show that the dramatic drop in output in July 2019 (see Figure 5-3) was directly related to the conflict over the training of pilots prior to service transfer (see Section 2.5.4). In July and the first half of August, the reduced availability stemmed from a shortage of pilots who had completed the compulsory training for the new aircraft model (Luftambulansetjenesten HF, 2019c). Although this situation was resolved by mid-August, the reduced availability from September to December 2019 was partly caused by organizational challenges related to the operator transition. According to Babcock interviewees, to fill work schedules, they depended on the pilots to take on some extra shifts in addition to their scheduled ones. However, the pilot interviewees explained that the conflicts that preceded pilots' employment as well as the dissatisfaction with some of the conditions in the employment contract meant that they were not willing to do so. Importantly, technical issues also significantly affected availability during this period: Babcock experienced substantial technical problems with their aircraft from

October to December. As Figure 5-3 indicates, additional resources were provided by the operator as well as LAT HF.

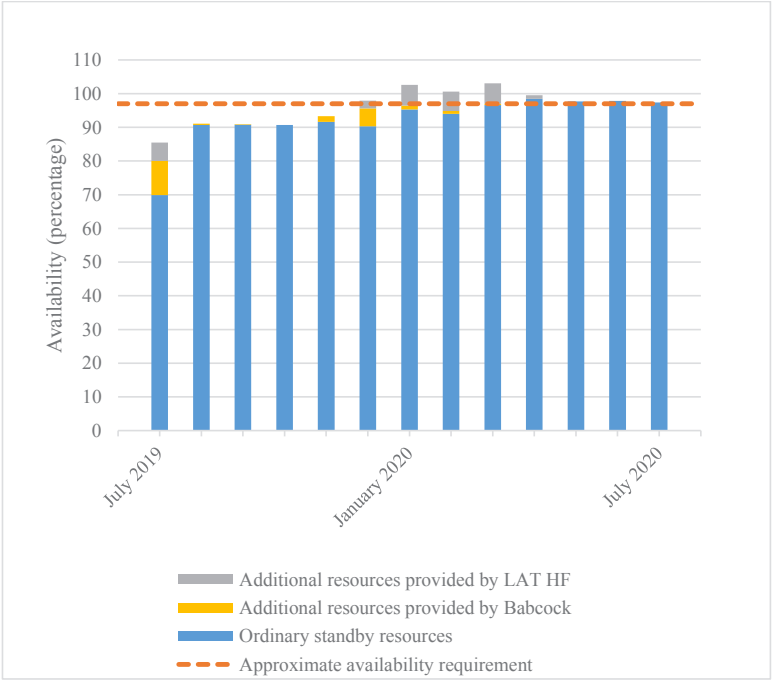

Figure 5.3 Fixed-wing availability in the contract implementation phase (July 2019 to July 2020).

The dotted line indicates the approximate availability requirement (see Appendix 4). Due to the acquisition of additional resources, availability was above 100 percent in some months (Luftambulansetjenesten HF, 2020).

The analysis shows that measures the operator took improved work relations and positively affected availability. One of the measures interviewed pilots emphasized was their employer's initiative towards the end of 2019 to renegotiate the employment contract. In addition, some of them highlighted that, when the media broadcasted that availability was significantly reduced in the Christmas holidays of 2019, the employer publicly defended the pilots' right to be on sick leave (in this case, caused by a contagious disease affecting several bases). Moreover, the pilots had taken the question of whether the change of operator had been a transfer of undertaking or not to the courts. In February 2020, the Nord-Troms District court ruled that this had in fact been the case. According to the interviewed pilots, the operator's decision not to appeal the ruling put a decisive end to the initial employer–employee conflict and, as one of them said during an interview, "both we and management started cooperating a lot more than before. Working in the same direction". By the summer of 2019, they had, as the same pilot described, a feeling that "everything is actually back to normal".

The article analyses the findings in relation to employee trust. Employees' feeling of obligation towards the employer and their willingness to accept management decisions require a certain level of trust (Kramer, 1999). The findings presented in Article II support this. Moreover, it has previously been established that workplace trust is dynamic (Cox et al., 2006). The findings from the fixed-wing ambulance case, showing a dynamic development in the relationship between operator and pilots, supports this.

5.3 Article III: Availability as a performance indicator and boundary object

The article "Tracking the right path: safety performance indicators as boundary objects in air ambulance services" problematizes the measurement of output reliability (availability of crewed aircraft) as a

safety performance indicator. Viewing availability as a boundary object (Star & Griesemer, 1989), the article discusses how different perceptions of availability held by LAT HF, the fixed-wing operators, and the pilots affected its use as a performance indicator. The findings in Article III are relevant for the assessment of output reliability by showing how indicators meant to reflect the output of one actor become objects of interpretation and are also seen to reflect overall system performance. The different perceptions of availability are summarized in Table 5-1. The main findings from the article are presented in the following subsections.

	LAT HF	Luft-transport	Babcock	Pilots
External measure of preparedness	x	x	x	x
Measure of contracted performance	x	x	x	
Measure of procurer performance	x			
Way to optimise operations		x	x	
Source of conflict		x		
Source of professional pride		x	x	x
Source of public and political misinterpretations			x	
Source of power				x

Table 5-1. Overview of different perceptions of availability according to analysis conducted in Article III.

5.3.1 Outside influences on availability monitoring

The analysis conducted for Article III shows that, for LAT HF, availability had several uses, both internally and externally. The fixed-wing Coordination Central (run by LAT HF, see Section 2.4.1) used it for continuous surveillance over preparedness resources that could be ordered for transport missions. It was also used as a performance indicator to monitor contracts with operators. In addition, it was one of the indicators regularly reported to the owners (the four regional health trusts). In the fixed-wing transition phase and contract implementation phase, LAT HF interviewees experienced how this indicator triggered involvement from the owners as well as the Ministry of Health and Care Services. As phrased by one of the procurer interviewees, "anything that smells like it might reduce preparedness on a national level makes the alarm bells [in the Ministry] sound".

Furthermore, the analysis displays that the indicator assessment can serve as learning processes reflecting changing external circumstances. In the fixed-wing service procurement, both political and public attention on the preparedness situation during the fixed-wing service transfer affected how availability was assessed. In the 2019 contract, LAT HF moved away from what had been a — somewhat simplified —fixed percentage of availability to a more fine-meshed assessment. Nevertheless, according to interviewees, the media and the public were interested in (reduced) availability expressed as percentages. As one of the procurer representatives explained, "in a way we have been pushed into using percentages in the new contract. And that is because in media and politically it became the big point of reference". Although the interviewees perceived this as a negative factor, a positive aspect for them was that, in the aftermath of the period of attention, the assessments became more precise.

At the same time, the analysis conducted for Article III identifies that the focus on one indicator means that less visible and measurable factors

affecting system performance can be overshadowed. In the fixed-wing service tendering process, availability came to be seen as *the* measure of patient safety in relation to the air ambulance service, despite other factors both limiting and enabling patient transport by air. For instance, coordination issues among various actors involved in patient transport affected the overall system performance (Luftambulansetjenesten HF, 2018c; Statens helsetilsyn, 2021). Such issues risk being downplayed when the focus is tuned into one indicator.

5.3.2 Availability as a source of action and conflict

Article III identifies that indicators can trigger action and involvement from key actors and professional groups. Although for the operators availability defined possibilities for optimising operations, it was also a source of professional pride. As one of the Lufttransport interviewees described, during the last year of the contract period, "I was simply overjoyed by the fact that we had delivered and we were very proud that we had delivered the availability we did." Lufttransport management and pilots made dedicated efforts towards high availability levels at the end of the contract. Similarly, Babcock, seeing that the pilots' reluctance to take on additional shifts in the autumn of 2019 affected availability (see Section 5.2.4), made efforts to improve employer–employee relationships.

Operator interviewees recognised the value of availability as an output indicator that could be communicated to the outside world. According to a Babcock interviewee, it was "maybe the only parameter which says something to people. If we have low availability in Brønnøysund for four days, it means that we actually don't have an airplane available in Brønnøysund." Although aircraft and personnel could be moved around to compensate for the lack of resources at one base, the interviewee saw availability as "a signal to the population in that region that this is what the numbers look like".

The analysis in Article III also shows that the assessment of output indicators and factors underlying indicator levels can be conflicting. To Lufttransport interviewees, the reduced availability in the contract implementation phase was an unavoidable consequence of LAT HF's decision to award the contract to Babcock, based on what Lufttransport interviewees argued were unrealistic aims and promises. To Babcock, the reduced availability was a consequence of Lufttransport's and the pilots' lack of willingness to cooperate. Furthermore, according to Babcock interviewees, in the public debate over the fixed-wing procurement, availability figures were misinterpreted. According to them, the ways interest groups conveyed the information led the public to perceive that availability was low based on incorrect assessments of availability. As a Babcock interviewee described, the acquisition of additional resources in the autumn of 2019 (by Babcock and LAT HF, see Figure 5-3) meant that "there has hardly ever been a better preparedness. But this did not come out. Focus was placed on our grounded aircraft."

Moreover, the importance of availability made it a source of power, as evident when Parliament encouraged Babcock and the pilot trade union to resume negotiations in June 2018. As one of the pilot interviewees explained, the grounded aircraft on the day negotiations between Babcock and the trade union collapsed "created a media storm". Although other factors also played a role, it is plausible that the reduced availability in this period and the media attention towards it influenced the decision to hold a hearing in Parliament.

5.4 Article IV: Effects of the procurement cycle on organizational reliability

The article "Adapting to the rhythm of the procurement cycle. Organizational reliability implications of change processes in procured critical services" explores how procurement cycles frame the timing and tempo of change processes and discusses the resulting implications for

organizational reliability. The article builds on interviews with representatives from LAT HF and the three operator companies. To complement organizational reliability literature, the article uses the concepts of episodic change (i.e., structural change initiated by organization management) and continuous change (i.e., ongoing improvement processes involving contributions across organizational levels) (cf. Weick & Quinn, 1999). Moreover, the article applies the concepts of macro pacer (e.g., Bluedorn, 2002) and entrainment (e.g., Ancona & Chong, 1992) from organizational theory with a temporal perspective. Somewhat simplified, "macro pacers" are the organizations that decide the tempo and timing of activity cycles that other organizations "entrain" (i.e., temporally adapt) to in order to ensure organizational performance. The main findings from the article are presented in the following subsections.

5.4.1 Episodic change enhancing reliability

The analysis conducted for Article IV shows that procurement cycles can lead to reliability-enhancing episodic change. In the air ambulance service procurements, preparations for new contract periods were systematized learning opportunities at regular, predictable intervals. Implementing changes based on learning from prior experiences is important for long-term organizational reliability (Rochlin, 1993; Roe & Schulman, 2008). The findings presented in the article show that, in preparation for a new contract period, LAT HF initiated what one LAT HF interviewee referred to as a "total review" of the service, where stakeholders across the system were involved in the evaluation of the running service and in planning for improvements in the coming service period. These review situations resembled negotiations in HROs regarding the systemic consequences of introducing changes (Schulman, 1993), by allowing considerations between, for instance, different quality priorities and local versus systemic aspects.

The analysis conducted for the article also shows that episodic change processes involve a certain level of stability. The service is planned for 10- to 11-year intervals and is not affected by the health trusts' annual budget cycles. Moreover, the timing of the episodic change is known to all relevant actors in advance. At the same time, the analysis indicates that, as phrased by one NLA interviewee, the change processes for procured critical services have the potential to be "staircases", with episodic "quality leaps" at the start of each contract period followed by a long period of limited possibilities for introducing improvements.

5.4.2 Macro pacing of procurement cycles

The analysis conducted for Article IV shows that procurers, by defining deadlines and the overall tendering process, act as macro pacers. In the air ambulance procurements, LAT HF succeeded in defining a contract period which was longer than the standard maximum length as defined in the Public Procurement Act. They also decided the pace of the tendering process. At the same time, procurement legislation restricted the scope of action of this macro pacing. For instance, once a request for tender had been announced, the main deadlines were in essence also binding for LAT HF.

One main finding in the article is that the air ambulance tendering processes, being bound by procurement legislation, in some ways led to inflexible change processes. Although change orders could be used to introduce improvements, procurers had to avoid significant changes (see Section 3.3.1). The findings in Article IV show that the procurer was conscious of ensuring that they were within the borders of procurement legislation and that some potential changes (e.g., improved medical equipment) were challenging to implement. In the analysis, this is regarded as a type of self-restricting behaviour which resembles the procurer's concern with carrying out correct procurements described elsewhere (Nærings- og fiskeridepartementet, 2019; Storsjö & Kachali, 2017).

5.4.3 Entrainment to procurement cycles

The analysis detailed in Article IV shows that, for tender participants and contracted suppliers, entrainment to the procurement cycle can be decisive. In the air ambulance procurements, tender participants and contracted operators had to entrain the tendering process as defined by LAT HF. Unlike the tempo in some inter-organizational projects (e.g., Dille & Söderlund, 2013) the tempo of competitive tendering processes is non-negotiable: "the [tender submission] deadline is at 12.00 sharp and if you deliver two minutes later, you're out…".

In the air ambulance service procurements, the interviewed operators experienced the entrainment to the tender process as stressful due to the comprehensive specification of requirements that had to be met within a relatively short time span. One way to meet the requirements was to start planning the response ahead of the tender announcement. For example, NLA started reviewing helicopter producers two years ahead of the tender announcement. Tender participation also required extensive organizational resources.

Similarly, in the transition phase, NLA and Babcock experienced the two-year contract preparation time as relatively short. To meet deadlines, the operators always needed to be, in the words of one of the interviewees, "one step ahead". Not least, this was due to the misfits between procurement deadlines and subcontractor deliveries. Overall, preparing for the contract was demanding for the organizations. For instance, one NLA procurer estimated that up to 30–40 employees were involved with contract implementation, in addition to their ordinary work tasks. For Babcock, contract preparations involved establishing a Norwegian branch of the organization. The conflict with pilots and Lufttransport also added to Babcock's challenges of being ready for contract start, not least in terms of having trained pilots according to the requirements.

5.4.4 Procurement cycles as a challenge to reliability enhancing continuous change

The findings presented in Article IV indicate that continuous, negotiated change processes recognised by HRO researchers as enhancing reliability (La Porte & Consolini, 1991; Roberts, 1990; Schulman, 1993) are challenged by conditions created as part of the procurement cycles. Firstly, while change in HROs is often initiated at the operational level or in response to concerns raised by operational personnel (La Porte, 1996; Martelli et al., 2018), procurement can destabilize the environments that initiate continuous improvement. Moreover, continuous change involves the renegotiation of some structural elements instead of the total replacement of structures; in fact, continuous change *depends* on a certain level of stability (Farjoun, 2010). In the fixed-wing ambulance service, Babcock's employment of Lufttransport pilots meant that continuity was preserved to a certain extent. Still, bonds between the employer and employees, as well as between Babcock and collaborating health trusts, had to be established.

Secondly, the article argues that the resource demanding entrainment to procurement cycles can draw organizational attention away from continuous improvement processes. In the rotor-wing tendering processes, output reliability was not affected. However, the rotor-wing interviewees expressed that tender participation and contract implementation required extensive organizational resources. Although HROs are sensitive to the need for organizational adjustments which enhance reliability (Weick & Sutcliffe, 2007), one potential implication of time-pressured tendering processes is that attention is turned away from matters that are not urgent, such as continuous quality development.

5.5 Article V: Reliability contributions and limitations of relational governance

The article "Contributions and limitations of relational governance towards the reliability of publicly procured air ambulance services" builds on interview materials from the procurer and the three operators. The article outlines the contributions and limitations of contractual governance towards reliability. It then assesses the contributions and limitations of relational governance, as an operationalization of relational exchange theory (RET) (Macneil, 1980). The relational norms of "supra-contractual relations", "preserving the relation", "role integrity", and "harmonization of relational conflict" are used to categorize and assess empirical findings. The findings of the article are presented in the following subsections.

5.5.1 Contributions and limitations of contractual governance

The analysis conducted for Article V confirms that contractual governance plays an indispensable yet insufficient role in procurement. The air ambulance service contracts defined roles and responsibilities, determined output, and specified penalties for noncompliance. Contract revisions and contract meetings were described by LAT HF interviewees as frequent, and they were seen as decisive for monitoring air ambulance service deliveries. At the same time, according to LAT HF interviewees, relying on contractual governance alone was insufficient for making the system work optimally. For instance, the contract implementation period required adjustments to soft contractual requirements (e.g., procedures and handbooks): as phrased by a LAT HF interviewee, the operators "often need some assistance to get on the right track" in this respect.

5.5.2 Relational governance as an HRO approach

The analysis conducted for Article V shows that relational governance resembles HRO approaches in several important aspects. For instance, in RET (Macneil, 1980), the central norm of preserving the relation emphasizes a holistic approach to the relationship. A similar perspective is found in HROs and HRNs, where reliability is an overarching goal guiding decision-making at all organizational levels. Another example is the norm of role integrity, which implies stable and predictable behaviour (Macneil, 1980). This resembles how organizations in HRNs create predictability within the relationship: joint activities in quiet periods lead to increased mutual awareness of the other organizations' responsibilities, expertise, and interests (Berthod et al., 2017).

5.5.3 Relational governance in air ambulance procurements

In Article V, findings from the air ambulance procurements are analysed according to the RET norms of supra-contractual relations, preserving the relation, role integrity, and harmonization of relational conflict. Overall, the analysis shows that many aspects of relational governance were present in the air ambulance service procurements.

The analysis indicates that the critical service context, reflecting the norm of supra-contractual relations, shaped the procurer–operator relationship. The importance of the air ambulance services to society was reflected in the media attention, owner involvement, and Parliament decisions. In addition, when service deliveries were significantly reduced in the fixed-wing contract implementation period, the situation allowed for the acquisition of alternative resources. In the words of a LAT HF representative, "we set all rules and regulations aside. A crisis is a crisis."

The norm of preserving the relation was decisive in the air ambulance procurements, especially for the establishment of Babcock as a new fixed-wing operator. The essence of the holistic aim of preserving the relationship was summarized by a Babcock interviewee, who stated that "it has been important to LAT HF that we succeed". The complexity of the service and the importance of service quality developments made flexibility and the give-and-take attitude of the procurer and operators particularly important. At the same time, LAT HF had to balance reliability-enhancing adjustments against the limits set by procurement regulations. An illustrative example is the preparation for the 2018 rotor-wing contract, during which NLA argued for a gradual implementation of new helicopter models (starting ahead of schedule), but LAT HF was reluctant to do this in case it could be interpreted as a significant change to the contract. Another example is that procurer interviewees feared that lenient contract monitoring would mean the unequal treatment of operators, encourage operator opportunism, or encourage future tender participants to "just write something" in tender proposals and then later change it.

The norm of role integrity, encompassing stable and predictable behaviour by the parties, was also an important aspect of relational governance in the air ambulance procurements. Overall, the operators acknowledged that LAT HF demonstrated high procurer competence in many areas. In addition, the operators recognised that a steady employee situation in LAT HF had a stabilizing effect on the procurer–operator relationship.

According to the norm of harmonization of relational conflict, exchange relationships have an inherent potential for conflict but also possibilities for resolving conflict situations. In the findings, one example of the resolution of a potential conflict was the postponement of discussions between LAT HF and Babcock regarding the economic responsibilities for the provision of extra resources (see Figure 5-3) until service deliveries were at an adequate level and the situation had stabilized.

5.5.4 Tensions between flexibility and stability

Article V demonstrates that an inherent tension can exist between flexibility and stability in the reliability governance of procured services. Although flexibility and adaptive capacities are core reliability-enhancing organizational features (e.g., Berthod et al., 2017; La Porte, 1996), the sum of flexible approaches may negatively affect reliability. In the air ambulance procurements, the procurer was well aware of how lenient behaviour towards operators could have long-term negative effects for the service (see the previous subsection).

Moreover, flexible adaptations in the procurer–supplier relationship must be balanced against the limitations imposed by procurement legislation. The analysis conducted for Article V did not assess the degree to which this happened in the air ambulance procurements, but it did determine that the legislation frames the possibilities for making changes.

5.5.5 Governance limitations in conflict situations

The analysis of the fixed-wing service transfer in Article V sheds light on the potential for conflict between organizations that jointly provide a critical service. RET holds that conflicts are inherent to exchange relationships (Macneil, 1980); moreover, RET can be used as a framework for explaining how relational aspects can escalate the conflict (Kaufmann & Stern, 1988). Kaufmann and Stern (1988) argued that, although a relational variant of role integrity usually means that the parties strive to solve emerging conflicts, a perception that the other actor is *intentionally* behaving in ways that negatively affect the relationship changes this. Applied to the fixed-wing procurement, the analysis indicates that the outgoing operator experienced the awarding of the contract to a competitor as intentional (because the procurer could have chosen to evaluate the tenders differently, for instance in terms of how the competitor's progress plan was scored in the evaluation). According

to Kaufmann and Stern (1988), when a party's behaviour is perceived as intentionally harming the relationship, resolving a dispute becomes harder. This appears to be a relevant explanation for the retained conflict in the fixed-wing ambulance procurement. The conflict regarding the training of pilots, where the procurer and operators claimed that they were doing their utmost to find solutions, but these were impeded by the other party, exemplifies this well.

In summary, one main finding in the article was that both contractual and relational governance can fall short in conflict situations. The contract cannot cover all contingencies, making relational governance necessary. However, relational governance requires the commitment of both parties and offers few remedies if this commitment is absent.

6 Discussion

This chapter is thematically structured around the three research aims of the thesis. In Section 6.1, the discussion concerns how the research findings contribute new knowledge in terms of how the procurement arrangement and tendering processes affect organizational reliability. Section 6.2 relates to the second aim and contributes new knowledge of how output reliability and organizational reliability are connected. In this section, the discussion concerns how tendering processes affected organizational reliability with implications for output reliability. Section 6.3 relates to the third aim—namely, exploring whether specific governance forms can contribute to maintaining reliability for the procured critical service.

One overall theme emerging from the research findings (see Chapter 5) is that publicly procured critical services have some particular characteristics which distinguish them from other critical service arrangements discussed in organizational reliability literature (see Section 3.2.2). The main ways in which these characteristics relate to the elements of the discussion are shown in Figure 6-1, which depicts four characteristics of the public procurement arrangement: the use of tendering processes, the temporal fragmentation that procurement cycles involve, the hierarchical procurer–supplier relationship, and the framing of this relationship created by procurement legislation. As Figure 6-1 indicates, the first two characteristics are particularly relevant to the discussion of organizational reliability (Section 6.1). The last two characteristics are discussed in relation to governance options (Section 6.3).

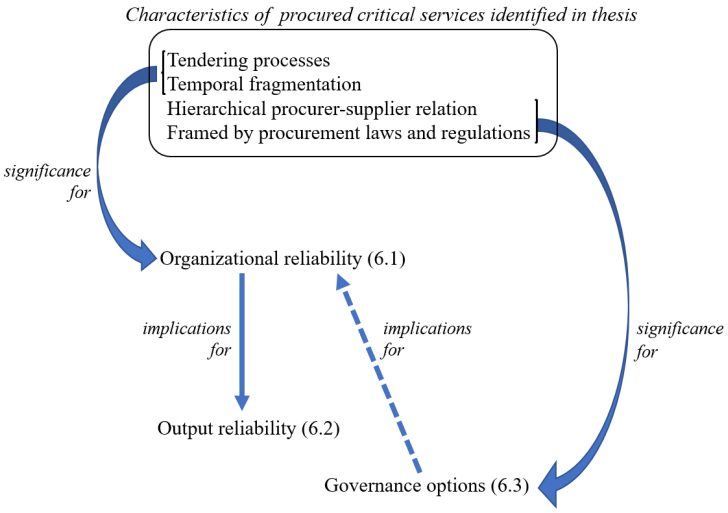

Figure 6-1. Overview of identified characteristics of procured critical service and their relation to the research aims.

The figure shows how the organizational characteristics of publicly procured services identified in the research are relevant for answering the research aims in terms of organizational reliability, output reliability, and governance forms.

6.1 Organizational reliability impacts of tendering processes and temporal fragmentation

The effects of service procurement on organizational reliability have been discussed in previous organizational reliability studies (e.g., Almklov & Antonsen, 2010; Cedergren et al., 2018), but the effect of tendering *processes* has apparently not been thematised. Furthermore, although structural fragmentation (i.e., dividing service supply between organizations performing different roles) and the added interface

challenges of this fragmentation are well-known from previous organizational reliability studies (e.g., Cedergren et al., 2018; de Bruijne, 2006), the research conducted for this thesis shows that tendering processes can result in the *temporal* fragmentation of service supply (see Section 5.2.1). The effects of tendering processes and temporal fragmentation on the reliability of publicly procured critical services are discussed here in relation to the organizational reliability literature.

6.1.1 Uncertainty and unstable work environments

The findings of this thesis indicate that tendering processes can undermine conditions that organizational reliability researchers have identified as essential for maintaining reliability. HRO studies have stressed the importance of operational personnel's competence and of sharp-end decision-making in high-tempo situations (e.g., La Porte & Consolini, 1991; Roberts, 1990). In the prolongation of this, the HRO support of, and status given to, sharp-end personnel has been emphasized (La Porte, 1996, p. 63). This also includes the acceptance of financial costs associated with maintaining this, including costs for socializing and training new personnel over long periods of time (Roberts, 1990). Tendering processes, particularly when resulting in a change of operator without involving a transfer of undertaking (see Section 2.5), can destabilize these conditions. Findings from the fixed-wing procurement case highlights some of the elements involved in such destabilization:

- *Uncertainty.* When the fixed-wing ambulance contract was awarded to a new operator, the future job situation of pilots working for the existing company was uncertain. For some, the uncertainty apparently motivated a job change. For the majority, it was experienced as demanding and distracting. This uncertainty is essentially different from the unpredictability that can characterize work situations of control room operators (Roe & Schulman, 2008). It is also different from the demanding work conditions on aircraft carriers, characterized by, for instance,

long work shifts and long periods away from home (Roberts, 1990). These two examples relate to challenges *at* work; tendering processes can introduce the more fundamental and personal question of *having* work in the near future.

- *Conflict.* Pilots experienced a conflict with their potential employer regarding employment conditions. According to HRO studies, tension among different professional groups (e.g., related to decision-making in high-tempo situations) is well known (La Porte, 1996, p. 64; Roberts, 1990, p. 168). In contrast, the conflicts that formed part of the fixed-wing tendering process were profound, dealing with employment conditions rather than work processes. In other words, the stable, mutually appreciative relationships characterizing HROs (Pettersen & Schulman, 2016) were not present.
- *Lack of support.* At the start of the contract implementation phase, pilots were unhappy with the lack of support from the employer. The relationship improved only once the employer had taken decisive steps to address the situation (see Section 2.5.4). Until this happened, the situation had signs of being diametrically opposed to that of HROs. HROs support sharp-end personnel (La Porte, 1996; Roberts, 1990); the fixed-wing personnel felt worked against.

One important aspect of this destabilization is the pace at which it happened. Previous research has shown that, when operational work is divided so that workers' responsibilities are confined to concrete tasks at the expense of system overview, the gradual replacement of workers with this overview (e.g., due to retirement) implies an *erosion* of HRO conditions (Almklov & Antonsen, 2010). Temporal fragmentation, on the other hand, can lead to abrupt changes in the composition of the operational workforce. The analysis of the fixed-wing case shows that uncertainty regarding future job prospects can incentivise operational workers to seek employment elsewhere. The

transfer of service responsibilities may also involve a substantial number of experienced employees being replaced simultaneously. Although this was not the end result of the fixed-wing ambulance procurement (as pilots eventually were employed by the new operator), the analysis of this procurement shows the potential effect of procurement on the composition of the workforce.

6.1.2 Challenges of cooperating across temporary organizational interfaces

Tender competitions potentially introduce new organizations into existing critical service supply networks. During the transition phase, temporary organizational interfaces between the outgoing and the incoming service suppliers are also created. These temporary organizational interfaces are clearly different from those that the organizational reliability literature has previously discussed. For instance, in HRNs, the involved organizations have different roles and responsibilities that are performed parallelly (Berthod et al., 2017). For procured critical services, when service supply is transferred from one supplier to another, the suppliers fulfil the same role, but at different times.

Moreover, findings from the air ambulance procurement indicate that the degree of goal sharing in the temporary supplier–supplier arrangement differs from that of other inter-organizational arrangements. For HRNs, shared goals may be the very reason for the existence of the network (Berthod et al., 2017). To be fair, in some cases, the overall network goals may be partly overshadowed by goals specific to each organization (e.g., Cedergren et al., 2018). Nevertheless, the tendering process introduces a situation that organizational reliability studies have not previously described: a “winner” and a “loser”, with diametrically different goals, are bound by their contracts to cooperate. Added to this, they may depend on the same resources, such as the operational personnel needed both to maintain the ongoing service supply and to

prepare for the coming contract period (Slotsvik, Gould, & Hayes, 2023). The fixed-wing ambulance procurement illustrates this well. The transition phase was characterized by a lack of cooperation and fundamentally different interpretations of why this was the case (Hayes et al., 2023; Slotsvik, Gould, & Stene, 2023). In other words, the shared goal of reliable outcomes, which has been identified as fundamental for organizational reliability (La Porte, 1996), was trumped by other considerations and goals.

This is not to say that the temporary supplier–supplier cooperation cannot work. On the contrary, the rotor-wing ambulance procurement shows that service transfer can be demanding yet overall successful (Slotsvik, Gould, & Stene, 2023). Previous research has identified that shared operational history can result in "'latent' informal structures" to be called upon when necessary (Almklov & Antonsen, 2010, p. 138). Informal inter-organizational relationships and structures have been identified as decisive for reliability in the organizational reliability literature (e.g., Almklov & Antonsen, 2010; Berthod et al., 2017; de Bruijne, 2006; Schulman et al., 2004). Such informal structures, developed over years of operating the rotor-wing bases parallelly, could be called upon in the rotor-wing transition phase, enabling cooperation between the operators (Slotsvik, Gould, & Stene, 2023). However, it appears that the *functioning* of informal workways depends on overall shared goals. In the rotor-wing ambulance procurement, the two involved suppliers shared the goal of a smooth transfer. In this sense, the rotor-wing transfer resembles the networks described by Berthod et al. (2017): shared overall goals make it possible to overcome coordination challenges.

6.1.3 Diverting organizational attention?

HROs were found to be characterized by a "strong sense of mission" towards safe and reliable core processes (La Porte, 1996, p. 63). This mission, and the superordinate goals associated with it, were shared

across all levels of the organizations (La Porte, 1996; Roberts, 1990). Moreover, these goals were non-fungible; in other words, they could not be traded off against economic efficiency or other overall goals (Schulman, 1993). Against this backdrop, a relevant question regarding publicly procured critical services is whether the tendering process can alter such conditions by shifting attention away from core operational processes.

The analysis of the air ambulance tendering processes shows that participating in tendering competitions and implementing new contract requirements can demand extensive organizational attention and resources (Slotsvik, Gould, & Hayes, 2023). For suppliers at risk of dismantling, or considerable downsizing, if the contract is lost to a competitor, the tendering process is likely to become a primary focus of managerial and administrative attention. Drawing upon organizational theory with temporal perspectives on change, the research conducted for this thesis discusses how procurers take on the role of macro pacers (Bluedorn, 2002; Perez-Nordtvedt et al., 2008) in the tendering process by defining the timing and tempo of the processes (Slotsvik, Gould, & Hayes, 2023). Tenderers and contracted service suppliers must "entrain" (cf. Ancona & Chong, 1992) to these processes, meaning that their organizational processes are aligned to the procurement cycle. This entrainment requires extensive organizational attention from the tenderers and suppliers (Slotsvik, Gould, & Hayes, 2023).

In other words, the tender participation process can become a core process competing with the ongoing operational processes. For the operator, winning the tender is necessary to ensure their participation in future critical service supply. In this sense, the procurement cycle leads to a situation where the operator must balance ongoing critical service reliability and future critical service reliability against each other.

6.2 Linking organizational reliability to output and outcomes

As highlighted in Section 1.3, an underlying premise of this research is that reliability can be assessed in terms of organizational outcomes as well as the structures and processes underlying these (Martelli et al., 2018). Some organizational reliability studies of critical services have focused on organizational structures and processes and have theorized about their implications for critical service deliveries (e.g., Almklov & Antonsen, 2010; Cedergren et al., 2018), whereas others have more explicitly addressed the relationship between them. For instance, Schulman et al. (2004) established a relationship between the reliability of California's electricity supply and the control room workers' contributions towards achieving this reliability. Similarly, de Bruijne (2006) found that KPN Mobile had consistently stable output, and the author discussed the inter-organizational structures and processes that enabled this consistency.

The research conducted for this thesis confirms the relationship between service output and underlying structures and processes, as will be discussed in Section 6.2.1. At the same time, the research problematizes the assessment of the relationship between the two in the context of critical service reliability. First (in Section 6.2.2), the findings show that the indicators of service output can fail to include systemic aspects; moreover, factors that influence how the indicators are assessed can be ignored. Second (in Section 6.2.3), the analysis identifies the need to include service *outcomes* as well as output in the assessment of critical service reliability.

6.2.1 Effects of tendering process on availability

The analysis of the fixed-wing service procurement shows that tendering processes can have disruptive effects on organizational reliability with negative implications for output reliability (Slotsvik et al., 2021). Based

on findings presented in Section 5.2 and the discussion in Section 6.1, the following connections between organizational reliability and output reliability can be established:

- Uncertainty among pilots and an unstable work environment negatively affected fixed-wing ambulance output in the transition phase.
- The conflict between pilots and the new operator negatively affected fixed-wing ambulance output in the contract implementation phase.
- The conflicted supplier–supplier relationship of the fixed-wing ambulance tender negatively affected output in the contract implementation phase.
- The diverting of organizational attention towards the tender process did not affect output in the rotor-wing ambulance service procurement. On the contrary, output was at the required level or above throughout the tendering process.

These findings confirm the conclusions drawn from studies of HROs by showing that a *lack* of some of the organizational characteristics identified in HRO studies has *negative* effects on reliability. HRO researchers assumed that stable environments were important for the inner workings of HROs (e.g., La Porte, 1996). The air ambulance service case supports this assumption by showing how an unstable situation at both the intra-organizational and inter-organizational levels negatively affects reliability. Not disregarding contextual differences, it is striking that the disruptions to the rotor-wing ambulance service were manageable whereas the more profound disruptions to the fixed-wing ambulance service (because the operator responsibility for all bases was transferred to a new operator) had negative implications for output reliability.

In summary, the analysis identifies that disruptions to a critical service network can negatively affect service output. Previous organizational reliability research concluded that restructuring critical infrastructure services into service delivering networks did not affect service deliveries; on the contrary, the research identified that the networks were able to counter input variability due to, amongst other things, the flexible shifts between performance modes and the use of informal information channels (de Bruijne, 2006; Schulman et al., 2004). The analysis of the air ambulance service adds to this knowledge by showing that it is not necessarily the networked structure per se, but disruptions to it that can affect critical service reliability.

6.2.2 Availability as a proxy for output reliability

At the same time, the link between output reliability and organizational reliability must be established with caution. On a general level, the use of performance indicators, including safety indicators and quality indicators to assess performance, imply a simplification of performance that risks being an *over*simplification (Kongsvik et al., 2010; Körvers & Sonnemans, 2008). A main concern is that indicators may focus on what is easily measurable, thereby ignoring more complex factors (Groene & Sunol, 2014; Oswald et al., 2018). Furthermore, it may be difficult to include organizational qualities in indicators (Kongsvik et al., 2010).

These precautions are valid for how availability is used as an indicator in the air ambulance service; they are also valid when availability is used as a proxy for output in this thesis. Firstly, availability as a performance indicator disregards the complexity of the service chain needed for safe and rapid patient transport. There is a risk that focus is directed towards operator output at the expense of, for instance, coordination issues between the units involved in the network (Luftambulansetjenesten HF, 2018c; Statens helsetilsyn, 2021). Secondly, the indicator disguises that the redistribution of fixed-wing resources can compensate for low availability at a particular base (Luftambulansetjenesten HF, 2018c).

Although available operational resources are a premise for the overall functioning of the services, the focus on this availability overshadowed precisely the aspects that have been identified in organizational reliability research: critical service provision across the organization can create coordination issues and responsibility confusion among the different parties responsible for delivering the service (e.g., Almklov & Antonsen, 2014; Cedergren et al., 2018).

The research on availability as a boundary object (Hayes et al., 2023) contributes new knowledge of how indicators work by showing that indicators can have different meanings for different social groups: the indicator can both trigger action and be shaped by the various groups' interpretations and uses of the indicator. The analysis of availability as a boundary object shows that, at best, availability was a source of professional pride and a shared goal within the organizations. For instance, in the fixed-wing service transfer, keeping availability at least at the contracted level had a mobilizing effect on both the operational and the management/administrative ends of the organization in the transition period. In this way, the output parameter can be a comprehensible goal to work towards, resembling the clear overall operational goals shared across organizational levels of HROs (La Porte & Consolini, 1991). At worst, availability was a source of conflict related to the different interpretations of how it should be assessed and why output levels varied (Hayes et al., 2023).

Interestingly, the analysis also identifies that the role of the air ambulance service as a critical service to society influenced how availability was assessed. Although availability was meant to be an internal indicator, availability figures appeared tangible and comprehensible to the outside world and were taken to reflect whether the service was on track or not (Hayes et al., 2023). Like the previously studied HROs that needed to be "worthy of the public trust" (La Porte, 1996, p. 67), critical service providers face high public expectations. The authorities' ability to protect citizens and attend to their health and basic

needs can be seen as "the final verdict" of whether establishing societal safety has been achieved (Olsen et al., 2007, p. 71). However, the research conducted for this thesis indicates that the grounds on which this verdict is reached can be a matter of interpretations and dispute.

6.2.3 Effects of tendering on critical service outcomes

The research has identified that shifting the attention from critical *infrastructure* services to other critical services involves the question of what the desired critical service *outcomes* are (Slotsvik, Gould, & Hayes, 2023). Previous organizational reliability research has been primarily concerned with critical infrastructure services (see Section 3.2). Acknowledging that defining critical infrastructure deliveries (e.g., electricity provision or the supply of water of a certain quality) may be more challenging than it appears to the outsider, it is plausible that defining the outcomes of critical services like health services is even more complicated. For instance, a healthcare system outcome of improved health depends on, among other things, healthcare quality (Donabedian, 1980; WHO et al., 2018). A thorough assessment of quality is beyond the scope of this thesis. The discussion is limited to whether the tendering processes encourage or limit quality improvements which potentially affect outcomes. Nevertheless, the research contributes to expanding the understanding of reliable critical service outcomes by exploring how improvement processes with the potential to influence service outcomes occur in procured critical services (Slotsvik, Gould, & Hayes, 2023).

The procurement cycle introduces improvement processes that are quite different from those of the initially researched HROs. The early studies of HROs identified that these organizations were constantly seeking ways of improving core processes and that they were arenas of continuous change (e.g., La Porte & Consolini, 1991; Roberts, 1990). Improvements were introduced in a gradual manner following cross-level negotiations, with an emphasis on whether introducing changes

would affect reliability at the system level (Schulman, 1993). In comparison, procurement cycles can result in formal, top-down *episodic change* (Mintzberg & Westley, 1992; Weick & Quinn, 1999) in relation to the preparation for and implementation of new contracts (Slotsvik, Gould, & Hayes, 2023). Preparing the specification of requirements of a tender incorporates a substantial evaluation process involving many stakeholders and a weighing of different considerations including overall systemic ones. In this sense, it resembles the reliability negotiations of HROs (Slotsvik, Gould, & Hayes, 2023).

At the same time, the continuous change processes that have been identified as decisive for HROs (e.g., La Porte & Consolini, 1991; Roberts, 1990) risk being interrupted and overshadowed by the tendering process (Slotsvik, Gould, & Hayes, 2023). Although HROs are characterized by management with a high degree of operational awareness (Weick et al., 1999), the procurement cycle introduces periods where attention must be turned towards the tender. The analysis of the rotor-wing service procurement shows that, although the supplier managed to keep service deliveries at the predefined acceptance level throughout the tendering process, the continuous quality developments that potentially affect service outcomes in the long run were overshadowed.

This analysis expands the discussion of how output reliability and organizational reliability relate. In essence, tendering processes can affect organizational reliability in ways not directly reflected in output reliability measures, but rather in terms of less tangible outcomes. Like aspects of operational work that risk becoming invisible when work processes are rationalized and treated as commodities (Almklov & Antonsen, 2014), aspects relevant for service outcomes risk becoming invisible or downplayed in tendering processes.

6.3 Reliability governance challenges for publicly procured services

One overall contribution of this research has been to identify characteristics that distinguish procured services from other public service arrangements. Compared to the network Berthod et al. (2017) discussed, the procurement arrangement has a strictly formalized structure defined by the contractual relationship (Greve & Ejersbo, 2011). It is a hierarchical relationship and, thus, different from more horizontal inter-organizational arrangements where coordination or governance responsibilities can be unclear. In addition, the public procurement arrangement differs from outsourcing arrangements initiated by private companies. As outlined in Sections 2.2 and 3.3, public procurement legislation imposes considerable constraints on how procurement can be carried out. The following subsections discuss how these aspects of the procurement arrangements both limit and enable governance with respect to organizational reliability.

6.3.1 Implications for governance forms and their effects on reliability

The analysis of the air ambulance procurements emphasizes the decisive role of the contract for critical service governance. The role of the contract in complex transactions is indisputable (e.g., Poppo & Zenger, 2002). The findings from the air ambulance procurement case support this, showing that the specifications of requirements and the contracts that built on them were the backbones of the procurements and the subsequent monitoring of deliveries (Slotsvik, Gould, & Stene, 2023).

Nevertheless, the research conducted for this thesis adds to the awareness raised by organizational reliability research concerning the inherent limits of contracts. Previous studies have concluded that it is challenging to specify in contracts how to deal with disturbances at the network level (Cedergren et al., 2018) and that a result of outsourcing is that

responsibilities are confined to the contracted operations (Almklov & Antonsen, 2014). The analysis of the air ambulance procurements confirms this and particularly emphasizes the effects of these limits if relationships between the parties become conflicted.

The analysis of the governance of the air ambulance tendering processes showed that relational governance played a decisive role for reliability (Slotsvik, Gould, & Stene, 2023). In this way, the research is in line with organizational reliability studies highlighting the detrimental role of *informal* structures and processes (e.g., Almklov & Antonsen, 2010; de Bruijne, 2006; Schulman et al., 2004). Relational governance, with its emphasis on holistic give-and-take attitudes and flexible problem solving, can in many ways be part of an HRO approach to the governance of procured critical services (Slotsvik, Gould, & Stene, 2023). As previously highlighted (Section 6.1.2), overall shared goals are essential for this approach to work. One of the operator interviewees summarized their give-and-take relation to the procurer well, stating that "it has been important to them that we succeeded". This attitude resembles the shared goals and flexibility demonstrated by HROs and HRNs (e.g., Berthod et al., 2017; La Porte & Consolini, 1991).

However, the research also identified that the sum of flexible adaptations can have negative implications for reliability (Slotsvik, Gould, & Stene, 2023). Paraphrasing Cedergren et al. (2018, p. 56), the sum of "micro flexibility" can lead to "macro instability". Results from the data analysis showed an inherent tension between flexibility and the need for stability. For instance, LAT HF interviewees were concerned that the sum of flexible approaches to soft contractual terms in the long run could lead to opportunistic supplier behaviour, thereby undermining the contract. In the analysis, this concern is related to reliability: flexibility is desirable, but not when it alters the stability needed to achieve reliability in the long run (Slotsvik, Gould, & Stene, 2023). The research confirms that, although reliability is often associated with adaptiveness and flexible

responses, it also depends on the stability achieved through adherence to rules and formalized processes (Farjoun, 2010).

Confirming that organizational life can be far from harmonious (Antonsen, 2009), the research indicates that, when tendering processes are characterized by conflict, both contractual and relational governance can fall short. Although evaluation reports of the air ambulance procurements correctly identify that more concrete requirements of operators regarding service transfer may diminish transition challenges in future tenders (Helse- og omsorgsdepartementet, 2021; Helse vest RHF, 2021), they fail to acknowledge that contracts cannot account for all eventualities in complex, long-term procurement. At the same time, the analysis of the fixed-wing procurement shows that, because relational governance depends on give-and-take attitudes from the involved parties, it falls short when such attitudes disappear (Slotsvik, Gould, & Stene, 2023).

Almklov and Antonsen (2010, p. 134) argued that "there may be areas where the logics of New Public Management and issues societal safety are incompatible". The research conducted for this thesis indicates that the same can be said for the logics of procurement: when both contractual and relational governance fall short, the procurement of critical services can result in periods of service delivery failures.

6.3.2 Reliability governance within a public procurement legislation frame

Previous studies of organizational reliability acknowledge the importance of legislation for critical service reliability at the general level (e.g., Roe & Schulman, 2008). The research conducted for this thesis has documented some specific ways in which procurement legislation frames governance with respect to reliability.

The research has shown that the Procurement Act includes elements of flexibility which are compatible with critical service deliveries. For instance, the Procurement Act allows urgency procurements under unforeseen circumstances, including circumstances regarding the supplier that the procurer could not have foreseen (Nærings- og fiskeridepartementet, 2016, § 5-2). In situations of unforeseen crisis, procurers do push aside ordinary tendering processes (Slotsvik et al., 2021; Storsjö & Kachali, 2017). Another example is deviations from the standard maximum contract length of four years: the Procurement Act states — and the air ambulance case empirically confirms — that "special conditions" may justify exceptions to the rule (Nærings- og fiskeridepartementet, 2016, § 11-1 and Chapter 26; Slotsvik, Gould, & Stene, 2023).

However, the reliability of critical services concerns not only the extraordinary circumstances, but also the continuous, everyday provision of services on which the population depends. The analyses of the air ambulance service tendering processes identified that the procurer had to balance reliability-enhancing adaptations against the possibility that these adaptations could be interpreted as significant changes. For instance, although NLA argued for a gradual implementation of the helicopter models specified in the 2018 contract to avoid start-up problems with all helicopters simultaneously, LAT HF feared that this could violate procurement legislation (Slotsvik, Gould, & Stene, 2023).

Importantly, the analysis indicates that procurement legislation not only directly frames procurer options and behaviour, but also indirectly imposes an additional frame: procurers stay well within the framework to ensure that they are acting in accordance with it. Due to the fear of making mistakes and risking complaints, cancelled competitions, or legal disputes, procurers are more concerned with carrying out correct processes than ensuring the quality of the procurement (Nærings- og fiskeridepartementet, 2019, p. 38). In the air ambulance case, the comprehensive specification of requirements and the thorough processes

leading up to them indicate that the procurer is highly concerned with the quality of the procurement. Nevertheless, the research shows that adaptations are only made if the procurer is completely convinced that they avoid the "legal trap" and are well within procurement regulation boundaries (Slotsvik, Gould, & Hayes, 2023).

7 Conclusion

Societal safety policies aim to ensure that critical services can withstand outside stresses, whether in the form of natural hazards, accidents, or intentional acts of crime (Olsen et al., 2007). However, the stresses affecting critical service delivery may be a consequence of how we organize them; they can come from within the service delivery arrangements, not only from the outside. The research conducted for this thesis has highlighted some aspects of this for publicly procured critical services. More specifically, the research has identified the following ways in which competitive tendering processes can affect the reliability of publicly procured services:

- Tendering processes involving a change of supplier can result in unstable operational environments and uncertainty among operational workers regarding future job prospects. Stable relationships and operational environments are known from previous organizational reliability research to enhance reliability (e.g., La Porte & Consolini, 1991; Roberts, 1990; Roe & Schulman, 2008). The research conducted for this thesis shows that destabilized operational work environments can have direct implications for reliability.
- A change of supplier can also lead to profound conflict between operational personnel and supplier management. In previous organizational studies of reliability, management support of operational staff has been identified as enhancing reliability (e.g., Roberts, 1990; Roe & Schulman, 2008). The analysis of the fixed-wing service procurement shows that employer–employee conflicts can be profound and can have negative effects on output reliability.
- For procured critical services, a change of supplier involves a temporary organizational interface between the outgoing and incoming supplier. HRNs are bound together by a shared goal

(Berthod et al., 2017). By comparison, competitive tendering can result in the enforced cooperation between the supplier contracted for a coming service period and the supplier contracted for the ongoing period. The research shows that, if the suppliers do not share the goal of a successful transfer, this may have negative implications for output reliability.

- Related to the previous point, available governance options may be inadequate for solving conflict situations. Contractual governance is limited by the difficulties of specifying for all eventualities; relational governance depends on the parties' willingness to cooperate. Moreover, governance options can be limited by procurement legislation.
- The procurement cycle can have negative effects on continuous change processes. Continuous change processes are known from previous organizational reliability research to enhance reliability (e.g., La Porte, 1996; Schulman, 1993). The analysis of the air ambulance procurements shows that procurement can lead to inflexible change processes, where changes are introduced in accordance with the procurement cycle and procurement legislation and not necessarily with a speed and timing beneficial for reliability.
- Importantly, the research also identifies some reliability-enhancing aspects of competitive tendering. In particular, the procurement cycle can include a "total review" of the service and system-wide negotiations over future service delivery qualities.

Overall, the study has highlighted several negative impacts of competitive tendering processes on critical service reliability. However, having considered air ambulance tendering processes and not the hypothetical alternatives (e.g., an insourcing of the service), this does not imply that insourcing is advocated as the best alternative. Rather, a recommendation for policymakers and potential critical service procurers based on the research is that, if procurement overall is judged

as the best way of acquiring a critical service, procurers must take into account — and prepare for — periods of organizational instability and reduced service deliveries. In the procurement cycle, the transition phase and the contract implementation phase are particularly vulnerable periods; planning for all contingencies in these periods is not necessarily possible. One important dilemma in this respect is between making the periods between each tender long enough to ensure stability while at the same time short enough to ensure the systemic quality developments each tender can involve. Moreover, procurers should be cautious of the effects of interpreting procurement legislation too restrictively: while restrictive interpretations minimize the risk of legal implications, opportunities for creating reliable service deliveries may be lost along the way.

7.1 Recommended further research

The research conducted for this thesis has enabled the identification of several critical service reliability themes which would benefit from further studies:

- In the organizational reliability literature, the effects or influences of laws, regulatory practices, and political decision-making are acknowledged (e.g., Roe & Schulman, 2016). However, the gap between this acknowledgement and its practical implications has yet to be filled. This thesis has provided a contribution towards filling the gap by analysing how procurement legislation affects the scopes of action of procurers aiming to acquire reliable services. Further research regarding the specific consequences of procurement legislation and other legal frameworks for reliability is encouraged.
- Previous organizational studies on critical service reliability (e.g., Almklov & Antonsen, 2010; Cedergren et al., 2018; Schulman et al., 2004) have primarily focused on critical *infrastructure* services. However, as critical services can have

outcomes whose attributes and qualities are difficult to define, there is a need for more research on the complex interplay between organizational reliability and such outcomes.

- This thesis has identified some effects of intra- and inter-organizational conflicts on reliability. Given that there has been little focus on conflicts in organizational reliability research, this is a thematic area which should be further explored.
- Last but not least, this thesis has discussed how organizational characteristics specific to public procurement affect reliability; with the variety of arrangements that are set up to provide critical services, similar research should be conducted for other types of critical service provision arrangements.

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PART II

List of articles

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Slotsvik, T. N., Gauteplass, A., Haavik, T. K., Størkersen, K. V., Nilsen, B. T., & Almklov, P. G. (2020). How tendering affects the resilience of critical societal functions : a literature review. In *Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference.* Research Publishing Services.

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Article III
Hayes, J., Slotsvik, T. N., Macrae, C., & Gould, K. P. (2023). Tracking the right path: safety performance indicators as boundary objects in air ambulance services. *Safety Science*, *163*.

Article IV
Slotsvik, T. N., Gould, K. P., & Hayes, J. (2023). Adapting to the rhythm of the procurement cycle. Organizational reliability implications of temporal misfits in the Norwegian air ambulance service procurements. [Submitted for publication in international journal April 2023.]

Article V
Slotsvik, T. N., Gould, K. P., & Stene, L. K. (2023). Contributions and limitations of relational governance towards the reliability of publicly procured air ambulance services. *Safety Science*, 164.

Article I

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Tracking the right path: Safety performance indicators as boundary objects in air ambulance services

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ABSTRACT

Indicators are used by most organizations to track their safety performance. Research attention has been drawn to what makes for a good indicator (specific, proactive, etc.) and the sometimes perverse and unexpected consequences of their introduction. While previous research has demonstrated some of the complexity, uncertainties and debates that surround safety indicators in the scientific community, to date, little attention has been paid to how a safety indicator can act as a boundary object that bridges different social worlds despite being the social groups' diverse conceptualization. We examine how a safety performance indicator is interpreted and negotiated by different social groups in the context of public procurement of critical services, specifically fixed-wing ambulance services. The different uses that the procurer and service providers have for performance data are investigated, to analyze how a safety performance indicator can act as a boundary object, and with what consequences. Moving beyond the functionality of indicators to explore the meanings ascribed by different actors, allows for greater understanding of how indicators function in and between social groups and organizations, and how safety is more fundamentally conceived and enacted. In some cases, safety has become a proxy for other risks (reputation and financial). Focusing on the symbolic equivocality of outcome indicators and even more tightly defined safety performance indicators ultimately allows a richer understanding of the priorities of each actor within a supply chain and indicates that the imposition of oversimplified indicators may disrupt important work in ways that could be detrimental to safety performance.

1. Introduction

Safety performance indicators are a topic of debate in the safety literature and in practice. The managerial purpose of safety indicators is to understand system performance with regards to safety and so make changes to improve, before any major system failures are experienced. This reliance is further strengthened by neoliberal ways of thinking and associated growing pressures for standardization and management (Kongsvik et al., 2018). Safety indicators are, like other performance indicators, aimed at reflecting performance in relation to the goals and objectives of a system.

Defining and using 'good' indicators has therefore become a preoccupation in both theory and practice, and is particularly important when it comes to the management of critical systems and services: those that fulfil some of the most basic needs of a population, such as energy and healthcare. Ensuring continuous critical service performance is at the core of the societal safety concept (Olsen et al., 2007). Critical services that contribute to such needs are increasingly delivered through procurement and contracting processes, to the extent that public procurement today represents almost one third of total government expenditure (OECD, 2022). The organizational fragmentation and complexity that this can produce further amplifies the need to develop robust and reliable safety performance indicators, including indicators that can reflect inter-organizational performance.

While there are clear advantages to increasing use of indicators they must be used carefully. The development and use of an indicator represents a process of abstraction and reification, in which intangible organizational and social factors and processes are translated into symbolic objects that can be measured, communicated and governed. However, complex and/or ambiguous indicators may make it difficult for different actors to develop a common understanding of safety. In addition to safety, other values such as production and efficiency often become connected to the same indicators. Consequently, despite their potential value, poorly conceptualized indicators can act as "decoys",

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directing attention away from critical information and organizational processes. Similar to social studies of indicators in other domains (Turnhout, 2009), what appears is a paradox making it clear that effective development and use of safety performance indicators are not self-evident processes: Safety performance indicators are necessary for the evaluation of safety management, but at the same time they are controversial and contested. Studying the meaning of a safety performance indicator beyond its eponymous function is therefore important to gain a greater understanding of conditions for indicator effectiveness and usability. This includes studying the multiple meanings that may be assigned to an indicator, how and by whom those meanings are constructed, and the associated implications for action. As practitioners are increasingly expected to understand the impacts and measure the benefits of public procurement (OECD, 2022) and other contracted services, this negotiation of meaning around shared safety indicators is of particular importance in the interorganizational networks that commonly deliver critical services.

In this context, where multiple organizations or groups interact, indicators can be conceived as boundary objects (Star and Griesemer, 1989), facilitating communication about the reliability and safety of system performance, and inviting collective examination of risks in ways that may not otherwise take place (Macrae, 2014). Conceptualizing artefacts—such as safety performance indicators—as boundary objects that have meaning in more than one social world provides a useful way to consider how the tensions between different actors and viewpoints of safety may be negotiated or resolved. Further, boundary objects can have a political dimension: they may be used to impose meaning, rather than fostering collaborative negotiation (McGivern et al., 2018).

We investigate these issues using a case study of the Norwegian air ambulance service. In these services, operational helicopter and fixed-wing services are publicly procured by a national health trust. Air ambulance services are used in Norway for both planned and emergency patient transports, and so a necessary precondition for service provision is that the operator provides continually available crewed aircraft at bases around the country. Procurers, operating companies and pilots all have a role in system safety and yet we find that a key measure of system safety – availability – means different things to the different social groups. Availability serves as a boundary object that is negotiated and interpreted within the different groups involved in the provision of this critical service. How indicators are shaped by their social and relational context, and the social and organizational work that surrounds and is informed by them, emerges as a critical question in both understanding how safety indicators 'work', and also how they might be better constructed and developed in the future.

2. Theoretical framing

We start by reviewing the current status of the literature on safety indicators, particularly debates about both the meaning and effectiveness of indicators. This leads us to selection of boundary object theory as our main analytical perspective, given its usefulness in cases where multiple actors assign varying meanings to a common object or concept, in this case a performance indicator.

2.1. Safety performance indicators

Measuring safety performance is a hot topic in the safety literature with recent contributions on what makes for a good safety indicator in fields as diverse as aquaculture (Holmen et al., 2021), patient safety (Labella et al., 2022), merchant shipping (Gil et al., 2022), road transport (Ibrahim et al., 2022), building construction (Liang and Liu, 2022), and the process industries (Selvik et al., 2021). It seems that those with interests in all complex socio technical systems are still struggling with how best to detect flaws in order to predict systemic failures and prevent them.

All safety indicators are proxy measures for the desired outcome i.e., no deaths or injuries. Any indicator that does not measure that directly has built into it a model of why accidents happen and how they can be prevented (Reiman and Pietikäinen, 2012). With some exceptions (Leveson, 2015; Sultana et al., 2019) the theoretical origins of given sets of indicators are typically obscure. Reiman and Pietikäinen (2012) note that safety performance indicators have various purposes in organizations where the typical indicators measure outcomes of activities or events that have happened (so called lagging indicators), while others provide information in support of anticipating and developing organizational performance (so called leading indicators). While lagging indicators have been used to define safety priorities or make conclusions about levels of safety, most systemic and dynamic approaches to safety performance claim that they are, on their own, of little help in understanding how the system is actually doing. For guaranteeing safety, lagging indicators must be complemented by leading indicators of system conditions and processes that drive safety forward (Hopkins, 2009; Reiman and Pietikäinen, 2012). Some researchers have gone so far as to propose that a set of indicators could be developed that would provide instantaneous feedback on the state of safety in a given system, a so-called safety barometer (Knegtering and Pasman, 2013), but difficulties in including organizational qualities into safety indicators have also been acknowledged (Kongsvik et al., 2010; Reiman and Pietikäinen, 2012). Despite significant research interest in safety indicators, including a special issue of Safety Science on this topic in 2009, several researchers have suggested a significant gap between parameters that are being measured as an indicator of system performance and the actual performance (Körvers and Sonnemans, 2008; Lindhout et al., 2020). Further, Swuste et al. (2019) predicted that the topic of safety indicators will remain in the spotlight for some time to come given their finding that 'indicators do not logically relate to current safety theories and models' (pg 85).

Criticism of the confusion surrounding indicators extends across sectors. Construction sector research has highlighted the extent to which companies tend to focus on factors that are easily measurable (Oswald et al., 2018) and easily quantifiable (Oswald, 2020), rather those that give a good indication of likely future safety performance—the selection of which would rely on a sophisticated model of what drives safety outcomes. Within research on patient safety, safety indicators and quality indicators more generally have been criticized for focusing on easily measurable factors at the expense of more important but less tangible factors (Groene and Sunol, 2014). For instance, research on safety indicators in prehospital care shows that safety monitoring systems have gradually evolved rather than being designed with clear purposes, leading to 'safety blind spots' (O'Connor et al., 2021).

Kongsvik et al. (2018) also highlighted two key limitations of indicators, noting that they are based on limited (and often biased) data about the system, and that there is always uncertainty associated with how well an indicator represents the actual underlying state of the system that the indicator is supposed to represent. It is particularly important that indicators can never fully capture or perfectly represent the underlying state of safety and so their use can lead to perverse consequences. In particular, there may be a tendency for individuals to 'manage the measure' rather than managing the original desired outcome for which the measure is simply a proxy.

Much of the research described above on what represents a good indicator of safety performance is predominantly managerial and/or in technical nature and draws on a deductive mode of analysis. While this coupling between management's desire to measure and safety science making safety measurable has been helpful in many ways, the continuing debates demonstrate that alternative perspectives are needed that move beyond epistemological questions regarding what makes a good indicator. Safety science more broadly also draws on more inductive, empirical and constructivist theoretical perspectives about what constitutes and explains safety. Such approaches have been particularly valuable in contexts where there may be discussions or controversies over safety and lead us to ask questions about the ontology

of indicators. A desire to investigate the nature of indicators in a social setting leads us to the selection of boundary object theory to investigate the use of 'availability' as a key outcome performance indicator in the Norwegian air ambulance service.

2.2. Boundary objects

In one sense, a performance indicator is simply a number that may be assumed to measure a stable and widely agreed aspect of safety or system performance. But this simple view fails to consider the role that a conceptual and symbolic object such as a performance indicator has in social interactions, as well as the profound impact that non-human actors can have on human actors (Star and Griesemer, 1989; Suchman, 1987). In the case of the Norwegian air ambulance service, some of the most relevant actors are the procurer organization (which contracts the service), the operator organizations (which deliver the service) and the pilots (the professional group responsible for operating the aircraft). These people inhabit different 'social worlds' – groups that make meaning together and act on the basis of those meanings (Star and Griesemer, 1989). To study the role of the outcome indicator acting at the interface between social worlds to ensure public safety, we draw on the concept of boundary objects, as originally developed by Star and Griesemer (1989) as an extension to actor network theory. Boundary objects can be either abstract or concrete things that have shared meanings across multiple communities and enable collaboration from different social worlds (Anderson et al., 2018).

The notion of boundary objects has been used in a range of qualitative and ethnographic research particularly in the field of organization studies, in the sociology of science and technology and in knowledge management (see Trompette and Vinck (2009) for a detailed review) and increasingly in health and safety-related studies (Macrae, 2014). The theory has proven to be a useful way to consider how tensions between different actors and viewpoints are negotiated and resolved. As Star and Griesemer explored in their much-cited study of scientific work in a natural history museum, boundary objects provide a way of working such that, 'consensus is not necessary for cooperation nor for successful conduct of work' (1989, pg 388). Boundary objects support coordination and cooperation between social worlds by satisfying the informational needs of each group because the boundary object is at the same time 'weakly structured in common use, and become strongly structured in individual use' (Star and Griesemer, 1989, pg 393). Boundary objects are therefore '…entities that enhance the capacity of an idea, theory or practice to translate across culturally defined boundaries' (Fox, 2011, pg 71). Many studies have found that the concept explains what is observed when different communities of practice interact (Wenger, 1998).

In health studies, a wide range of artifacts have been conceptualized as boundary objects including quality models (Wiig et al., 2014), care pathways (Allen, 2009) and patients themselves (Bishop and Waring, 2019). In contrast, boundary object theory has not been widely used within the safety field, despite the interest in organizational safety in recent decades. A few safety scholars have used boundary object theory to investigate how different professional groups interact and the implications for safety outcomes. Macrae (2014) studied how experienced flight safety investigators interpret and acted in response to reports of flight safety incidents, examining how "incidents are transformed into risks, which then function as boundary objects, facilitating communication about the safety of organizational practice that otherwise may not take place" (Macrae, 2014, p 207). The process of constructing a particular risk as a boundary object allowed safety investigators to create objects of collective enquiry, around which specialists from various operational areas are connected and work together to examine organizational practices and improve safety. More recently, studies using boundary object theory in the safety domain have focused on the extent to which different social groups working in complex systems negotiate an outcome which balances system safety and other potential goals (Hayes et al., 2022; Tillement and Hayes, 2019). In these cases, artefacts produced at work have a strong symbolic meaning that varies between professional groups and allows work to proceed, even in the face of multiple, and sometimes conflicting, goals.

This means, importantly, that a boundary object is 'something people … act toward and with. Its materiality derives from action, not from a sense of prefabricated stuff or "thing"-ness' (Star, 2010, pg 603). In our case, the availability of standby resources in the air ambulance service fits this description. It is monitorable and quantifiable, but at the same time it implies different things to different social groups. As such, it is a classic boundary object, 'a set of work arrangements that are at once material and processual' (Star, 2010, pg 604), not simply a static material object but rather 'the stuff of action' (2010, pg 603). As Fox describes, 'the concept of a boundary object is attractive. It offers the promise of communication across barriers, to facilitate the growth of knowledge or the success of a policy or other innovation. An effective boundary object might even succeed in bringing harmony to a dissensus, or peace to a conflicted situation' (2011, pg 80).

Alternatively, as some of the studies in the safety domain have shown, boundary objects are a way of managing conflict without necessarily finding a resolution. Instead, they may be 'to some extent imposed on particular groups and sometimes these are contested' (Oswick and Robertson, 2009, pg 188). As Oswick and Robertson point out, boundary objects are 'not inherently apolitical' (2009, pg 187). This has relevance in understanding the way in which indicators are used to try to manage system safety performance across multiple system boundaries. Therefore, what makes effective safety performance indicators needs to be given further consideration. In the perspective of boundary object theory, instead of attributing the effectiveness of indicators to objective scientific or policy criteria, the effectiveness of a particular safety performance indicator becomes dependent on its usefulness and a social matter (Turnhout, 2009).

3. The fixed-wing ambulance case and 'availability' as an indicator

The Norwegian air ambulance service, consisting of both fixed-wing (airplane) and rotor-wing (helicopter) services, is an important part of the emergency medical service chain on occasions requiring patient transport over long distances or from inaccessible areas. A national health trust owned by the four regional health trusts (subject to the Ministry of Health and Care Services) is responsible overall for the operational part of the services. This responsibility includes the procurement and contract management of air transport services at thirteen rotor-wing bases and nine fixed-wing bases on contracts ranging from six to eleven years in duration. Also, they oversee a flight coordination central, located at the University hospital of Northern Norway (UNN), which coordinates all fixed-wing operations. Personnel required to operate the air ambulance service (pilots, maintenance staff and, for rotor-wing services, rescuers) are provided by the contracted operators. The local health trusts affiliated with each base provide medical staff, usually meaning that a nurse forms part of the fixed-wing crew and a medical doctor is part of the rotor-wing crew.

While the air ambulance service includes both fixed-wing and rotor-wing services, the first is the focus of this paper. We take as our case for study the transition in air ambulance fixed-wing services from one private provider to another and the impact that this transition had on preparedness in the period June 2017 to approximately July 2020 (one year after contract start). We focus particularly on exploring how 'availability' served as a boundary object during the transition of responsibility for service provision when a new contract was awarded to an incoming operator who had not operated in Norway previously. The transition phase between the awarding of the contract (in June 2017) and the start of the new contract period (July 2019), involved conflicts between the outgoing operator on the one side and the procurer and incoming operator on the other. Also, the negotiations between the incoming operator and the pilots of the outgoing operator (represented

by their trade union) stalled. It was not until Parliament intervened, that negotiations were successfully concluded, and pilots were employed by the new operator. In summary, the transition phase, as well as the contract implementation phase (approximately the first year of the contract period) involved periods of reduced service output, extensive media focus and political involvement in the procurement process (self identifying reference removed). The consequences for the patients were not registered or systematically examined by the air ambulance service in retrospect (Norwegian Board of Health Supervision, 2021).

A core expected outcome and requirement for the air ambulance is preparedness. In essence, preparedness involves having crewed aircraft or helicopters available at all bases 24/7, thereby being ready for both planned and acute patient transport. Within the service, this is often referred to as 'availability'. When referred to as the state of having standby resources (and not specifically as an indicator), 'availability' is used interchangeably with 'preparedness'. Given that the helicopters and aircraft must be crewed to be defined as available, the concept reflects organizational performance and not a static presence of resources. As the following analysis shows, availability is not a neutral concept but has multiple, and sometimes contested, meanings across the different actors involved in the procurement process.

4. Method

This study adopts a case study methodology (Yin, 2018), using data triangulation, involving a combination of semi-structured interviews and document studies. Data was collected as part of an ongoing research project on societal safety issues related to publicly procured critical services.

An overview of the interviews of the four key groups that are analyzed as part of this article is shown in Table 1. The interviews were carried out between August 2020 and June 2021 by one or two interviewers, with one of the co-authors involved in all interviews. Interviews with procurer representatives were mainly done at their headquarters in Bodø, while other interviews, due to the Covid-19 pandemic, were digital. Three of the interviews with the procurer representatives, being the first interviews to be conducted, had the aim of gaining broad knowledge of the air ambulance service including how procurement was carried out and contracts were monitored. These interviews included between two and four interviewees. Some of the procurer representatives were present at more than one group interview.

The remaining interviews were chronologically structured; the interview questions centered around the research participants' experiences with and perceptions of the different procurement phases. To capture the interview participants' experiences and descriptions, the introductory question for each phase was "Can you describe the period from xx to xx?" This was followed by questions regarding their actions in this phase, the challenges they encountered and their assessment of the procurement process at this stage.

Questions were deliberately open-ended, to minimize the possibility that the interviewers influenced the research participants' answers. If the research participants' statements appeared unclear, we validated our understanding by rephrasing the statements and asking the participants whether our understanding was correct. Central statements given by the first interview participants of each group were rephrased as questions to the remaining participants from the same group, to check whether the statements were representative for the group as a whole. References to concrete facts regarding the procurement process (e.g., dates, availability figures) were crosschecked with information found in documents.

Table 1
Overview of research interviews.

	Group interviews	Individual interviews	Interview participants
Procurer	4		8
Outgoing operator		3	3
Incoming operator		4	4
Pilots		6	6
Total	4	13	21

Interviews with the pilots' trade union, representatives from the rotor-wing operator, rotor-wing personnel (pilots and rescuers) and medical staff have also provided relevant background information. The documents reviewed are publicly available and include policy documents, board meeting documents, correspondence, and newspaper articles. The different actors' perceptions of preparedness and availability were not part of the initial interview guides but emerged as a relevant theme in the early data analysis phase. At first, in our reading of board meeting documents, availability figures seemed to be 'neutral'. However, in interviews, each organization's representatives described issues related to availability, but from different starting points. Moreover, their descriptions of availability levels during the various procurement phases contradicted each other, making the apparently neutral figures part of their conflicting views regarding the procurement process. This triggered our interest in availability as a theme. To further clarify our understanding of availability as an indicator, the last group interview with procurer representatives was focused on availability. The interview questions centered around how availability was monitored and procurer experiences with this, whether availability as an indicator reflects the operators' contributions to the service and the state of the operational service as a whole, and other factors that are important for air ambulance service outcomes.

Interviews were analyzed using NVivo. In the coding and analysis process, we followed a systematic text condensation approach (Malterud, 2012). Given our interest in availability as a boundary object, we identified interview quotes concerning 'availability' and 'preparedness' and coded these text sections. The further analysis led to a condensation of the codes centered around three themes: what 'availability' implied for the research participant groups, how availability was perceived in the transition phase and contract implementation phase, and how the reduced availability could be explained according to them.

As described above, 'availability' emerged from the data being collected regarding system safety as the research progressed. Deciding on performance indicators as an object of study before the interview process would have led to more detailed questions regarding the research participants' assessment of availability as an indicator. However, our approach has allowed us to situate 'availability' in a social and relational context which is considerably wider than its immediate use as an indicator and contract measure. Discovering the boundary object enabled us to analyze how research participants make use of it when describing their work processes and interactions with others. With procurer interviewees we were able to combine these two approaches by including an additional interview focusing on availability, but the time frames of the project did not allow a second round of interviews with representatives from all the organizations.

Analyzing our empirical material, we see that availability was shaped and applied in a wide network of social groups and that it was formed due to their interaction over time. Some of these groups (media, politicians) were beyond the more limited social network that the project aimed to study. Extending the study to these groups that were not anticipated when the project was conceived may have provided additional insights. Based on our experiences, we recommend the design of future studies to allow for additional social groups that emerge from initial data collection to be included. Research designs that allow for the dynamic nature of social interactions regarding indicators and follow their interaction processes over time (e.g., using two rounds of interviews) are also to be encouraged.

5. Results

In the transition and contract implementation phases, several social groups were affected by the reductions in preparedness that occurred as part of the contract transition. This analysis focuses on the four most relevant actors which were directly involved in maintaining availability, namely the procurer organization, the outgoing and the incoming operators and the pilots.

5.1. The procurer organization

5.1.1. Defining and managing availability

The procurer organization is responsible overall for the operation of the air ambulance service, including the procurement and contract management of operational services. To the procurer organization, 'availability' reflects two matters. On the one hand, it is the 'actual availability', meaning standby resources which are at the disposal of the emergency services and which the procurer organization is responsible for coordinating from a flight coordination central. By using availability in this way, anything affecting availability plays an equal role, whether it is unsafe weather conditions, lack of aircraft (due to planned maintenance or unforeseen technical problems), the crew situation (lack of available crew) or other circumstances that have the potential to impede patient transport by air. On the other hand, availability as a reactive measure of contractor performance is also seen to be essential and so used for contract management with the fixed-wing operating company. Here, it is the conditions within the control of the operator (such as planned maintenance and lack of on-duty crew) that are taken into account.

In the previous fixed-wing contract, the requirement for most of the bases was that for each quarter of a year, manned aircraft had to be available at least 95 percent of the time (taking only conditions within the control of the operator into consideration). According to procurer organization representatives, a downside to this was the operator could adopt a strategy of managing the measure in order to minimize costs. For instance, if the operator had 100 percent availability for two months at one base, it would be possible for them to move resources to a base with lower average availability to avoid payment cut-offs there, or to take pilots out of service for training purposes. While this was within the boundaries of the contract, significant reductions in actual availability at some bases could have negative implications for the patients, making availability a patient safety issue.

Requirements regarding the availability of rotor-wing resources have been more detailed, and also more successful in terms of achieving a high preparedness. Therefore, in the current fixed-wing contract, the procurer organization defined requirements which are similar to those used in past and current rotor-wing contracts. In these contracts, resources can be out of service for a limited number of hours each month due to either planned maintenance or lack of crew. In the case of unforeseen technical problems, alternative resources must be provided within 12 hours. According to operator organization interviewees, the current requirements effectively drive desired behaviors and have increased overall fixed-wing availability. Nevertheless, deciding whether the lack of resources is within the responsibility of the operator can sometimes be difficult. This was the case in the high conflict transfer period between the fixed-wing operators in 2019 (self identifying reference removed), moving attention away from maximizing the availability of the service to patients towards allocation of blame for any shortfall. Also, payment penalties incurred must be balanced against the total financial situation of the operator. As one procurer representative described,

A cut-off for lack of preparedness is about 200–220 000 kroner per 24 h per event. Of course, if there are many of those it's quite expensive for the airline. And then the dilemma for us is if they say that "if you curtail us [i.e., reduce payment] now, we are not going to make it [i.e., go bankrupt]." In that way we lose our scope of action.

This person is concerned that imposing a significant financial penalty on the operator that is designed to improve their performance could result in loss of the service entirely if the operator fails financially. This was seen to adversely impact system performance.

5.1.2. Availability as a performance indicator

In addition to using availability to manage their contractor, availability is treated by the procurer as a visible overall indicator of the quality of the service they provide. This measure is used internally and in communication with those higher in the supply chain to demonstrate outcome. Internally, daily availability overviews are presented on a screen in the coffee break area at the headquarters so that real time availability data is always on show to staff and visitors. It is also reflected in how the procurer reports to the owners (i.e., the four regional health trusts). Along with economic overviews, other more detailed safety indicators and flying time production, availability figures are reported at all regular board meetings. Here, the overviews of availability are accompanied with brief descriptions of availability reductions. An example of this from a board meeting in 2018 is:

Availability for fixed-wing ambulances has so far this year been 92.7 %. In the period August-September availability has been 95.7 %. Out of service situations are mainly due to sickness and lack of crew. [There has been] a significant improvement in availability the last months compared to April/May this year. Out of service situations due to [pilots reporting] "unfit" [for flight] are reduced and back at prior levels. Only 3 hours in August and September.

Overall, procurer representatives experience that the owners define the frames for the air ambulance service but leave the running of the services to them. The preparedness situation exemplifies an exception to this. As the quote above shows, detailed operational information is reported to the owners even though this is outside the direct control of the procurer. According to one interviewee, "In my experience, what the owners are concerned about is when there is a failure in the agreed delivery. In other words, unexpected events or concerns about the preparedness […]. That's when I experience that we get the most involvement from the owners." In this way, availability has become a proxy for the effective performance of the procurer and/or operator and yet, procurer organization interviewees emphasize the complexity of the air ambulance service and that the service to end users is dependent on the combined contributions of multiple organizations. Coordination issues, for example between air ambulance units and road ambulances, have been highlighted both in an internal report aiming to improve the efficiency of the service (Luftambulansetjenesten, 2017) and in an external investigation of the fixed-wing ambulance services (Norwegian Board of Health Supervision, 2021). They also highlighted that the system is flexible in the sense that fixed-wing resources can be acquired from a neighboring base if the closest resource is unavailable.

5.1.3. Procurer experience of availability in the transition phase

During the transition between fixed-wing operators in 2019, a considerable number of pilots lacked the mandatory training to operate the new aircraft models that were to be used. Seeing in advance that this would have a substantial effect on availability, the incoming operator provided extra resources (crewed aircraft) from its umbrella organization and the procurer acquired extra resources from private companies and the Armed Forces to make up the shortfall. The situation was closely followed by the owners and the Ministry of Health and Care Services. In the words of one of the interviewees, "anything that smells like it might reduce preparedness on a national level makes the alarm bells [in the Ministry] sound".

By this time, availability as a performance measure was being communicated to the public by the media. The Ministry of Health and Care Services instructed the procurer to publish online daily updates regarding availability at each of the fixed-wing bases. These overviews showed the number of hours that the different resources were available and were published until May 2020. According to the procurer,

availability becoming the public point of reference created problems for them in relation to how the operator's performance was perceived by others. In the new contract, the procurer had attempted to move away from a fixed percentage by using a more fine-grained method for assessing availability, but the media and other external stakeholders made calculations of what the availability percentage should be when the new contract requirements were met. One example referred to in the media was that requirements in the new contract equaled an availability of 98.4 percent. In October 2019, the procurer published a press release to make clear that this was not the case. As described by one of the procurer representatives, "in a way we have been pushed into using percentages in the new contract. And that is because in media and politically it became the big point of reference".

On the positive side, public awareness of the preparedness situation has affected the monitoring of the air ambulance service. As explained by one procurer interviewee,

The air ambulance service has never been as monitored as it is now. I make daily statistics for this, and this is partly because we were overwhelmed with telephone calls from the media from the autumn of 2019 onwards. We are on it and consider each case of unavailability. Is it the operator's responsibility or outside it? Ask critical questions all the way. That didn't happen as much in the last contract. The air ambulance service operated out of reach of common people, if I can use that expression.

Despite the ambiguity over exactly what constitutes availability and who is responsible for any temporary lapses in performance, this interviewee notes that media interest has improved their monitoring of the operator's performance.

5.2. The outgoing operator

5.2.1. Availability perceptions

When the outgoing operator lost the fixed-wing contract to a competitor, it marked the end of a more than 30-year presence at some of the bases. Outgoing operator interviewees have described how contributing towards patient transport is professionally meaningful. Maintaining availability above the accepted level is one aspect of this. Not least, this is apparent when they describe the effort that was made towards the end of the contract period. As expressed by one interviewee,

[When the contract period was over] I was simply overjoyed by the fact that we had delivered and we were very proud that we had delivered the availability we did. Once we had filled the gap of the pilots that left, towards the autumn of 2018, we delivered to the letter until the last second. And that was absolutely not to be taken for granted.

As well as being a source of professional pride, availability was also a contractual matter for the outgoing operator. Not least, this was apparent in their response to the fact that the pilots were needed both to operate the current ambulance service and to train for the coming service in the spring of 2019. One of their suggestions was to reduce availability for a period, but this was rejected by the procurer organization. Recapturing the dialogue with the procurer organization, an operator interviewee phrased it this way:

'The availability requirement in our contract… if you are willing to adjust this we can take the employees out of service and sign them up for courses run by the new operator. […] But in that case, we can't be punished for this.' The [procurer organization] sharply turned this down: 'No, you have to deliver the service according to contract.'

The transition requirements, in particular training pilots to operate the new service, introduced a new factor that impacted availability and responsibility for managing this became another potential point of conflict.

5.2.2. Explaining reduced levels of availability

According to the outgoing operator, the reduced availability in the contract implementation phase was rooted in the procurer's lack of understanding of what was required to keep availability at an adequate level. In the words of one of the outgoing operator interviewees,

They should have understood, or understood but didn't care, that [the incoming operator] never would meet the requirements, which said that July 1st 2019 availability was going to be at [the predefined] level and that everything was in place. It was simply impossible for [the incoming operator]. And every-one associated with aviation knew that. Or every-one who is competent in this field. So that was the main problem.

Furthermore, the outgoing operator claimed that their competitor won the new contract on incorrect grounds and the calculations regarding the resources needed to meet the availability requirements were an important part of this. According to the outgoing operator, the competitor had gambled that they could save costs by keeping the number of employed pilots at a minimum and relying on them to take on extra shifts to a larger extent than in the previous contract.

5.3. The incoming operator

5.3.1. Availability perceptions

To the incoming operator, availability is a valuable indication of the delivery level they are at and whether they need to adjust to ensure future preparedness. In this way, availability is an important operational measure for them but there is also a clear political dimension. They see availability as a parameter which gives the public an indication of whether they can be transported in medical emergency situations. As one interviewee phrases it:

It's maybe the only parameter which says something to people. If we have low availability in Brønnøysund for four days, it means that we actually don't have an airplane available in Brønnøysund. If you become acutely ill we have to get hold of an airplane from somewhere else. And of course, these are national resources, and resources are moved around. But it says something, it's a signal to the population in that region that this is what the numbers look like.

Illustrative of this claim, the incoming operator uses this signal effect of the indicator actively for communicating with the outside world, by publishing availability figures on their Facebook page. One of the interviewees argued that public providers of helicopter services (e.g., the rescue helicopters or police helicopters) should be monitored in the same way: "Well, our availability has always been measured. All of a sudden every-one knew what the availability figures for the air ambulance services were. Maybe then it's right to ask 'why don't other public and private entities do the same?' ". They are of the view that other services should be subject to the same political pressure that they experience.

5.3.2. Availability perceptions in the contract implementation phase

The incoming operator and the procurer organization realized in advance of the new contract period that it would be impossible to have enough fully trained pilots ready and that this would affect availability. As a result, extra crewed aircraft were supplied by the operator and, in addition, the procurer acquired extra helicopters and aircraft. In this sense, whether the functioning of the service was reduced became a question of which resources to include in the overall availability indicator. In the opinion of the incoming operator, preparedness was maintained throughout 2019 and was never critically low. Rather, to them it was a question of how availability was presented by stakeholders, the media and politicians. As one interviewee phrased it:

We had placed an extra helicopter in Tromsø, we had an extra helicopter from the Norwegian Armed Forces in Kirkenes, there were two aircraft from another company and in addition we supplied three Swedish resources [aircraft]. There has hardly ever been a better preparedness. But this did not come out. Focus was placed on our grounded aircraft. The total preparedness was considerably better, the ones who yelled and shouted about this knew that. But it was not in their interest to tell the whole story.

This interviewee was making the point that while they might have been unable to meet their contractual requirements at the start of the contract period, overall, the availability of a means to transport patients for care was very high due to the various contingency arrangements that

has been put in place outside their contracted service. Despite this, media reports focused on availability in the narrow sense and reported that targets were not met. According to the operator, this affected the public impression of availability in this period. One interviewee referred to this as "perceived negative preparedness". Another interviewee described the situation like this:

I'm sure that if you had talked to 100 lay people… or 1000, which is what you normally do when you collect data…. If you had asked them "Where do you think, in percent, the level of preparedness was at during the last half year of 2019?" Ask that question to 1000 people in Finnmark, and my guess is you would get something between 30 and 60 percent. How about telling them that actually on average it was over 97, or close to 97 percent? Then I think the response would be "Oh, I didn't realize that. But once when Agda (generic female name) needed to go to Alta (town in Northern Norway with hospital facilities), the ambulance wasn't there."

This interviewee was of the view that the public perception of the availability of the emergency service was grossly incorrect.

5.4. Pilots

5.4.1. Availability perceptions

Most of the fixed-wing bases are at airports with short runways situated in areas where weather conditions are a limiting factor, meaning that fixed-wing ambulance pilots need to have specialized competence and experience (self identifying reference removed). The interviewed pilots recounted that working in the air ambulance is meaningful but also emphasized that the desire to contribute by transporting critically ill or injured patients must be balanced against aviation safety. When a crew is on duty at a base, the aircraft at this base (given that there are no technical issues) will be registered as available. However, aviation safety conditions surrounding the pilots are also important for whether the aircraft actually can be utilized. This relates to the end of work shifts and duty time restrictions, but also to the judgements of pilots regarding, for instance, weather conditions.

In this way, 'availability' is closely tied to pilot work schedules. To make the work schedule fall into place, operators depend on pilots to work some extra shifts in addition to their obligated workdays. In the transition phase, this was all the more necessary. When the 2019 contract was awarded to a new operator, and future job prospects were uncertain for the pilots, some of them resigned from their positions, affecting availability (self identifying reference removed). In interviews, pilots have recounted that they felt a strong commitment towards the outgoing operator, but that they were exhausted from the uncertainty surrounding the transition process. While some worked extra to compensate for the lack of personnel, others felt that, given the circumstances, this would be too demanding. One of the interviewees described it this way:

*Really, it was like puncturing a balloon. It burst, and people didn't have the energy, they were exhausted. And the problem was that this made people talk more about it, making them more mentally worn out. People weren't capable of working overtime, they didn't come in their spare time [*i.e., *take extra shifts], they talked about it during the flights.*

When negotiations between the incoming operator and the pilots' trade union over a collective transfer of employees failed in April 2018, all on-duty pilots were reported as 'unfit for flight' by the Nominated Person Flight Operation due to their stress levels in the immediate aftermath of the negotiation failure. They could report as fit again on an individual basis when they felt ready. In interviews, pilots have expressed that this was a necessary safety measure given the circumstances. At the same time, some of them also point out how the media focus this created contributed to reaching an agreement with the incoming operator. In the words of one of the pilots,

There were a lot of coincidences leading up to reaching an agreement, but amongst other things, the grounded aircraft created a media storm and several pilots and other stakeholders wrote about the process. This resulted in a hearing [in Parliament], which in turn led to us reaching an agreement.

The situation calmed when an agreement over the collective transfer of pilots was reached. However, the pilots were discontented with some aspects of the agreement and the process leading up to it. It took a long time and several profound changes in the employer-employee relation before the pilots felt the same type of commitment towards the incoming operator. One of the pilots describes it this way:

[The outgoing operator] was really in our hearts. And being proud of our employer, every-one made an extra effort and turned up on short notice and worked a lot in their spare time. Working for [the incoming] operator, there was a lot of discontent in the beginning and a lot of insecurity since we didn't really feel appreciated. […] When we were on duty we did our tasks just like at [the outgoing operator's] and we worked overtime too, but we didn't work extra shifts for [the incoming operator] in the beginning.

In this way, availability had become a factor that the pilots could use in negotiating with their new employer.

6. Discussion

6.1. Availability as a boundary object

As a boundary object, availability has different meanings in the social worlds of different organizations and groups as summarized in Table 2. Availability, for the procurer, has two faces: one faces 'up and out', the other 'down and in'. Availability is used to assess the performance of the procurer organization by external parties, such as the owners, the media and government; and availability is also a primary parameter that the procurer uses to look inwards to assess the performance of the fixed-wing aircraft operator. Although availability is defined more narrowly in the latter context, focusing on availability performance data becomes a way of managing the procurement relationship with the contractor, and communicating what performance is required from them. And, as external and public scrutiny of availability performance increased, the procurement organization increasingly engaged with availability as an object of inquiry, or epistemic object (Miettinen and Virkkunen, 2005), which invited further scrutiny and triggered closer examination of the activities of the operator. Availability, as a boundary object, therefore acted as a bridge that translated increased public and political attention into more intensive and inquisitive scrutiny by the procurer organization of actual operational activities. That is, availability is transformed into "an interpretive device that is used to do epistemic work" (Macrae, 2014, p206) in the spaces between different organizational actors.

The outgoing and incoming operators share several perceptions of availability, some externally facing and some internal. Firstly, availability is understood to be an important indicator of preparedness and so directly linked to public safety i.e., the ability to transport ill patients at short notice. In this context, the operator seeks to maximize availability.

Table 2
Overview of different meanings of availability.

	Procurer	Outgoing operator	Incoming operator	Pilots
Measure of procurer performance	✔			
Measure of contracted performance of operator	✔	✔	✔	
External measure of preparedness	✔	✔	✔	✔
Source of public and political misinterpretation			✔	
Source of conflict		✔		
Way to optimize operations		✔	✔	
Source of professional pride		✔	✔	✔
Source of power				✔

Despite its functional importance, operators are also well aware of the external political dimension of availability when it comes to published data and public perceptions regarding operator performance and public safety. They also resent the blurring of the definition of availability knowing that overall system performance and so public safety is a function of much more than simply their fixed-wing aircraft data. This manifested itself differently for the two operators. For the incoming operator, availability became a source of public and political misinterpretation. For the outgoing operator it became a source of conflict with the procurer which says more about the procurement process than public safety.

Despite the (somewhat imperfect) way that availability can represent safety for the operators, availability is also used internally as an operational parameter that becomes enrolled in efforts to optimize the financial side of service provision, managing resources in a way that minimizes cost whilst meeting contractual availability obligations. In this context, lower availability is cheaper to provide, but the contract sets a minimum requirement at which financial penalties arise. This provides financial incentive to ensure that resourcing levels and activities such as maintenance and training are organized so that minimum requirements are met.

These uses of availability sat somewhat uneasily with another: that managing this complex service delivery to meet the availability target was also a source of professional pride linked to the provision of a high-quality service to the public. The way that operators relate to these two aspects of availability—optimizing around a financially beneficial minimum floor level or working to enhance the professional pride of delivering effectively for the public—may, in themselves, offer rich proxy indicators of the organizational and cultural approach to safety performance within different organizations. The inherent ambiguity of boundary objects, such as the availability metric, and the ways that organizations interpret and organize around these potentially offer a revealing lens into an organization's engagement with safety and performance indicators more broadly.

For the pilots, professional pride lies partly in high performance through overtime working and negotiating the situated judgements that underpin go/no go decisions. Another key aspect is the value ascribed to aviation safety more generally and the provision of an important public function – safely flying patients from remote areas to locations where they can be treated. At the same time, pilots understand availability is important to others and their contributions are critical in meeting politically-motivated availability targets. This gives them a source of power that can be, and has been, used during the transition period in their collective negotiation over terms and conditions linked to the move to a new operating company. In this sense, indicators are not necessarily apolitical; how they are used also depends on the interests of the different social groups.

Prior to the contractual transition period, the procuring organization had the capacity to manage differing perceptions of availability in their relationships with the owner and with the contracted service provider. The increased pressure on the system during the transition has shown the fragility of this indicator as a measure of public safety due to the multiple meanings of availability in different social worlds.

6.2. Availability as an indicator of system performance

As described above, availability came to be seen, publicly, primarily as a measure of preparedness. It is interesting to consider how well this single parameter performs in this role. Given its status as a historical average, availability is also fundamentally a lagging, outcome indicator with all the limitation that come with that. An outcome here means the temporary 'end result' (Reiman and Pietikäinen, 2012) of this part of the supply chain and its contribution to the overall health care systems' quality and patient safety outcomes. We also see that requirements can be specified in different ways. A minimum availability percentage sounds simple, but the time period over which it is averaged makes a difference. As we saw, according to procurer representatives, the outgoing operator used this flexibility to reduce services on some occasions in order to save money if they were ahead of the minimum target with the end of the period approaching. From the perspective of the procurer and the public, this form of 'managing the measure' is unlikely to be desirable. On the other hand, a simple percentage is highly recognizable to stakeholders outside the system, who may think this gives them a clear and immediate understanding of system performance—even if this is not really the case.

The availability of aircraft to perform successful patient transport from remote bases is a function of many things other than the operator being able to provide an aircraft with the appropriate crew. There are factors outside the operator's control—such as, most obviously, weather. These factors, being fundamental for aviation safety, are a limiting factor for patient transport which appeared to be overlooked in the public debate. There are also other ways in which an emergency transport service can be provided as demonstrated by the range of contingency measures that were in place immediately following the contract transition—and that the incoming operator drew on to claim that availability performance was never placed in jeopardy, despite the adaptative and resilient performance required from multiple other parties to ensure this was the case. In summary, operator performance (as reflected by the availability measure) came to be seen as an indicator of public safety in spite of other factors both limiting and enabling patient transport by air.

The problems with availability as a measure of system performance have already been reported. In a supervision report of the fixed-wing ambulance service conducted by (Norwegian Board of Health Supervision, 2021), the gap between contracted availability and actual availability is problematized. Furthermore, the report identifies challenges to patient transport which are not sufficiently taken care of in the air ambulance today. Amongst other things, these include challenges in the interfaces between different parts of the patient transport chain. Also, it identifies a lack of knowledge regarding the service as a whole, including total transport time for patients.

If availability is a poor measure of overall system safety, then why do key stakeholders focus on it so much? Using boundary object theory, we see that a broad output indicator such as availability can have leading qualities in practice and thus be more effective at promoting positive change than might be predicted. The indicators' appeal to different social groups allows for discussion and a subsequent reflection and adaptation of how the indicator is used by the organization or social group that defined it in the first place. This underlines that although safety monitoring systems may have gradually evolved rather than being intentionally designed (O'Connor et al., 2021), this evolution can be a reflexive process resulting in an improved application of the indicator. Social groups may not be in complete agreement about system performance, but an indicator that becomes an effective boundary object introduces stability into the system. Despite its weaknesses, availability has some advantages as a performance indicator that only become clear through the lens of boundary object theory.

6.3. Implications

The fixed-wing ambulance case exemplifies how, for critical services receiving considerable public attention being delivered within a complex network of organizational actors, indicators originally developed for internal monitoring and contract management can become malleable, contested and highly visible symbolic objects of organizational, professional and public interest. In our case study of the fixed-wing service procurement, the procurer organization intended to make the management of availability finer grained and not expressed as a percentage, but public awareness of the reduced preparedness led to an interest in comparable figures. In this sense, a challenge with indicators is not only that they favor easily measurable factors (Groene and Sunol, 2014; Oswald et al., 2018), but that they are potentially overvalued

because they appear tangible and comprehensible to the outside world. Furthermore, when public interest in the indicators increases, organizations may be pushed towards prioritizing measures affecting the indicators at the expense of other measures and activities that may have more tangible linkages to safety performance.

When indicators become the focal point of contests and negotiation, it follows that more complex and less measurable factors are overshadowed or made invisible. Pronounced examples of this from the fixed-wing ambulance case, which are likely to be relevant also to the delivery and governance of other inter-organizational critical services, are interface issues related to coordination and joint responsibilities between the different parties responsible for delivering the service (e.g., Almklov and Antonsen, 2014; Cedergren et al., 2018). Coordination issues have been recognized as a pressing matter internally in the air ambulance service (Luftambulansetjenesten, 2017) and have, along with the lacking wholistic responsibility for the service, been identified as important factors for decisive delays in patient transports (Norwegian Board of Health Supervision, 2021). The quality, safety and performance of the total output of the patient transport chain is however more difficult to monitor than the availability of crewed aircraft.

Moreover, our research has also shown how focusing performance management activities and financial incentives on outcome indicators such as availability can create complex and counter-intuitive problems that reveal some of the inherent tensions in managing the safety of critical services by aid of such means. This is particularly the case when using the threat of imposing significant financial penalties on an operator as an incentive to improve performance. On the one hand, if people interpret an indicator as a threat, this may create pressures within an organization to 'game' the indicator and hide bad news to avoid a potential penalty (Bevan and Hood, 2006; Hood, 2006). This is commonly referred to as Goodhart's Law: transforming an indicator into a target can render it useless as an indicator (Hood and Piotrowska, 2020). On the other hand, in the arena of critical services, it may be self-defeating to impose a significant financial penalty on an operator, as that penalty may then reduce the resources available to address risks and improve safety or at the extreme may bring about the financial failure of an operator, which in turn has implications for the provision of critical services—particularly in sectors such as healthcare where there are limited or no options for alternative providers to rapidly step in (Murray et al., 2014). The network of meanings, interpretations and incentives that an indicator is embedded within can therefore lead to that indicator working in both unintended and unexpected ways.

Furthermore, critical service provision like that of the fixed-wing ambulance necessitates effective decision-making of individuals in different parts of the service chain. Pilots considering a patient transport mission are an example of this. Firstly, individual professional judgement regarding, for instance, weather conditions are critical to the safe operation of the service and directly impact availability. Secondly, when transport missions are likely to exceed pilot's regulated working hours, individual pilots must carefully appraise the importance of the mission against their professional capability of working overtime. Our analysis of availability as a boundary object identifies that factors influencing such judgements may become invisible, or put under considerable pressure, when availability is treated as a single, undifferentiated indicator and focus of performance management. This resembles the difficulties of including organizational qualities in outcome indicators which have been identified by other researchers (e.g., Kongsvik et al., 2010).

7. Conclusions

This case study of the Norwegian air ambulance service explores the array of challenges that must be negotiated when defining and using system performance indicators within complex supply chains. Studying these indicators as boundary objects allows for a wider understanding of how indicators are embedded in a social and relational context. While it is widely accepted that indicators are proxies for the performance they intend to reflect, conceptualizing them as boundary objects allows more nuanced and sophisticated exploration of how these indicators, and the performance that they are intended to indicate, is interpreted and negotiated between different professional groups. Moreover, as our analysis has shown, these interpretations and negotiations become embedded in the evolving patterns of how a particular indicator is used and evaluated within and between organizations. This points to an important and promising, but currently under-explored, perspective on safety indicators: how indicators are shaped by their social and relational context, and the social and organizational work that surrounds and is informed by them, is a critical question in both understanding how safety indicators 'work', and also how they might be better constructed and developed in future.

Accordingly, this study indicates that there would be much value in further exploring and applying boundary object theory to investigate performance indicators in a range of safety domains. Such studies should seek to go beyond the specific technical design and definition of indicators, and should more expansively engage with the social and organizational work that is done to, and through, safety indicators in ongoing efforts to understand and manage the safety of complex systems. Importantly, the analysis developed in this study highlights how the organizational utility of an indicator is not necessarily tied to consensus in definition or interpretation; indeed, the interpretive flexibility that indicators afford can be an important source of organizational coordination as well as a stabilizing mechanism that allows different, and sometimes competing, cognitive communities to productively organize around a common safety objective. What would seem particularly important to extend our understanding is a better account of how these processes unfold over time within and between organizations and different professional groups. Our study here offers a temporally constrained view of a single safety performance indicator during a confined time period. To further develop and apply the conceptual apparatus of boundary object theory in the realm of safety indicators will require more extensive studies of a variety of these objects and the work that goes on around them in different organizational settings and industrial contexts; and it will require even more expansive studies across time and organizational space (Macrae, 2019), to understand how indicators—and the ways in which they are interpreted, contested, negotiated and stabilized—unfold over time and at different levels of and scales of organizational activity.

CRediT authorship contribution statement

Jan Hayes: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Tone Njølstad Slotsvik:** Conceptualization, Investigation, Formal analysis, Writing – original draft, Writing – review & editing. **Carl Macrae:** Writing – review & editing. **Kenneth Arne Pettersen Gould:** Conceptualization, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Contributions and limitations of relational governance towards the reliability of publicly procured air ambulance services

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A B S T R A C T

The interconnectivity of critical services, resulting partly from the megatrends of globalization, liberalization, and deregulation, comes in many shapes and forms, one of them being the procurement arrangement. For publicly procured critical services, the transition between two contract periods can create organizational stresses that affect reliability. This paper, drawing on empirical materials from a case study of the two most recent air ambulance service procurements in Norway, assesses how governance solutions can counter such stresses and contribute to maintaining organizational reliability. Specifically, we analyse the contributions and limitations of relational governance, using relational exchange theory as a starting point.

Although contractual governance is fundamental for procured services, contracts cannot account for all future contingencies in long-term, complex procurements. In addition, contractual governance can shift the actors' focus to procedural and contractual matters rather than total outcomes. Relational governance counters this effect by encouraging a holistic approach in which both flexibility and joint problem solving are important. We find that, in air ambulance procurements, the procurer has applied relational governance, with positive effect on organizational reliability. However, we also find that relational governance implies a difficult balancing act between flexibility-enhancing and stability-preserving approaches. Furthermore, when conflicts between a procurer and supplier are profound, neither contractual nor relational governance can necessarily provide adequate solutions. We argue that an implication of imperfect governance solutions is that procurer organizations and public policy makers need to take into account that the procurement of critical services can involve periods of reduced reliability in service output.

1. Introduction

In June 2017, a fixed-wing (airplane) operator providing ambulance services in Norway for almost 30 years lost the impending fixed-wing ambulance contract to a new operator. In the two years leading up to the new contract period, a high-conflict situation developed between the health trust procuring air ambulance services and the losing operator as well as between the pilots and the incoming operator. As a result, both before the new contract started and after, the number of crewed aircraft available for planned and emergency patient transport was lower — at times considerably lower — than the predefined acceptance level. For parts of the population in northern Norway, with long distances to the nearest hospital, this was experienced as a dramatic situation. Illustrative of this, in a little more than 24 h in May 2018, the Facebook group "People's movement for a safe and operative air ambulance" gained 50.000 followers. Referred to as "the air ambulance crisis" and extensively covered in the media, the fixed-wing ambulance procurement led to considerable political debate and the involvement of Parliament in the procurement process.

The "air ambulance crisis" provides a new perspective to what is already well known within safety sciences: organizational interfaces can create vulnerabilities that potentially jeopardize safety as well as critical service reliability (e.g., Almklov, Antonsen, & Fenstad, 2012; de Bruijne & van Eeten, 2007; La Porte, 1996; Le Coze, 2020; Roe & Schulman, 2008). Safety scientists engaged with organizational studies face an empirical context that is quite different from that of a generation ago: In the past decades, the megatrends of globalization and digitalization, as well as liberalization and deregulation, have profoundly shaped the environment that companies, public organizations and regulators operate in (Le Coze & Dupré, 2022). One key aspect is how single organizations that provide critical services, or are engaged in safety critical production, have been replaced by networks of organizations. This necessitates shifts in organization safety research towards "network failure accidents" (Le Coze, 2020) and towards critical service networks (e.g., Berthod, Grothe-Hammer, Müller-Seitz, Raab, & Sydow, 2017; de Bruijne, 2006).

Recognising the importance of these shifts, we argue that 'the devil is in the details'. If the aim is increased knowledge of how safety and reliability can be achieved for networks of organizations, we need research on specific network types in concrete contextual settings (Klijn, 2008). To complicate matters, the 'network' term lacks a shared definition and there are ambiguities in how it is applied (Provan, Fish, &

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Sydow, 2007). Our empirical object of study, the case of the Norwegian air ambulance service, illustrates the complexity and diversity of networks. At the core of our study is the procurer-supplier arrangement that characterizes public procurements. According to Klijn (2008), such public–private arrangements can be described as a type of governance network. The procurer-supplier arrangement is also a subset of a larger, complex air ambulance network aimed at providing patient transport and pre-hospital emergency healthcare. Moreover, as this case study will touch upon, in times of crisis, the network expands beyond its ordinary borders.

In its current form, public procurement goes hand in hand with the new public management philosophy (Greve & Ejersbo, 2011). Procurements are, at least in the European Union (EU) and Economic Community (EEC) member countries, aimed at crossing borders. In this sense it reflects the megatrends of globalization and liberalization (Le Coze & Dupré, 2022). Public procurement resembles the outsourcing, or contracting and subcontracting, of private firms. Contracting, like procurement, involves legally binding contracts, implying that roles and responsibilities are more precisely defined than in loosely connected networks. From research on high-risk industries and organizational accidents, we know that contracting and subcontracting can contribute to organizational accidents or in other ways compromise safety (Hayes & Tillement, 2022; Le Coze, 2020; Milch & Laumann, 2016). Likewise, research on critical service reliability for outsourced or procured services demonstrates that these arrangements can lead to issues affecting reliability (e.g., Almklov & Antonsen, 2010; Cedergren, Johansson, & Hassel, 2018).

Public procurements depart from private firms' outsourcing in at least one important aspect: they are bound by procurement regulations specifying how the procurements can be carried out (Dragsten, 2020). In other words, regulation frames the governance options of the procurer. We argue that understanding governance options within their boundaries increases our knowledge of how networked critical services reliability can be achieved. Hayes and Tillement (2022, p. 3) conclude that, from a safety perspective, contracting is "neither always bad nor good". Rather, the quality of the interactions of the involved parties, as well as the outsourcing situation, affect safety outcomes (Hayes & Tillement, 2022). Our line of argument follows the same track: we aim to demonstrate that reliability considerations make the governance of procured critical services a balancing act, and that the context and development of the procurement process matters for outcomes.

The empirical case of the Norwegian air ambulance services provides a unique opportunity to study procured critical services and how these can be governed to ensure safe and reliable service supply. In Norway, fixed-wing (airplane) and rotor-wing (helicopter) ambulance services are procured by a national health trust on 6- to 11-year contracts. The procurements, regulated by the EU Procurement Directive (2014/24) and the Norwegian Public Procurement Act, are carried out through competitive tendering processes. In this study, the most recent rotor-wing procurement (contract started in 2018) and fixed-wing procurement (contract started in 2019) are examined.

Analysing empirical materials from both procurements, we aim to provide a nuanced assessment of governance effects on service reliability. We build on the theoretical foundations provided by high-reliability organization (HRO) studies and subsequent organizational reliability studies of networks. However, given the limited research on the governance of such networks within the safety sciences (Berthod et al., 2017), and particularly the lack of studies concerning procured services, we expand our theoretical scope by including literature on contractual and relational governance. More specifically, we apply 'relational exchange theory' (RET) (Macneil, 1980) as a framework for analysing how relational governance was applied by the air ambulance service procurer and for assessing the reliability contributions and limitations of this. Given that RET has not been applied in organizational reliability studies previously, as part of our theoretical approach, we establish how the most central norms of RET resemble the reliability enhancing approaches of HROs and high-reliability networks (HRNs).

The study is guided by the following research question: *What are the reliability contributions and limitations of relational governance for procured critical services?* We have limited the study to two periods, which we define as the *transition phase* and the subsequent *contract implementation phase.* The transition phase is the time period between the awarding of a contract and the start of that contract, which in the case of the air ambulance contracts is approximately two years. The contract implementation phase is the period required to adjust to the contract. Based on interviews with relevant actors, we estimate this latter period to last for approximately one year after contract start.

2. Theoretical foundation

2.1. Organizational structures and processes underlying reliability

The assessment of reliability in this article builds on the theoretical foundation provided by studies of high-reliability organizations (HROs) (e.g., La Porte & Consolini, 1991; Roberts, 1990; Schulman, 1993). The HRO literature includes no agreed-upon definition of reliability (Busby & Iszatt-White, 2014). Initially, reliability was assessed in terms of "failure-free organizational performance" to understand how complex and hazardous systems could operate without major failures while maintaining capacity in periods of peak demand (La Porte & Consolini, 1991, p. 19). In this sense, reliability can be understood in terms of operational performance: a system which maintains operational performance, regardless of changing conditions, performs reliably (Weick & Sutcliffe, 2007). Implied in this understanding is the importance of organizations' reliability-enhancing structures and processes (La Porte, 1996). Accounting for the structures and processes that are a prerequisite for reliability is central to this article.

Importantly, such structures and processes have both formal and informal aspects. A valuable contribution of the HRO literature has been to shed light on how not only formal structures but also the more informal ones and the cultural aspects of organizations affect reliability. An example of this is the emphasis of HROs' cultures of high reliability, characterized by, amongst other things, high levels of personal engagement, willingness to report errors, and avoidance of blame placing (La Porte, 1996). In addition, a core characteristic of HROs is the ability to shift from formal hierarchical structures to command by sharp-end expertise during high-tempo or extraordinary situations (La Porte, 1996; Weick & Sutcliffe, 2007).

Maintaining reliability can imply stability: despite changing conditions, outcomes remain stable. However, this notion of reliability disguises the dynamic organizational processes required to counter input variability (Farjoun, 2010). At an operational level, input variance may require quick and flexible responses from front-line personnel with extensive system and resource overview (Roe & Schulman, 2008). At an organizational or system level, meeting variable and unexpected conditions requires innovation and an exploratory approach (Farjoun, 2010). At the same time, innovation and exploration depends on some degree of stability within the organization (Farjoun, 2010). While methods and rules can be constraining, they also reduce uncertainty and enhance legitimacy and trust, thereby enabling adaptation (Farjoun, 2010; Giddens, 1984; North, 2005).

2.2. Achieving reliability in networks: Challenges and examples of governance solutions

High reliability theory scholars recognised that achieving reliability is harder across organizations than in single organizations (e.g., Grabowski & Roberts, 1997; La Porte, 1996). Organizational studies have identified that, for critical services provided jointly by several organizations, challenges regarding, for instance, coordination, communication, and shared responsibilities may affect reliability (Almklov & Antonsen, 2014; Cedergren et al., 2018; de Bruijne, 2006). Nevertheless,

few studies have examined how public networks are organized to counter such challenges and ensure reliable service provision (Berthod et al., 2017). Some scholars have drawn attention to the need for research on high-reliability *networks* (HRNs), meaning the heterogenous, inter-organizational networks which deliver reliably under changing and unexpected conditions (Berthod et al., 2017; Clark-Ginsberg, DeSmet, Rueda, Hagen, & Hayduk, 2021). According to Berthod et al. (2017) and Clark-Ginsberg et al. (2021), an understanding of the governance of such networks is central.

Based on a case study of an emergency network in a German city, Berthod et al. (2017) identified that the network is governed through the different governance modes first described by Provan and Kenis (2007): shared governance (i.e., without central governance), governance via a lead-organization, and network administration organization (NAO) governance (where a neutral administrative body coordinates the network). In the case study, Berthod et al. (2017) described the informal processes of combining these governance modes as "layering", whereas a more abrupt "switching" to a centralized command structure was used when emergency situations occurred. They argued that these two processes are central for achieving reliability.

Although -Berthod et al. (2017) described an informal network which differs substantially from the explicitly defined structure of the air ambulance services, some of the observations from this case serve as an interesting background for assessing air ambulance service governance. Firstly, Berthod et al. (2017) highlighted the importance of mutual trust between key actors, resulting from joint planning and improvement activities. Secondly, the actors recognize the mandates, responsibilities, expertise, and interests of others. Thirdly, the actors had, in line with the fulfilment of their own mandate, a common interest in participating in the network and shared the goal of preventing large crises. As will be demonstrated, these factors resemble central aspects of relational governance and are highly relevant to the air ambulance case.

2.3. Contractual governance: Some identified challenges

Critical services are provided to the public through a broad spectre of organizational arrangements. Some of these, like public–private partnerships and public procurement from private or non-profit actors, include the joint contributions of public and private/non-profit entities. For such arrangements, contractual governance is central, due to the legal status of the contract and the specification of responsibilities (Greve & Ejersbo, 2011).

Contractual governance refers to governance by means of a formal contract (Cao & Lumineau, 2015). Complex contracts may specify the outputs to be delivered, the roles and responsibilities of the involved organizations, procedures for contract monitoring, and penalties for noncompliance (Poppo & Zenger, 2002, p. 708). In this way, contractual governance can reduce opportunism and safeguard inter-organizational relationships (Williamson, 1985). At the same time, contractual governance has some inherent limitations. On the one hand, the lack of specific clauses may lead to ambiguity and make opportunism possible (Cao & Lumineau, 2015). On the other hand, detailed contracts may lack a signal of trust (Poppo & Zenger, 2002). Furthermore, the *application* of contracts may be rigid or more flexible, potentially creating a mismatch between the involved organizations' understanding of how the contracts should be applied (Cao & Lumineau, 2015). Perhaps most importantly, it is impossible to anticipate all contingencies, so contracts are incomplete (Grossman & Hart, 1986; Williamson, 1979).

For publicly procured services, procurement regulations pose some specific limits on how contractual governance can be carried out. In the EU and EEC member countries (including Norway), public procurements of a certain minimum value are guided by the principles of competition, equal treatment, predictability, verifiability, and proportionality (Bovis, 2018). The judicial precedent of the EU Court of Justice has shown that these principles are central to the interpretation and application of the procurement directive (Arnesen, Hammersvik, Hjelmeng, Kolstad, & Rognstad, 2022). To a certain degree, the procurement regulations include elements of flexibility which can be important for critical service deliveries (Storsjö & Kachali, 2017). For instance, the procurement act allows accelearted procurement under unforeseen circumstances, including circumstances regarding the supplier that the procurer could not have foreseen (The Public Procurement Regulation, 2016, paragraph 5-2). In addition, contract revisions (`change orders') can be made to existing contracts. However, the procurer must avoid 'significant changes' that could have altered tender competition outcomes, which would violate procurement regulations. In effect, social considerations must be weighed against the possibility that they limit competition (Dragsten, 2020). Fearing mistakes that potentially lead to complaints, cancelled competitions, or – in the last resort – legal disputes, procurers are often concerned with carrying out correct processes at the expense of the quality of the procured services (Nærings- og fiskeridepartementet, 2019).

In organizational reliability studies, challenges with contractual governance are well known. In this literature, issues related to responsibilities for service provision are particularly emphasized. For instance, delivering according to contract may in effect mean that delivery happens at the minimum level defined by the contract (Willems, Busscher, van Den Brink, & Arts, 2018). This can include "work-arounds" to fulfil the requirements (Cedergren et al., 2018, p. 56). A striking example provided by Cedergren et al. (2018) is railway maintenance contractors that, in cases of traction power line failures, are obliged to be on site within a set time limit. To comply with the contract in situations when qualified staff are unavailable, unskilled staff are sent on site. Consequently, the contract terms are fulfilled, but the goals are not achieved, resulting in "micro efficiency but macro inefficiency" (Cedergren et al., 2018, p. 56). A response to suppliers' opportunistic behaviour may be over-monitoring by the contractor and a focus on procedural and contractual issues rather than the desired outcome (Willems et al., 2018). Related to this is the existence of mutual distrust, in situations both of competitive tendering (Willems et al., 2018) and of internal buyer–supplier models (Almklov & Antonsen, 2014). In cases where contractors do take on responsibility for their part of a task, a holistic responsibility may be lacking (Almklov & Antonsen, 2010).

2.4. Relational governance and the interaction with contractual governance

In recognition of the deficits of contracts and contractual governance, theories regarding relational governance have emerged. In literature discussing the effectiveness of relational governance and its interplay with contractual governance, three main theoretical approaches are used: transaction cost theory (TCT), social exchange theory (SET), and relational exchange theory (RET) (Cao & Lumineau, 2015). Whereas TCT is a theory within economics and related disciplines, the latter two focus on behavioural aspects of transactions. Put shortly, SET (Blau, 1964) focuses on trust as essential for stable social relations, while RET (Macneil, 1980) describes norms of behaviour which are central to exchange relations. These three theoretical approaches — particularly the latter two — are often combined (Cao & Lumineau, 2015).

Whereas the literature originally framed the relationship as a dichotomy where the two governance forms substitute or complement each other (Poppo & Zenger, 2002), later studies concluded that contractual and relational governance function as complements rather than substitutions (Cao & Lumineau, 2015; Zheng, Roehrich, & Lewis, 2008). However, the details and dynamics of this interplay remain understudied (Klein Woolthuis, Hillebrand, & Nooteboom, 2005; Zheng et al., 2008). Moving away from the substitution–complement dichotomy, contractual governance can be seen as enabling relational governance by framing behaviour, whereas relational governance compensates for the limitations of a contract (Benítez-Ávila, Hartmann, Dewulf, & Henseler, 2018). Furthermore, relational governance plays a facilitating role for both enforcing contractual obligations and engaging

in joint problem solving when faced with unforeseen contingencies (Zheng et al., 2008). As a result, relational governance is particularly relevant for long-term, complex contracts (Zheng et al., 2008). An important reason for this is that relational norms define "day-to-day collaborative micro-practices" (Benítez-Ávila et al., 2018, p. 440).

2.5. Relational exchange theory and connections to organizational reliability

Although several theoretical approaches to relational governance exist, we focus on RET (Macneil, 1980) in this article. Importantly, Macneil (1980) did not assess exchanges in terms of governance forms, but described the behaviour of the parties involved in an exchange (Ivens & Blois, 2004). In this article, we use relational governance as a concept to describe situations in which procurer behaviour is in accordance with relational exchange norms.

According to Macneil (1980), exchanges lie on a spectrum ranging from discrete to relational, depending on their "relational intensity". Of Macneil's 10 (originally nine) norms or principles of exchange behaviour, some are more central in discrete transactions, where the buyer specifies contractual terms which are fulfilled by the seller without any need for adjustments, whereas others are more relevant for transactions of a relational character. However, discrete exchanges also have relational attributes (Macneil, 1980). Furthermore, the norms themselves are transformed when moving from one end of the discrete–relational spectrum to another (Ivens & Blois, 2004). As an example, the discrete norm of solidarity focuses on fulfilling the individual transaction, whereas the focus of the relational norm of solidarity is on preserving the relationship (Kaufmann & Stern, 1988).

Macneil's (1980) norms have been criticized for being too numerous, overlapping, and difficult to operationalize (e.g., Noordewier, John, & Nevin, 1990). In this article, Macneil's (1980) identification of five dominant norms in relational exchanges is used as a starting point (see Fig. 1). Of these, we describe the dominant norms of role integrity, preservation of the relation, harmonization of relational conflict, and supra-contractual relations and discuss them in relation to the HRO and HRN literature. The last dominant role, propriety of means, is not treated as a separate norm because, by focusing on adapting the means used to achieve a goal, it overlaps with the norms of flexibility and restraint of power.

2.5.1. Preservation of the relation

Several of Macneil's (1980) norms can be grouped together in the dominant norm 'preservation of the relation' (see Fig. 1). In particular, the norms of contractual solidarity and flexibility are central to the preservation of the relation (Ivens & Blois, 2004). Contractual solidarity, described by (Macneil, 1980, p. 52) as "the norm holding exchanges together", places the relationship between the involved parties, rather than the details of the transaction, at the centre, thereby overlapping with flexibility, the other central component of preserving the relation. Flexibility in an exchange relationship can be described as adaptation to external or internal situations (Jobidon, Lemieux, & Beauregard, 2018). Also, restraining the use of power, even when one is in position to pursue one's interests at the expense of the whole, is important for the preservation of the relation. In a relational exchange relationship, it is understood that misuse of power may increase conflict levels and undermine the relationship (Cannon, Achrol, & Gundlach, 2000). This links it to the overarching goal of preserving the relation. In summary, we understand the norm of the preservation of the relation as the guiding principle to which all other relational exchange norms submit.

Preserving the relation can be seen as a holistic approach with similarities to HRO and HRN approaches. In much the same way that the context of the relationship as a whole determines how details of a transaction in an exchange relationship are treated, the context of reliability determines the structure and inner workings of HROs. Similarly, for HRNs, the overarching goal is reliable output, even in the case of unexpected incidents and peak activities. In fact, the networks owe their existence to some desired output which calls for the contributions of the organizations constituting the network (Berthod et al., 2017). In an HRN, such as the network described by Berthod et al. (2017), the network's overall goal, aligned with the goals of each participating organization, appears to be the guiding principle defining the need for commitment to the network during quiet periods as well. Furthermore, for both HROs and HRNs, flexibility and adaptability are central for achieving reliability goals.

However, one difference between RET and HRO/HRN theory with

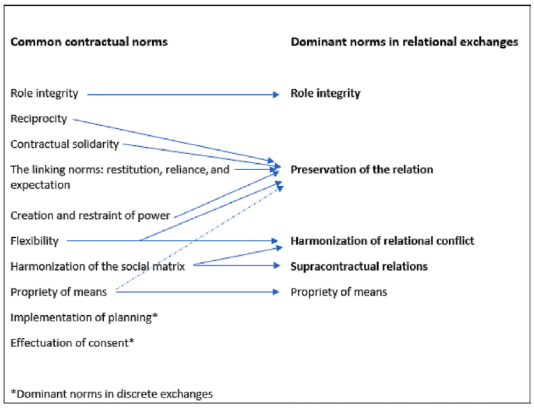

Fig. 1. Dominant norms in relational exchanges (Macneil, 1980). Adapted from Ivens and Blois (2004). The dotted arrow indicates an adaptation made in this article.

regards to the holistic approach is RET's emphasis on power restraints. Power has seldomly been discussed in studies of safety culture (Antonsen, 2009) and appears to be downplayed in HRO literature. One explanation may be that restraints in power are implicit in the way in which HROs are run. Similarly, although Berthod et al. (2017) did not discuss power as an explicit theme, the HRN lead organizations' restraint in use of power is implicit in the layering and switching of governance modes. Centralized control is exercised when necessary, but refrained from in preparatory, quiet periods.

2.5.2. Role integrity

In relational exchanges, roles are highly complex and multidimensional (Macneil, 1980). Role integrity refers to the stability of each party's role to ensure predictability within the relationship (Macneil, 1980). This also includes each party fulfilling their obligations so that overall project objectives are met (Jobidon et al., 2018).

The norm of role integrity has parallels to the roles of expertise groups described in HROs. In HROs, work tasks are highly specialized and complex, and reliability depends on the contributions of each expertise group. A core characteristic of HROs is the deference to expertise during high-tempo and emergency periods. Implicit in this characteristic is the expectancy for experts to fulfil their roles. As demonstrated by Roe and Schulman (2008), the "reliability professionals" on whom critical infrastructure services depend go beyond even these formal expectancies. In this sense, role integrity can be seen as being integrated into HROs and central for achieving reliability.

In HRNs, the full scope of the roles of each participating organization is not necessarily known to the other organizations. However, participation in joint planning and preparedness meetings results in an increased mutual awareness of the various organizations' responsibilities, expertise, and interests (Berthod et al., 2017). Berthod et al. (2017) argued that this participation is core for achieving reliable outcomes in times of peak activity. In other words, HRNs strive to ensure predictability within the relationship by making the roles of each participating organization known to the others.

2.5.3. Harmonization of relational conflict

Conflict or tension is seen as a common component of exchange relationships due to the inherently diverging interests of the parties (Kaufmann & Stern, 1988). Although the dominant norm of 'harmonization of relational conflict' (Macneil, 1980), overlaps with the norm of the preservation of the relation, its status as a separate norm emphasizes the possibility of conflict within an exchange relationship as well as the potential for resolving it. In essence, at the relational end of the scale, parties are willing to see disagreements over details in the transaction in the context of the relationship as a whole (Kaufmann & Dant, 1992). Whereas conflict resolution in discrete transactions are dealt with formally and externally (for instance, litigation), in a relational exchange, conflicts are resolved informally within the relationship (Kaufmann & Dant, 1992; Macneil, 1980).

In contrast, a striking feature of safety culture studies in HROs as well as in other organizations is the lack of emphasis on organizational conflict (Antonsen, 2009). For example, the shifts from hierarchical management to sharp-end decision making in high-tempo or crisis periods (e.g., La Porte, 1996) appear to be processes characterized by agreement. To be fair, problem solving within HROs is not described as friction free; nevertheless, the negotiations over reliability-enhancing solutions (Schulman, 1993) seem to be knowledge based rather than caused by divergent interests. Although it may be true that studies of safety culture overlook organizational conflict and power issues (Antonsen, 2009), it may also be that HROs encourage processes similar to those of relational conflict resolution. The context of the holistic relationship is central to problem solving in relational exchange relationships; the context of the shared goal of reliability is central to how problems are solved in HROs.

As previously mentioned, the literature discussing the reliability of networked critical services described how the fragmentation of service supply can lead to conflicting views on responsibilities and aims. However, it does not discuss this in detail. In addition, in the HRNs described by Berthod et al. (2017), the existing tensions (e.g., between autonomy and accountability) appear to be solved without conflict. This is attributed to the efforts made towards maintaining the network in quiet times (Berthod et al. (2017).

2.5.4. Supra-contractual relations

The norm of harmonization with the social matrix — the most relevant part of the dominant norm of supra-contractual relations (see Fig. 1) — has been largely ignored in empirical studies, at least within marketing science (Ivens & Blois, 2004). However, when linked to the reliability of critical services, it is fundamental. According to Macneil (1983), the social matrix defines some minimum conditions necessary for exchange to occur, making some contractual statements central and others unnecessary. This is illustrated through the example of a transnational transaction, where foreigners often react to what is included and not included in a contract (Ivens & Blois, 2004). Therefore, we understand the norm of supra-contractual relations as accounting for the context specific to the society in which the exchange is made.

For HROs, the societal context plays an important role. The public expectations of safe and reliable operations serve as an internal justification for allocating sufficient resources to this end and put pressure on HRO managers towards "being worthy of the public trust" (La Porte, 1996, p. 67). For HRNs as well, reliability is a prerequisite for external legitimacy (Berthod et al., 2017). Berthod et al. (2017) linked public legitimacy to the interplay between accountability and autonomy and to the question of governance dynamics. Particularly in crisis situations, clear lines of responsibility may be necessary to comply with public scrutiny (Berthod et al., 2017). In this sense, public expectations can be said to constrain the governance options available within an HRN.

3. Case description

A main objective of the Norwegian health trusts is to provide good and equal specialist health services to those who need them at the time they need them, regardless of their place of residence, age, economic background, or other individual factors (Helse- og omsorgsdepartementet, 2021). As Norway is a sparsely populated country with challenging topography and weather conditions, the air ambulance service is a vital supplement to road ambulances for achieving this objective.

A national health trust (from now referred to as 'the procurer') owned by the four regional health trusts is responsible for the operational part of the services, including responsibility for procurements (with assistance from a health trust specializing in procurement) and contract management of the air transport services. In addition, they oversee a flight coordination centre that coordinates all fixed-wing operations. An overview of central air ambulance service actors is shown in Fig. 2.

The operational service consists of both fixed-wing and rotor-wing services, which are substantially different from each other. Fixed-wing services are used to transport patients over larger distances, mainly from short-field airports. In northern Norway, where four of the six fixed-wing bases are situated, fixed-wing services are to a large degree used for emergency missions, whereas the majority of the missions in southern Norway are planned (Luftambulansetjenesten HF, 2017a). The aircraft are crewed by pilots (employed by the operator) and specialist nurses (provided by local health trusts). Rotor-wing services are primarily used for emergency missions, including in areas difficult to reach by road ambulance. The 12 bases (2019 figure) are spread across the country and are located at or close to hospitals. A helicopter crew consists of a pilot and a rescuer employed by the operator and a medical doctor employed by the corresponding local health trust.

Before the most recent rotor-wing procurement (contract started in 2018), rotor-wing services were provided by two operators. In the latest

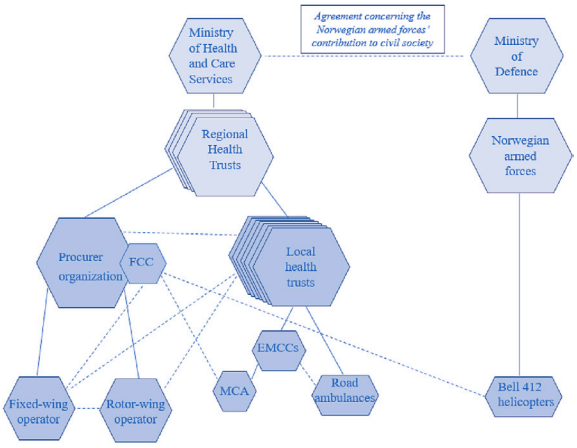

Fig. 2. Overview of central air ambulance service actors. Abbreviations: EMCCs – Emergency Medical Communication Centres; FCC – Fixed-wing coordination central; JRCCs – Joint Rescue Coordination Centres; MCF – Medical coordination of fixed-wing ambulances. In the figure, lines indicate hierarchical relationships and stapled lines indicate operational interaction. The Ministry of Defence and their subunits are not part of the air ambulance service but provided helicopter resources during "the air ambulance crisis". Sources: Norwegian Board of Health Supervision, 2021; Helse- og omsorgsdepartementet, 2021.

procurement, the operator at three of the bases lost these contracts to the other operator (from now referred to as 'the rotor-wing operator'). According to evaluation reports, the transition phase was challenging (Helse- og omsorgsdepartementet, 2021). This was confirmed in our interviews with operator management and operational personnel who highlighted challenges with transferring personnel (since the procurement had not been defined as a transfer of undertaking) and the time and resources spent on preparing for a new contract at the expense of other activities. Nevertheless, all in all, the change of operator and the start of a new contract period was seen as a success. Cooperation between the operators and between the procurer organization and the operator worked well, and output reliability was maintained throughout the period (Helse- og omsorgsdepartementet, 2021).

For the fixed-wing procurement (contract started in 2019), the process was substantially different. The same operator who had lost the 2018 rotor-wing contract (from now referred to as 'the outgoing operator') had been contracted at all fixed-wing bases for decades. In 2017, the outgoing operator lost the 2019 contract to an operator with air ambulance experience from Scandinavia but not Norway ('the incoming operator'). The outgoing operator questioned the grounds on which the contract was awarded and notified an interim court order. Although the case ultimately was not taken to court, the loss was not accepted by the outgoing operator. In addition, the incoming operator and the pilots' trade union initially failed to reach an agreement over the collective transfer of pilots to the new operator. During parts of the transition period and the contract implementation period, output (measured as the availability of crewed aircraft) was lower than the limits defined by the contract (Slotsvik et al., 2021), particularly during the first months of the new contract period, when extra resources (crewed aircraft) had to be provided by both the incoming operator and the procurer organization. The reduced output and conflicts between the involved actors led to considerable media attention and political involvement in the procurement.

4. Method

The study adopted an explorative case study design, in which explanation building is an iterative process (Yin, 2018). The study formed part of a larger research project aimed at exploring effects of public procurement on critical service reliability. The application of relational governance was not a predefined topic of interest but emerged as a highly relevant theme in the course of data analysis.

Data were collected from a combination of documents and interviews, in addition to introductory meetings and a workshop with the participating organizations. Documents included publicly available board meeting documents from the procurer organization, official reports on the air ambulance service, Parliament documents, newspaper articles, and publicly available correspondence between the procurer organization and relevant organizations. The latter two categories of documents were systematically reviewed using the news archive Retriever (Atekst) and the public post overview of the procurer organization, respectively. The interviews included three semi-structured group interviews with eight representatives from the procurer organization and a total of 28 semi-structured individual interviews with representatives from management and administrative representatives from the three operators, fixed-wing pilots, rotor-wing pilots and rescuers, the pilots' trade union, and medical doctors associated with the air ambulance service. For the purpose of this study, the interviews with procurer representatives and operator representatives are the most central.

With the exception of the procurer interviews, which we conducted at the very start of the data collection process, interview questions were structured around the different phases of the procurement processes. This was done to capture the dynamic development of the processes, rather than describing a more static presence of particular characteristics (Langley, 2009). Moreover, we wanted to get a thorough understanding of the research participants' perceptions. For each procurement process phase, the opening question was "How would you describe the period from xx to xx?". This was followed by questions concerning the research participants' actions in this period, the challenges they

encountered and their general assessment of the period. In situations where the research participants' statements appeared unclear, we validated our understanding by rephrasing the statements and asking the participants whether our understanding was correct.

We transcribed and coded interview materials using NVivo. Initially, the coding of the interview material was empirically guided, resulting in an abundant number of codes. This led to the recognition that main relevant themes had to be identified. One central theme was the procurer's governance approaches and the governance issues they encountered. This made us familiarize ourselves with contractual and relational governance literature, and led to a particular interest in RET (Macneil, 1980). The second round of coding was guided by RET norms. We extracted all quotes concerned with governance and the procurer-supplier relations from the interview material. Next, we operationalized the most relevant norms (preservation of the relation, role integrity, the harmonization of relational conflict, and supra-contractual relations) to structure the extracted quotes. The operationalization is shown in Table 1.

For each group (procurer organization, operators), we then identified and synthesized meaning from the quotes, using a text condensation approach (Malterud, 2012). Presenting our results (Section 5), we have used a combination of quotes and synthesis.

5. Results

Before analysing the role of relational governance in the air ambulance procurements, we first give a short account of the role of contractual governance, including its contributions and limitations, within the setting of the air ambulance service. As described below, contractual governance was indispensable yet insufficient for achieving reliable service supply. Instead, our assessment of the contributions and limitations of relational governance first demonstrates why relational governance played a constructive role in the interaction between the procurer organization and the operators who were awarded the new contracts. Then, our analysis of the developing conflict with the outgoing operator demonstrates the limitations of relational governance. We explore each process in turn through the framework of RET norms, namely: supra-contractual relations; preservation of the relation; role integrity; and harmonization of relational conflict.

5.1. Reliability contributions and limitations of contractual governance

In a complex and critical service delivery context like that of the air ambulance services, the value of the contract for achieving reliability can hardly be exaggerated. Fitting the description of complex contracts (Poppo & Zenger, 2002), the air ambulance service contracts define the roles and responsibilities of the parties, determine delivery output, and specify penalties for noncompliance. Interview participants from the procurer organization describe contract revisions and contract meetings as frequent and decisive for monitoring the air ambulance service deliveries. Furthermore, contractual governance frames the possibilities for relational governance. For instance, the operator is obliged to supply the procurer with relevant information and participate in air ambulance network fora.

Table 1
Operationalization of relational exchange norms.

RET norm	Key feature of norm	Operationalization – key words
Preservation of relation	Placing the relation in the centre	Flexibility Cooperation Acknowledgement of the other party's contribution
Role integrity	Predictability / stability	Competence Consistency of behaviour
Harmonization of relational conflict	Conflicts are inherent to exchange relationships but can be solved	Conflicts resolved informally
Supra-contractual relations	Context	The importance of critical services for society

Smaller amendments to the contracts can be made through change orders. However, in the words of one of the procurer interviewees, these amendments must be balanced against "the legal trap", as amendments can be interpreted as significant changes to the initial specification of requirements and, consequently, counter the procurement principles. Instead, the preparation of a new tender becomes the one big opportunity for making improvements in terms of both service quality and the defining of responsibilities. A telling example of this comes from the procurer's evaluation of the 2019 fixed-wing procurement:

> *There is a lot of experience and learning points to be drawn from this project. One of the most important should be to specify in the contract an obligation to transfer the service to a new operator over a longer time period, base by base. In future agreements, it should be described as accurately as possible how the transition to a new contract period and possible change of operator should be carried out* (Luftambulansetjenesten, 2019).

Although this quote illustrates a strong belief in the contract as a governance tool, procurer representatives also recognized some inherent limitations of contractual governance. For instance, they stressed the need for informal information sharing in addition to formal contract monitoring. As one interviewee described it, "It is necessary to have a lot of informal conversations to make the system work in the best way possible". Although this may be true for many systems, these long-term, complex procurements have specific characteristics that make it difficult to rely on formal governance alone. Firstly, not only is the contract period long, but the terms are specified years in advance of the contract start. Secondly, contract governance at the start of the contract period is particularly challenging. A procurer interviewee described that,

> *When it comes to the soft [contractual] requirements, like descriptions, routines, procedures, handbooks and so on … adjusting this to what they wrote two and a half years ago … well, they often need some assistance to get on the right track, to put it that way.*

Finally, the complexity of the procurements makes it difficult to account for all eventualities.

5.2. Reliability contributions of relational governance

Not disregarding the importance of contractual governance, or periods of reduced output reliability (Slotsvik et al., 2021), we claim that relational governance played a profound role for organizational reliability during the transition phases and contract implementation phases of the two most recent air ambulance procurements. To elaborate on this, we provide descriptions of procurer behaviour which has been in accordance with the RET norms.

5.2.1. Supra-contractual relations

We understand the norm of supra-contractual relations as the exterior contextual factors which constrain and enable behaviour within an exchange relationship. Acknowledging the importance of other contextual factors, we focus our analysis on how the role of the air ambulance service as a critical service to society affects behaviour options within the air ambulance procurer–operator relation.

The norm of supra-contractual relations is essential for understanding procurer behaviour in a critical service context. Other actors' expectations and involvement when preparedness is challenged illustrate the important societal function of the air ambulance service. For instance, as one procurer interviewee expressed, the four regional health trusts that own the procurer organization strongly emphasize preparedness:

In my experience, what the owners are concerned about is when there is a failure in the agreed delivery. In other words, unexpected events or concerns about the preparedness […]. That's when I experience that we get the most involvement from the owners.

Another interviewee pointed out that the Ministry of Health and Care Services involves itself if preparedness is affected: "anything that smells like it might reduce preparedness on a national level makes the [Ministry's] alarm bells sound". In addition, media attention response from impacted groups and political parties during the air ambulance crisis demonstrate the importance of this service to society. According to one procurer representative, during this period, the procurer organization identified 30 different groups (e.g., political parties, labour unions, medical units) who were involved in the public debate.

The overall responsibility for operational parts of the air ambulance service limits the behaviour options of the procurer. Procurer interviewees described that a small reduction in service delivery can be handled for a short period by defining stricter priorities in terms of which patients are to be transported by air. One procurer representative explained that "today, the air ambulance service carries out quite a few patients transports that you wouldn't prioritize in an emergency situation". Furthermore, to an extent, alternative resources can be acquired. This was done during the fixed-wing transition phase and contract implementation phase, in part by cooperating with the Ministry of Defence. In the words of one of the procurer interviewees,

We set all rules and regulations aside. A crisis is a crisis. The Ministry [of Health and Care Services] contacted the Norwegian Armed Forces, responding to requests further down in the system. And then the Ministry of Health and Care Services and Ministry of Defence reached an agreement about the latter's contribution.

However, access to suitable alternative resources is limited, further constraining the options of the procurer. One of the interviewees described it as follows: "if one of the operators has a total service failure, then we simply don't have any remedies for it. We have to get the existing operator back on its feet.".

5.2.2. Preservation of the relation

Against the backdrop of the critical service context, there are no acceptable alternatives to making the procurer–supplier relation work. The RET norm preservation of the relation holds that this is done by placing the relation, rather than the details of the transaction, at the centre (Macneil, 1980). The give-and-take attitude characterizing the preservation of the relation norm counters some of the limitations of contractual governance that we have described previously. The joint efforts towards making the relationship work are particularly evident at the start of a contract period. According to one of the procurer interviewees,

My impression is that when one starts a new contract both we and the supplier discover that there are a lot of requirements which aren't met or that we have different understandings of the requirements. And then we have to go back and forth for a while, adjusting requirements and change orders, but after a while this settles down quite well.

A holistic approach was also reflected in the procurer's attitude towards payment reductions in cases of non-compliance: "we have postponed the payment reductions until the situation has been clarified, to make sure there is liquidity, so that we as customers aren't the ones pushing the operator over the edge."

The preparations for and implementation of a new fixed-wing contract in 2019 offer a particularly suitable example of the importance of preserving the relation. As confirmed by all three operators, the start of a new contract period is challenging, time-consuming, and resource demanding. For an operator who lacked air ambulance experience in Norway and had to establish a Norwegian branch of the company, the challenge was all the larger. Added to this were the difficulties of cooperating with the outgoing operator and their pilots. In the interviews, representatives from the procurer and the incoming operator highlighted the other's ability to handle difficult situations and adapt to the circumstances in both the transition phase and the contract implementation phase. For example, one of the procurer interviewees stated that, "If someone is to be praised, I think the incoming operator did a good job in terms of the obstacles they ran into. That they didn't give up. Because really, they have run into a lot of trouble." The incoming operator confirmed the good relationship, describing the procurer as a professional counterpart and the cooperation as positive. For example, one incoming operator interviewee explained that "it has been important to [the procurer organization] that we succeed".

Of course, assessed in terms of service output, which was considerably below the predefined level at the start of the contract period (Slotsvik et al., 2021), one could argue that simply preserving the relationship was not sufficient to reach the output goals. However, an alternative assessment is that the considerable efforts invested in joint problem solving and adaptations were key for avoiding further reductions in output.

Furthermore, the procurer–supplier relationship appears to be particularly important in complex procurements where the quality and continuous quality development of the service are hard to predefine. This was evident in the rotor-wing contract implementation phase, where progress plans and contract deliveries were monitored, but there was less room than usual for developing the service. A rotor-wing operator representative explained,

A challenge has been that, in the phase where we felt we were in control of deliveries and operations, [the procurer] had an ongoing parallel process that required a lot of energy from them […]. That also meant that the customer–supplier relationship was a bit different from what it has been afterwards, when things calmed down.

In effect, the challenging fixed-wing transition meant that the procurer, over a two-year period, lacked the time and resources for more elaborate cooperation with the rotor-wing operator. Another rotor-wing operator interviewee explained that "we got a smaller collaboration platform with our client than we normally would have had to develop the service together and to attend to it and so on." Thus, achieving output reliability in this sense required not only a *preservation* of the relationship, but also an *expansion* of the relationship. Under the given circumstances, the procurer was unable to meet this need.

At the same time, reliability-enhancing adjustments are balanced against the limits set by procurement regulations. An illustrative example is evident in the preparation for the 2018 rotor-wing contract. According to the contract, new helicopter models were to be implemented at all bases. Fearing start-up trouble that would affect output reliability in the running-in of the new models, the rotor-wing operator argued for a gradual replacement of helicopters at the nine bases it already operated. Initially, the procurer organization, claiming that this could be interpreted as a violation of the procurement principles, was reluctant to do so. A rotor-wing operator representative explained that "they were terrified that this might have a retroactive effect, in terms of who won the tender and that kind of things. But that particular time, we succeeded [in convincing the procurer]". This statement implies that there are other occasions when contract adjustments cannot be made due to the procurement regulations and procurer's interpretations of them.

5.2.3. Role integrity

The norm of role integrity, reflecting predictability within the relationship due to the stability of each party's role (Macneil, 1980), appears to have been highly relevant to organizational reliability in the air ambulance service, where the role of the procurer can be characterized as complex and multidimensional. In addition to being responsible for the flight operational aspects of the air ambulance service, the procurer is expected to contribute to cooperation between the health trusts at a

national level and to be a centre of expertise in selected areas (Luftambulansetjenesten HF, 2017b). Ambiguities in the holistic responsibility for the air ambulance services (Norwegian Board of Health Supervision, 2021) contribute to making the role of the procurer complex. Even when narrowing the focus to the procurer–operator relationships, the role of the procurer is characterized by complexity. The procurer organization takes on the roles of contract supervisor, mediator between operators and medical units, and medical/technical advisor.

Our analysis shows that procurer competence contributes to preserving role integrity. Procurer staff include professions with specialist competency in both the medical and aviation fields. Procurer interviewees stressed the importance of this, saying that "it's essential that our people have a high enough competence to be seen as equal or capable. There is no trustworthy communication if our medical and operational staff don't have sufficient competence."

Although representatives from the operators pointed at concrete deficiencies in the procurer's competence, their overall judgement, as expressed in interviews, was that the specification of requirements and procurement processes showed high procurer competence in many areas. In addition, the operators recognized that a steady employee situation in the procurer organization had a stabilizing effect on the procurer–operator relationship.

Role integrity is also achieved by ensuring that the procurer organization appears consistent to the operators. For instance, procurer management stressed the need to communicate contract requirements both within their own organization and to the operators to avoid revision teams having to face the attitude that deviations from the contract have been informally accepted by other procurer representatives. In the words of one of the procurer interviewees,

> *We are very aware of that one can't make new arrangements with the suppliers, because that makes it impossible for the revision teams. [The operators] can't say, "Yes, but I called [procurer headquarters in] Bodø and they said it was okay". So, we put a lot of effort into that.*

Interestingly, procurer representatives argued that one of the reasons for avoiding contract deviations is that they must ensure equal treatment of the operators. They also feared that lenient contract monitoring would affect future tenders. According to a procurer representative, "What we fear is that people that participate in tenders just write something and then they know that they can change it later on". In this way, the stabilizing effect of role integrity appears closely associated with contractual governance.

5.2.4. Harmonization of relational conflict

Relational exchange theory highlights the exchange relations' inherent potential for conflict, but also the potential for resolving these conflicts within the relationship. The relationship between the procurer and the incoming operator illustrates both these aspects clearly. One example of a situation with a high conflict potential was the need for extra resources (crewed aircraft) to compensate for reduced service output in the fixed-wing contract implementation phase. In effect, extra resources were acquired by both the operator and the procurer organization. Discussions regarding who was to pay for the extra external resources were postponed and were, at the time of the interviews (i.e., December 2020), not resolved. Importantly, the ongoing discussions have not hindered cooperation regarding operational aspects. In other words, the mutual efforts for resolving the potential conflict and keeping it apart from areas where cooperation is needed can be seen as reliability-enhancing behaviour.

5.3. Limitations of relational governance: The conflict with the outgoing operator

Although complex, long-term public procurements like those of the air ambulance service benefit from applying relational governance, this governance form has some pronounced and perhaps inevitable limitations affecting reliability. Here, we highlight some of these limitations by focusing on how the evolving conflict between the procurer and the outgoing operator in the fixed-wing procurement, as well as the consequences of this conflict, can be understood by applying RET norms. The norms are presented according to their relevance for the conflict situation.

5.3.1. Role integrity

The norm of role integrity encourages predictable behaviour and, thus, stability in the relationship. In contrast to the fixed-wing procurement, the rotor-wing procurement can be interpreted as a situation where procurer role integrity towards the outgoing operator was maintained. To the operator, the loss of the rotor-wing ambulance contract had been a defeat, albeit an acceptable one as they, overall, experienced the competition as fair. This situation, as well as the competing rotor-wing operator's early initiative to employ pilots and rescuers from the outgoing operator, was decisive for the outcome of the transfer process. In the words of a representative from the outgoing operator, *"Of course, it was still a demanding period. But the transition was as smooth as it could be. The cooperation worked well both between [us], [the other rotor-wing operator], and [the procurer] as a client."* Rotor-wing operator representatives confirmed this as well. For instance, one of them described the process as not being "complicated at all. We compete when we compete and cooperate when the competition is over, to put it that way."

The fixed-wing procurement was experienced entirely differently by the outgoing operator. According to pilot interviewees, the outgoing operator had been confident of winning the contract, believing that they were the only operators with the competence to meet the tender's quality requirements. Given their familiarity with the procurer through decades of fixed-wing and rotor-wing ambulance procurements, as well as their recent experience with the latest rotor-wing procurement, they assumed that they knew how the tenders would be assessed. When describing the procurement process in retrospect, operator interviewees argued that they were assessed incorrectly. According to them, one of the most significant errors made — and one decisive for the outcome of the process — was the high score given to the competing operator's unrealistic progress plan and that the procurer should have realized that this would affect service delivery. Based on these factors, we argue that the outgoing operator experienced the awarding of the contract to the competitor as a deviance from prior behaviour and, thus, as a breach in procurer role integrity.

5.3.2. Preservation of the relation

Once the breach of the relationship was a fact, the procurer's attempts to preserve the relationship and secure a smooth transition period were unsuccessful. The procurer organization undoubtedly spent considerable time and resources trying to resolve difficulties in the service transfer between the two operators. However, the case material shows an almost deadlocked situation where the causes of the situation were attributed to the other party. Although each party argued in the interviews that they made important contributions towards solving the situation and that the counterpart failed to do the same, in sum, the give-and-take attitude reflected in the norm of preservation of the relationship was absent.

According to procurer interviewees, the outgoing operator demonstrated a clear lack of goodwill and wanted to make the transition as painful as possible. The incoming operator had a similar interpretation, as expressed by a representative from the incoming operator:

> *It's fair enough to be critical [of the contract awarding] in hindsight but at the same time one has to look at one's own goodwill towards finding constructive and good solutions. And [the outgoing operator] hasn't made too much of a contribution here.*

The outgoing operator, on the other hand, described in the interviews that the solutions suggested by the procurer and incoming

operator would violate existing aviation rules. An outgoing operator interviewee gave one example of this:

> *You can have the intention that something is to be seamless, but when you ask for something [e.g., training pilots without taking them out of their ordinary work schedules] which is impossible without breaking the law and European aviation regulations…*

To an extent, it can be argued that, to the procurer, it was more important to preserve the relationship to the incoming operator than to the outgoing operator. In this sense, the norm of the preservation of the relationship is limited in situations where the end of a contractual relationship approaches and the establishment of a new relationship between the two parties seems unlikely.

5.3.3. Harmonization of relational conflict

The relational norm of conflict resolution holds that conflicts are solved within the relationship, not externally. As the fixed-wing procurement had no juridical consequences, despite the high conflict level, it would appear plausible that this norm did, in fact, apply in the relationship between the outgoing operator and procurer. However, interviews with outgoing operator representatives indicated that the procurement did have the potential for ending up in court. When the contract was awarded to the competitor, the outgoing operator called for an interim court order while considering whether to bring the procurement to court. In the end, they decided not to do so. According to an operator representative, this was due to short time limits, difficulties in obtaining documents from the procurer, and the fact that the evidential burden would be on them as prosecutors. Another interviewee from the outgoing operator highlighted the workload and complexity of the case as reasons for not bringing the procurement to court. Based on this, we argue that the operator had practical rather than relational reasons for attempting to solve conflict internally and not externally.

5.3.4. Supra-contractual relations

Our analysis of the effect of the norm of supra-contractual relations is narrowed down to how the criticality of the air ambulance service to society affects the procurer–operator relationship. Interviews with both procurer and outgoing operator representatives leave no doubt of the joint awareness of how important output reliability is. Outgoing operator interviewees described that it was important to them to develop the service and that they were proud of their role in society. As expressed by one of them, "we have viewed ourselves as more — a lot more — than a bottom-line supplier".

Nevertheless, contractual arrangements encourage a time-limited responsibility for service reliability by setting an end date for the suppliers' contributions. Seeing how the fixed-wing ambulance transition developed, it appears that supra-contractual relations are not sufficient to encourage a more holistic sense of responsibility for service provision either. Put somewhat bluntly, other considerations surpassed the outgoing operator's potential contribution towards reliability in the contract period succeeding theirs.

6. Discussion

6.1. Indispensable reliability contributions of relational governance

Societal expectancies related to critical service reliability are high. For HROs, the shared goals of reliability and safety trumps all other considerations (La Porte, 1996; Roberts, 1990). For HRNs, a shared output goal may be the very reason why the network came into existence (Berthod et al., 2017). Yet, when service delivery is split between organizations, working towards a common aim and sharing responsibilities for reaching it is often problematic (Almklov & Antonsen, 2010; Cedergren et al., 2018). Rather, each organization's efforts to reach their own goals, even when at the expense of the whole, can lead to "micro efficiency and macro inefficiency" (Cedergren et al., 2018, p. 56). For critical services, if macro inefficiency translates to reduced reliability, this is problematic. Thus, it seems essential for critical service governance to understand what makes organizations pull in the same direction.

For publicly procured critical services, contractual governance provides a partial solution to this challenge. By defining roles, responsibilities, output, and consequences of non-compliance, the role of the contract in complex transactions is indisputable (Poppo & Zenger, 2002). Furthermore, some limitations of the contract can be reduced. For existing contracts, change orders can define necessary changes, although these must be balanced against procurement rules and additional costs. In addition, procurements can serve as learning processes, where deficiencies in one contract become improvements in the next. Nevertheless, for complex, long-term contracts, this learning process is limited. Not only do the time periods between two subsequent long-term contract signings complicate learning, but the circumstances surrounding two contracts will never be identical.

In terms of reaching the overarching goal of reliable service supply, contractual governance can fall short. Although the contract can provide incentives which encourage the supplier to contribute to the goals of the procurer, an inherent limitation of contractual governance is that procedural and contractual issues may overshadow the focus on overall goals and outcomes (Willems et al., 2018). Furthermore, it opens for deliveries at the bare minimum of the contract (Cedergren et al., 2018; Willems et al., 2018). Disturbances and emergencies are not only hard to predict, but they may also require coordinated responses across organizations to ensure reliability. These are harder to cover in contracts (Almklov & Antonsen, 2014; Cedergren et al., 2018).

A reliability contribution of relational governance lies precisely in countering contractual trenches and instead providing a holistic approach. Or, as phrased by an operator representative describing the air ambulance procurer: "it has been important to them that we succeed". With this as a starting point, a give-and-take attitude, with joint contributions towards the relationship and the shared goal, forms the relationship, not least because it encourages adaptation, flexibility, and joint problem solving. In this way, relational governance resembles how HROs adapt to changing circumstances to maintain reliability and safety. An important aspect of this includes exceeding the minimum contributions that each organization is required to make. Instead, the organizations demonstrate an attitude which resembles that of reliability professionals (Roe & Schulman, 2008) in the sense that their contributions go beyond the minimum requirements.

Based on our analysis of the air ambulance procurements, we argue that relational governance may be important for many publicly procured services and that for critical services, where reliable outcomes are of utmost importance to society, it becomes indispensable. This is particularly true when there are limited alternative resources, such as for the air ambulance services. Although smaller reductions in output can be compensated for, larger or long-term reductions cannot be tolerated. Consequently, the procurer–supplier relationship *must* work.

Arguing that both contractual and relational governance is needed to maintain reliability for publicly procured critical services, we observe that the two modes are closely linked together. Berthod et al. (2017) have described how a German emergency network combined different governance modes through "layering". To this end, the governance modes of shared governance, lead-organization governance, and network administrative organization (NAO) governance were used simultaneously to deal with inherent tensions in inter-organizational networks (Berthod et al., 2017). Although the size and loose bindings of the network they describe, as well as the governance modes relevant to the network, differ markedly from a procurer–supplier relationship, "layering" appears to be a relevant term for the governance of procurement relationships as well. Agreeing with Klein Woolthuis et al. (2005) and Zheng et al. (2008) that the details of the interplay between contractual and relational governance still need to be uncovered, the concept of "layering" is valuable for describing how these modes can be

applied simultaneously and that they are interwoven.

However, in some respects, contractual governance and relational governance appear so closely interwoven that they not only overlap, but also interrelate. In the air ambulance case, we saw that contractual governance is particularly closely connected to the norm of role integrity. The contract, by specifying expectations of each of the parties, contributes to the predictability and stability that the norm of role integrity encourages. In fact, the procurer organization representatives demonstrated an awareness of this link. They argued that adherence to the contract resulted in predictability for current operators but also for future tender competition participants by making it clear that written offers were to be fulfilled. As argued by Farjoun (2010), rules can reduce uncertainty and build legitimacy and trust.

6.2. Inherent tension between flexibility and stability

A more fine-meshed analysis showed that, although indispensable, relational governance is not always easily applicable. Central to this limitation of relational governance is the demanding balancing act between flexibility and stability.

Flexibility and adaptive capacities are two of the characteristics valued in HROs and HRNs for enhancing organizational reliability (Berthod et al., 2017; La Porte, 1996). These characteristics, in the form of joint problem solving and flexible adaptations to preserve the exchange relationship, are also a central part of relational governance. For exchange relationships, the direct positive effect of relational governance on adaptive capacities and subsequently on performance outcomes have been recognized (Noordewier et al., 1990). This effect is particularly important in uncertain circumstances (Cannon et al., 2000).

However, flexible adaptations are limited by the outside boundaries of procurementregulation. In the air ambulance service case, this was apparent on several occasions. Even when both parties recognized that departing from the contract specifications would be ideal for reliability, the procurer was reluctant to do so. It is beyond the scope of this paper to assess whether the procurer's interpretation of procurement regulations was strict, lenient, or a combination of the two. Nevertheless, at a more general level, it is clear that public procurers are cautious of operating well within procurement regulations because they fear the legal consequences of breaking them (Nærings- og fiskeridepartementet, 2019). A downside to this is that correct procurements, rather than good procurements, become the focal point (Nærings- og fiskeridepartementet, 2019). A similar assessment is relevant for the *implementation* of the contract. Flexible adjustments, recognized by the procurer as reliability enhancing, must always be balanced against the possibility of breaking procurement regulations. This is particularly important for critical services, whose output must be continuous. The procurer cannot risk lawsuits or other consequences with the potential to affect output negatively.

To an extent, flexible adaptations are also limited by the need for stability. There is, in other words, an inherent tension between flexibility and stability; or, if we apply the RET norms as a framework, between preserving the relation and role integrity. For procurer–supplier relationships, flexibility means adapting to external circumstances and resolving contractual issues, whereas stability is, in part, created by adhering to the contract. This bounded flexibility is also recognized in other organizational reliability studies. Although adaptations to changing circumstances are encouraged in HROs, they are balanced against the need to limit risk and uncertainty. In addition, adaptations, including structural redesigns, cannot be carried out if they conflict with long-term reliability or with other parts of the system (Pettersen & Schulman, 2016).

A potential challenge for procurer and contract managers is that, although flexible approaches may be beneficial for resolving concrete issues, in sum they may negatively affect reliability. Cedergren et al. (2018) introduced the concepts of micro-efficiency and macro-inefficiency to describe how achievements of individual organizations' goals may reduce overall outcomes of a network. The same concepts are valuable for understanding the trade-offs between flexibility in concrete situations and overall consequences of multiple contract deviations. The total effect of micro-practice flexibility may threaten the stabilizing effect of role integrity. This applies in both the short term (e.g., if flexibility leads to opportunistic supplier behaviour) and the long term (e.g., if potential suppliers are under the impression that tender proposals can include false promises).

To further complicate matters, the interplay between flexibility and stability is intricate. The mechanisms may, like the organizational change and stability (Farjoun, 2010), be mutually constituent. According to Farjoun's (2010) analysis, whether and how flexibility and stability mechanisms complement each other depends, among other things, on the wider context, timespan, and the organizational level they appear at. The analysis sets out how stability and change will be more complementary in a complex, multidimensional system than if appearing at the same organizational level. These mechanisms may also be more conflicting in the short run, but complementary in the long run (Farjoun, 2010). Applying this analysis to the procurement process, we agree that flexibility and stability may be mechanisms operating at different levels simultaneously. We argue that, building on our analysis of the norm of role integrity in the case material, an overall consistent and predictable behaviour reduces uncertainty between the interacting organizations. This predictability, somewhat counterintuitively, allows for the flexibility required to solve specific issues. Our case study primarily focuses on reliability from a short-term perspective. However, we find it plausible that, in line with Farjoun's (2010) proposition, the importance of stability as an 'anchor' for flexibility increases over time.

We find that the processes leading up to the balancing acts between flexibility and stability are nowhere as friction free as they appear to be in HROs or in the alternation of governance modes for HRNs described by Berthod et al. (2017). Rather, the air ambulance system, with its many contributing organizations, is one in constant negotiation. In fairness, Berthod et al. (2017) did describe tensions inherent to networks, such as the tensions between efficiency and inclusiveness in decision-making or between internal and external legitimacy. However, from their descriptions of an emergency management network, it appears that the handling of tensions happens without friction, and certainly without conflict, between the actors. In the air ambulance services, the processes are different. Although we have described how potential conflicts have been resolved, tension exists between *actors* and not only between opposing governance considerations. Importantly, according to RET, there is nothing surprising about this. Rather, conflicts are inherent to exchange relationships (Macneil, 1980).

6.3. Relational governance and unsolvable conflicts affecting reliability

Some conflicts appear difficult — if not impossible — to resolve using contractual and relational governance, thereby affecting reliability. In our case study, the outgoing operator's loss of the fixed-wing contract to a competitor was the starting point of such a conflict. We argued that the conflict can be analysed using RET norms (see Section 5.3). In short, to the outgoing operator, the allocation of the fixed-wing contract to a competitor was an unexpected breach in role integrity. The relationship was damaged as attempts to preserve it failed.

To expand on this, Kaufmann and Stern's (1988)'s RET analysis of conflict behaviour is highly relevant. In summary, they argued that, in commercial disputes, three elements influence how the other party's behaviour is perceived: the behaviour itself, the pattern of relational and discrete contracting norms in the relationship, and whether the other party's behaviour is seen as intentional or due to uncontrollable external circumstances. Kaufmann and Stern (1988) emphasized that, in most circumstances, a relational variant of role integrity means that conflict behaviour is downplayed in exchanges as solutions are sought within the relationship. However, the perception that the other party *intentionally* behaves in a way which harms the relationship alters this, meaning that

the more relational the norm of role integrity, the more unfair the other party's behaviour is perceived. Applied to the fixed-wing procurement, our interpretation is that the outgoing operator experienced the awarding of the contract to a competitor as intentional (because the procurer could have chosen to evaluate the tenders differently) and, therefore, unfair.

Furthermore, Kaufmann and Stern (1988) argued that, the stronger the perception of unfair treatment, the more hostility the affected actor will feel after the initial dispute has been resolved. This seems valid for the fixed-wing ambulance procurement. Sharply contrasting the rotor-wing procurement, where the loss of the contract was accepted and the parties cooperated in the transition phase, the feeling of hostility was retained throughout the fixed-wing transition phase. Specifically, it manifested itself in the spring of 2019, when pilots were needed both to operate the existing service and to participate in training programs to prepare for the coming contract (for details, see Slotsvik et al., (2021)). During this period, the outgoing operator, the procurer organization and incoming operator claimed that they were doing their utmost to find solutions, but they were impeded by the other party. When different solutions were rejected, it was argued that these were outside the frames of aviation safety, work hour restrictions, or procurement regulations. A plausible explanation for the deadlocked situation may be that intentional conflict behaviour can be hard to distinguish from cooperative behaviour limited by external circumstances (Kaufmann & Stern, 1988).

The conflicts that characterized the fixed-wing procurement had a significant effect on output reliability (Slotsvik et al., 2021). Significantly, our assessment of governance contributions to reliability is that both contractual and relational governance can fall short in such conflict situations. As the contract cannot cover all eventualities, a certain level of cooperation is necessary if the focus is to be on outcomes rather than procedural and contractual matters. Relational governance, on the other hand, requires the commitment of both parties and offers few remedies if this commitment is absent. Although the parties expressed a strong commitment towards the air ambulance services and were aware of its importance to society, when the situation intensified, other considerations came first. Therefore, the air ambulance case demonstrates that, in some situations, reliability requirements to critical services are incompatible with procurement arrangements.

6.4. Contributions of RET to HRN research

The aim of this study has been to assess the reliability contributions and limitations of relational governance using RET as a framework. At the same time, our analysis shows that RET provides a theoretical perspective that contributes to the further development of HRN theories. Here, we outline three of these contributions.

Firstly, RET highlights aspects of conflict and power that are relevant for reliability. Although perhaps inherent factors of organizations and inter-organizational relationships, power and conflict are largely downplayed in HRO and HRN studies and have, at a more general level, received little attention in safety science research (Antonsen, 2009; Dekker & Nyce, 2014). In fact, RET offers an explanation as to why this is the case. In a relational exchange, demonstrations of power and conflict behaviour are downplayed for the greater good of the enduring relationship. For this reason, underlying conflicts may not have been very apparent in HRO and HRN case organizations. However, as demonstrated by the air ambulance procurements, conflict and hostility may well be dominant in HRNs, with a clear impact on output reliability. RET, as well as Kaufmann and Stern (1988) contribution to understanding perceptions of unfair treatment, offers valuable approaches to this.

Secondly, the RET framework can serve to develop Farjoun's (2010) analysis of stability and flexibility within a networked setting. The norm of role integrity is valuable for exploring how organizations' predictable and consistent behaviour adds to the stability of networks, thereby also enabling flexible problem solving when necessary.

Lastly, although reliable service production is central to the external legitimacy of HROs and HRNs (Berthod et al., 2017; La Porte, 1996), RET offers a more explicit link than HRO/HRN theories between behaviour within a network relationship and the outside context. The norm of supra-contractual relations is largely ignored in marketing studies, yet for critical services this norm is central. Macneil (1980) concluded that the norm of preserving the relation *binds* exchanges together. For critical services, it can be argued that the external context (society's expectations of service delivery) serves as an outside pressure *pushing* exchanges together.

At the same time, the application of RET in this study confirms that the many and overlapping relational norms proposed by Macneil (1980) are more easily applicable when narrowed down to a more manageable number. Furthermore, the phrasing of some of the norms, such as supra-contractual relations are not intuitively understandable. This necessitates the simplification and operationalization of the norms.

7. Conclusion

Societal safety policies are sector-spanning, large-scale policies aimed at ensuring that systems providing services fundamental to the population and the functioning of society can withstand external stresses (Morsut, 2021). However, these policies fail to recognize that critical service systems also have the potential for *producing* stresses. Our study of the Norwegian air ambulance service procurements, focused on the transition between two contract periods, demonstrates this clearly. Indeed, even when there is no change in suppliers, the attention and resources required from organizations across the system towards tendering processes and contract implementation are, consequently, drawn away from core operational tasks. Even more pressing, a change of supplier means that two different logics collide: the service is expected to be supplied uninterruptedly, but at the same time the splitting of the service into contract periods marks very decisive borders for the responsibility of the outgoing and incoming service providers.

Our study problematizes some decisive organizational reliability factors that must be included when balancing the pros and cons of procuring critical services. Firstly, our case study supports the understanding that because all contingencies cannot be accounted for in contracts, contractual governance is inherently limited (Grossman & Hart, 1986; Macneil, 1980; Williamson, 1979). To a certain degree, aspects offering flexibility can be incorporated into the contracts and can be added as change orders once the contract is implemented. In this respect, given that procurers stay well within procurement regulations due to the fear of legal consequences if these are broken (Nærings- og fiskeridepartementet, 2019), it is possible that procurers – and their legal advisers – have reduced their scope of action more than necessary. Nevertheless, even contracts that are intentionally flexible may fail to cover future contingencies. Moreover, promoting contractual flexibility in the sense of redundancy must be weighed against financial considerations; redundancy comes at a cost.

Secondly, as a result of the limitations of contractual governance, we argue that, when critical services are procured, procuring organizations must follow the holistic approach that both HRO/HRN theories and RET assert. Although the need for flexible adaptations and joint problem solving may be obvious to the HRO researcher, this is not necessarily the case for public organization managers or policy makers. Rather, the evaluation reports following the air ambulance procurements indicate that contributions such as those of relational governance are invisible when compared to concrete contractual learning points and are, therefore, overlooked.

Lastly, and perhaps most importantly, based on this study we argue that, despite the significant contributions of both contractual and relational governance towards reliability, the implication of their limitations is pressing. Although contractual governance is limited by contracts' inability to account for all future contingencies and even shifts attention from total outcomes to procedural and contractual

matters, relational governance has few remedies to maintain a holistic approach once a profound conflict exists between the parties. We conclude that the procurement of critical services may include periods in which negative effects on reliability cannot be avoided through either contractual or relational governance. Thus, systems must be sufficiently redundant in order to maintain output reliability or, in other words, be able to provide alternative solutions if output reliability is negatively affected. Otherwise, the procurement of critical services may be incompatible with their criticality for society.

To our knowledge, the actual processes of commercial tendering, including the transition of responsibility between critical service providers, have not been researched in previous organizational reliability studies. In this respect, our study represents an early contribution to a field that, due to the criticality of the services provided, warrants further attention. Furthermore, we see the application of RET to HRN settings as a promising approach to the governance of procured critical services. At the same time, the RET norms are not easily applied, and a further development of an applicable framework based on the norms is welcomed. A limitation of our study is that it is restricted to a specific context; further research should include contributions from other critical services, enabling comparison and analysis across countries and regulatory contexts. In addition, studies analysing the use of contractual and relational governance in procured air ambulance services in other countries would increase our understanding of the mechanisms that expand or constrict the procurers' scope of action.

At a more general level, seeing the conflict level achieved in the fixed-wing procurement process, we encourage studies that can deepen the understanding of how conflicts emerge and can be resolved in HRNs. While conflict and power aspects are understudied in safety sciences (Antonsen, 2009; Dekker & Nyce, 2014), other theoretical fields, such as that of RET, see the potential for conflict as inherent to inter-organizational and inter-individual relations. These perspectives should be integrated into HRN research.

CRediT authorship contribution statement

Tone Slotsvik: Investigation, Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Kenneth Arne Pettersen Gould:** Conceptualization, Funding acquisition, Formal analysis, Supervision. **Lillian Katarina Stene:** Conceptualization, Investigation, Formal analysis, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1 - Document overview

The following documents have been used for document analysis:

LAT HF documents

Annual activity reports
Aktivitet i luftambulansetjenesten 2017.
Aktivitet i luftambulansetjenesten 2018.
Aktivitet i luftambulansetjenesten 2019.
Aktivitet i luftambulansetjenesten 2020.

Board meeting protocols including activity reports
Protokoll styremøte 31.01.2018
Protokoll styremøte 16.02.2018
Protokoll styremøte 22.03.2018
Protokoll styremøte 24.05.2018
Protokoll styremøte 20.06.2018
Protokoll styremøte 13.09.2018
Protokoll styremøte 02.11.2018
Protokoll styremøte 04.12.2018
Protokoll styremøte 29.01.2019
Protokoll styremøte 22.02.2019
Protokoll styremøte 01.04.2019
Protokoll styremøte 06.05.2019
Protokoll styremøte 11.06.2019
Protokoll styremøte 28.08.2019
Protokoll styremøte 24.10.2019
Protokoll styremøte 03.12.2019
Protokoll styremøte 28.01.2020
Protokoll styremøte 20.02.2020
Protokoll styremøte 14.09.2020

Evaluation report
-*Forbedring og effektivisering av ambulanseflytjenesten. Rapport fra prosjektgruppe oppnevnt av styret i Luftambulansetjenesten ANS*, 2018. [*Improvement in air ambulance deliveries and efficiency. Report from project group appointed by the board of Luftambulansetjenesten ANS,* 2018]. (Luftambulansetjenesten 2018c.)

Other documents

-*Vedtekter for Luftambulansetjenesten HF*, 2017. [*Statutes for The air ambulance service health trust*, 2017]
-*Konkurransegrunnlag. Konkurranse med forhandling. Kjøp av ambulanseflytjenester for perioden 1. juli 2019- 30. juni 2025 med mulighet for forlengelse 2+3 år. Bodø, 2016. [Request for tender. Competition with negotiations]* (Luftambulansetjenesten HF, 2016a)
-*Kravspesifikasjon. Konkurranse med forhandling. Kjøp av ambulanseflytjenester* [*Specification of requirements. Competition with negotiations. Procurement of fixed-wing ambulance services.*]. (Luftambulansetjenesten HF, 2016b)
-*Virksomhetsoverdragelse i ambulanseflyanskaffelsen - offentliggjøring av dokumenter* [*Transfer of undertaking in the fixed-wing ambulance procurement - publication of documents*]. (Luftambulansetjenesten HF, 2018a).

Written correspondence LAT HF and operators / other actors

20083-65 Baseovertakelse 15. mai
20083-65 Plan for utflytting
201742-28 Status bekymringsmelding pr 25.01.19
201742-28 Status i forbindelse med bekymringsmelding angående trening
201742-29 Status i forbindelse med bekymringsmelding angående trening
291753-28 Treningsprogram
201753-68 Treningskalender
201753-68 Trening våren 2019
201820-4 Vedrørende beredskapssituasjonen i ambulanseflytjenesten
201824-15 Kapasiteten på ambulansehelikoptre
201824-16 Tilbakemelding kapasiteten på ambulansehelikoptre
201824-19 Oppfølging kapasiteten på ambulansehelikoptre NLA AS
201824-22 Info om ambulanseflysituasjonen
201824-22 Tiltaksplan ambulanseflysituasjonen – brev til Helse- og omsorgsdepartementet
201824-24 Befaring ambulansefly BSAA 080518
201824-24 Vedr innleid ambulansefly
201824-25 Bekymringsmelding fra flysykepleiere i Nord a
201824-15 Bekymringsmelding fra flysykepleiere i Nord
201824-26 Bekymringsmelding – manglende personell ved våre luftambulansebaser a
201824-26 Bekymringsmelding – manglende personell ved våre luftambulansebaser
201824-27 Bekymringsmelding ang ambulanseflysituasjonen
201824-28 Til orientering – Stortingets behandling 15. mai 2018
201824-30 180521 Innspill svar spørsmål i Stortinget
20182430 SV Spørsmål fra Stortinget
201824-31 180524 Notat til Helse og omsorgskomiteen a
201824-31 180524 Notat til Helse og omsorgskomiteen
201824-31 Høring i Helse- og omsorgskomiteen
201824-52 Varsling om kansellering av trening
201824-53 Varsling om kansellering av trening
201824-45 Bekymringsmelding – Trening gitt av BSAA

201824-54 Bekymringsmelding sendt 2 desember 2018
201824-54 Status bekymringsmelding sendt 25 januar 2019
201824-54 Trening for ny operatør AEMS
201824-54 Vedlegg 1- Evaluering BSAA
201854-54 Vedlegg 2 – EASA Annual Safety Review 2018
201854-55 19-01966 Bekymringsmelding – trening for ny operatør AMES
201854-55 SV Bekymringsmelding – trening for ny operatør AMES
201824-56 Varsling om kansellering av trening
201824-57 Varsling om kansellering av trening
201824-58 Reinntreden i avtale om trening
201824-59 Reinntreden i avtale om trening
201829-11 Bekymringsmelding luftambulansebaser – Ålesund og Arendal
201829-12 Bekymringsmelding luftambulansebaser – Ålesund og Arendal – svar
201829-13 Arendal – midlertidig flytting av helikopter
201830-5 Bekymringsmelding luftambulansebaser – Ålesund og Arendal
201837-3 Oppsummering sluttmøte LT FW AS hovedkontor
201837-3 Oppsummering sluttmøte revisjon 0418 LT RW AS base Tromsø
201927-12 Bekymring regularitet amb.fly høst 2019
201927-12 Bekymringsmelding redusert regularitet ambulansefly
201927-13 Bekymringsmelding fra sykepleiere a
201927-13 Bekymringsmelding fra sykepleiere
201927-16 Bekymring regularitet amb.fly høst 2019
201927-16 Svar Bekymringsmelding redusert regularitet ambulansefly
201927-18 Bekymringsmelding redusert regularitet ambulansefly
201927-18 Svar på redegjørelse LAT HF
201927-19 Melding om vedtak- Uttalelser Sviktende beredskap i luftambulansetjenesten
201927-26 Bekymringsmelding fra Finnmark legeforening
201927-26 VS Bekymringsmelding redusert regularitet ambulansefly
201927-28 Luftambulansetjenesten – uttalelse fra Øst-Finnmark regionråd
201927-28 Uttalelse luftambulansetjenesten
201927-31 Melding om vedtak – Uttalelse beredskapssvikt i luftambulansetjenesten

Parliament documents

-Redegjørelse fra helseministeren om ambulansefly i nord 15.05.2018 [Statement given by the Mininster of health regarding the fixed-wing ambulance in northern Norway] https://www.stortinget.no/no/Saker-og-publikasjoner/Saker/Sak/?p=72229
-Stortingsvedtak 860-865 2018. [Parliament resolutions 860-865 2018]. (Stortinget, 2018).

Legal documents

-Lov om helseforetak m.m. [Health Authorities and Health Trusts Act], LOV-2001-06-15-93 C.F.R. (2001).
-Lov om offentlige anskaffelser [The Public Procurement Act], LOV-2016-06-17-73
-Forskrift om offentlige anskaffelser [The Public Procurement Administrative Regulation], FOR-2016-08-12-974
- Arbeidsmiljøloven [Working Environment Act] LOV-2005-06-17-62

External evaluation reports

-*Evalueringsrapport. Evaluering anskaffelse flyambulansetjenester.* (Evaluation report. Evaluation of fixed-wing ambulance procurement.) (Helse vest RHF, 2021)
-*Organisering av luftambulansetjenesten. Rapport fra ekspertgruppe.* (The organizing of the air ambulance service. Report from expert group.) (Helse- og omsorgsdepartementet, 2021)
-*Tilsyn med ambulanseflytjenesten. Undersøkelse av om befolkningen i Nord-Norge får forsvarlige ambulanseflytjenester. [Supervision of the fixed-wing ambulance service. Investigation of whether the population in Northern Norway receive justifiable air ambulance services.]* (Statens helsetilsyn, 2021)

Newspaper articles

Newspaper articles from *Aftenposten*, *Finansavisen*, *iTromsø*, *NTB tekst*, *Nordlys*, *NRK* and *VG* in the period December 2016 to October 2020.

Appendix 2 - Interview and meeting overview

The following table (Table A2-1) gives an overview of the interviews and meetings conducted as part of the thesis.

Date	**Organi-zation, level**[2]	**Data collection type**	**No. of inter-viewers**	**Tran-script**	**Comment**
05.11.2019	NLA, operational	Visit to NLA base		No	No digital record
04.06.2020	LAT HF	Meeting		No	No digital record
01.09.2020	LAT HF	Physical group interview	3	Yes	Research participants A, B
01.09.2020	LAT HF	Physical group interview	3	Yes	Research participants C,D
01.09.2020	LAT HF	Physical group interview	3	Yes	Research participants B, E, F, G
18.09.2020	NLA, operational	Digital individual interview	3	Yes	Part 2 25.09.2020
24.09.2020	NLA, operational	Digital individual interview	1	Yes	
28.09.2020	Local health trust, operational	Digital individual interview	1	Yes	
01.10.2020	Local health trust, operational	Digital individual interview	1	No	
02.10.2020	Local health trust, operational	Digital individual interview	1	External (incompl.)	

[2] To simplify, organizational levels are referred to as operational and managerial/administrative (M/A).

13.10.2020	NLA, operational	Digital individual interview	1	No	
14.10.2020	Local health trust, operational	Digital individual interview	1	External	
14.10.2020	NLA, operational	Digital individual interview	1	External	
16.10.2020	Local health trust, operational	Digital individual interview		External	
20.10.2020	NLA, operational	Digital individual interview	1	Yes	
27.10.2020	NLA, operational	Digital individual interview	1	External (incompl.)	
30.10.2020	Local health trust, operational	Digital individual interview	1	Incomplete	
30.10.2020	Local health trust, operational	Telephone interview, individual	1	No	
03.11.2020	NLA, operational	Digital individual interview	1	No	
04.11.2020	NLA, operational	Digital individual interview	1	External	
07.11.2020	Local health trust	Physical, individual	1	No	No digital record
12.11.2020	Babcock, M/A	Digital individual interview	2	Yes	
12.11.2020	Lufttransport, M/A	Meeting		No	No digital record
13.11.2020	NLA, operational	Digital individual interview	1	No	
26.11.2020	Babcock	Meeting		No	No digital record
04.12.2020	Lufttransport, M/A	Digital individual interview	2	Yes	

17.12.2020	Babcock, M/A	Digital individual interview	2	Yes	
13.01.2021	Lufttransport, M/A	Digital individual interview	1	Yes	
15.01.2021	LAT HF, M/A	Digital individual interview	1	Yes	Research participant H
22.01.2021	Lufttransport, M/A	Digital individual interview	1	Yes	
26.01.2021	Babcock, M/A	Digital individual interview	1	Yes	
29.01.2021	Babcock, M/A	Digital individual interview	1	Yes	
03.02.2021	Pilot trade union	Digital individual interview	2	Yes	
16.02.2021	Pilot trade union	Digital individual interview	1	External	
12.03.2021	LAT HF	Digital, group	1	No	Research participants B, H
16.03.2021	Babcock, operational	Digital individual interview	1	External	
17.03.2021	Local health trust, operational	Digital individual interview	1	External	
19.03.2021	NLA, M/A	Digital individual interview	1	External	
07.04.2021	Babcock, operational	Digital individual interview	1	External	
08.04.2021	NLA, M/A	Digital individual interview	1	External	
15.04.2021	Babcock, operational	Digital individual interview	1	External	

19.04.2021	NLA, M/A	Digital individual interview	1		
29.04.2021	Babcock, operational	Digital individual interview	1	External	
30.04.2021	Babcock, operational	Digital individual interview	1		
05.05.2021	Babcock, operational	Digital individual interview	1		Completed 07.05.2021

Table A2-1. Interview and meeting overview

Appendix 3 – Interview guides

A. Interview guide LAT HF

-Information about the project and repetition of information regarding protection of personal data, oral consent to research participation

The air ambulance service

-Can you describe how the air ambulance service is organized today?
-Is there a difference between the different bases?
-What are the main differences between rotor-wing and fixed-wing transport?
Which qualities are important in the operative air ambulance service? What do you do concretely to obtain these qualities?

Regulation

-How do you ensure that you comply with public procurement legislation?
-In your opinion, are there aspects of the legislation that gives negative consequences for the way the tender announcements are formulated and for the quality of the air ambulance service?

The tendering process

-Can you describe the process in advance of a tender announcement?
-Which actors are involved in this process?
-Who decides the criteria in the tender announcement?
-How do you incorporate experiences from previous tenders and experiences with the present suppliers in the tender announcement?
-Can you describe the process from tender announcement to contract start?
-How are the contracts monitored?
-How do you assess the quality of the service? In your opinion, do these

assessments reflect the quality of the service?
-How are contract deviations dealt with?

The use of procurement in the air ambulance service

-In your opinion, what are the positive and negative aspects of competitive tendering?
-How does competitive tendering affect the quality of the service that the population receives?
-How long does has it taken before a new contract period 'settles down' and start-up problems are overcome?
-Can you describe the experiences you had with the changes of rotor-wing operator in 2018 and fixed-wing operator in 2019?

Preparedness

-How are reductions in preparedness countered?
-Who is responsible for coordinating additional measures if preparedness is reduced?
-Which actors can contribute to compensating for reduced preparedness?
-Does competitive tendering hinder measures that can ensure preparedness? --
-Does competitive tendering contribute towards a higher preparedness level than you otherwise would achieve?

End of interview

-Is there anything you would like to elaborate on or any questions you think we should have asked?

B. Generic interview guide operators – administrative level

-Information about the project and repetition of information regarding protection of personal data, oral consent to research participation

Background information

-Can you provide a short description of your background and your role in company xxx?

The specification of requirements

-Did you have any input to the specification of requirements before these were announced?
-How would you describe the specification of requirements? Which similarities and differences did it have with previous specifications?
-Is there anything that should have been done differently with regards to the specification of requirements?

Tender proposals and negotiations (the period before the awarding of the contract)

-How would you describe the process of developing the tender proposal?
-Can you give some examples of considerations you had to make in relation to the evaluation requirements?
-How would you describe the tender negotiations?

The period between contract awarding and contract start

-How would you describe the period between contract awarding and contract start?
-Which type of preparations did you have to do in this period?
-Did you encounter any challenges in relation to these preparations?
-How would you describe the cooperation with the incoming/outgoing operator?

The period from contract start onwards (if applicable)

-How would you describe the period from contract start onwards?
- What have the past six months been like compared to beginning of the new contract period?
-How would you describe the process of integrating operative personnel from the outgoing operator?
-How would you describe the cooperation with the health trusts at the different bases?
-Can you describe how you deal with needs to introduce changes to the service? Do you experience that procurement legislation complicates the introduction of changes? Do you have any examples of this?

The procurement overall

-What do you regard as the main challenges in the latest tendering process?
-Which alternatives to procuring operative services exist? What do you see as the main benefits and challenges of these?

End of interview

-Is there anything you think you should have been asked about in the interview or anything you want to elaborate on?

C. Interview guide fixed-wing pilots

-Information about the project and repetition of information regarding protection of personal data, oral consent to research participation

Background information

-Can you provide a short description of your background and your role in Babcock?
-(If applicable:) How would you describe working in the air ambulance service compared to 'ordinary' air transport services?
-Can you describe how the cooperation with medical personnel works at your base?

The period before the awarding of the contract

-How did you experience the period before the contract was awarded to Babcock?

The period after the contract had been awarded

-How did you experience the period after the contract had been awarded?
-How did you react to the announcement of the contract awarding?
-The way you remember it, did the announcement have any concrete effects on the pilots (e.g., resignments, sick leaves)?
-The way you remember it, did it have any concrete effects on aviation safety?
-How did you experience the negotiations between Babcock and the pilot trade union?
-Did you participate in the training scheme in the spring of 2019? What were your experiences with this?

The period after contract start

-How would you describe the first months of working for Babcock?
-How would you describe working there now?
-(If applicable:) when did things change? Why are things different now compared to in the beginning?

The procurement overall

-What do you regard as the main challenges of the latest tendering process?
-Which alternatives to procuring operative services exist? What do you see as the main benefits and challenges of these?

End of interview

-Is there anything you think you should have been asked about in the interview or anything you want to elaborate on?
-Can you recommend anyone else I should interview?

Appendix 4 – Assessment of availability

The LAT HF assessment of availability (thesis Section 5.2.2)

In the most recent rotor-wing ambulance contracts and the fixed-wing contract starting in 2019 the availability requirements were as follows (my translation):

"For every aircraft on 24-hours preparedness the operator cannot have more than 12 hours of out-of-service per month due to planned technical maintenance. For every aircraft on 24-hours preparedness the operator cannot have more than 12 hours of out-of-service per month due to lack of crew. In the case of unforeseen technical errors, back-up aircraft must be provided as quickly as possible and at the latest within 12 hours. Interruptions to preparedness that are longer than this leads to economic penalties for the operator." (Luftambulansetjenesten HF, 2019a).

Fixed-wing availability January 2018 – June 2020 (thesis Sections 5.2.3 and 5.2.4)

Table A4-1 (next page) shows fixed-wing ambulance availability between January 2018 and June 2020, including comments on how the numbers were calculated (if applicable) and the source of information.

	Month	Availability (percent)	Comment	Source
2018	January	94,16	Average as reported in source	Luftambulanse-tjenesten HF, 2018a.
	February	94,16		
	March	90,61		Luftambulanse-tjenesten HF, 2018b.
	April	86,67		
	May	88,75		
	June	91,15		
	July	93,67		
	August	95,66		
	September	95,89		
	October	95,39		
	November	98,25	My calculation of the average for November and December based on an annual average for 2018 of 93,55 percent.	Luftambulanse-tjenesten HF, 2019b.
	December	98,25		
2019	January	97,3		Luftambulanse-tjenesten HF, 2020a.
	February	95		
	March	95,4		
	April	95,9		
	May	96,7		
	June	96,3		
	July	69,9		
	August	90,7		
	September	90,8		
	October	90,7		
	November	91,6		
	December	90,3		
2020	January	95,28		Luftambulanse-tjenesten HF, 2021
	February	94,02		
	March	96,6		
	April	98,45		
	May	97,7		
	June	97,87		

Table A4-1. Fixed-wing ambulance availability January 2018 – June 2020.

Assessment of reasons for reductions in availability (thesis Sections 5.2.3 and 6.2)

In section 5.2.3, three crew-related reasons for out-of-service are described. The following outline gives a more detailed background for the assessment of how these were related to the tendering process.

1. Fixed-wing availability in the period 2011 to 2017 was stable, as were the reasons for out-of-service:

From 2011 to 2017, availability varied between 94.9 and 95.3 percent (Luftambulansetjenesten HF, 2018c). In an overview of reasons for out-of-service (technical and crew-related) in the period 2012-2017, these reasons were reported as "very stable" (Luftambulansetjenesten HF 2018d). In 2009 and 2010, average annual availability was below the required level (approximately 92.5 percent and 93.5 percent respectively) (Luftambulansetjenesten HF, 2018c). Although not explicitly addressed in the data material of this thesis, it appears reasonable to assume that the output reduction was related to start-up issues in the 2009 contract period.

2. The increase in pilots reporting (or being declared) "unfit for flight" in April 2018 was primarily caused by the collapse in the negotiations between Babcock and the pilot trade union:

In April 2018, pilots being "unfit for flight" accounted for 135 hours of out-of-service, compared to a total of 30 hours in the 3 preceding months and a total of 51 hours in 2017 (Luftambulansetjenesten HF, 2018b and 2018e). Reports to the LAT HF board do not provide figures for May, June and July but state that reporting of "unfit for flight was back at prior levels in August and September 2018 (Luftambulansetjenesten HF, 2018f).

3. Sickness absence and crew shortage was partly caused by the tendering process:

In the LAT HF assessments of availability, sickness absence and crew shortage for other reasons are combined. LAT HF reported that out-of-service due crew shortage increased in 2018:

"Availability for the fixed-wing ambulance in 2018 was 63702 hours of 68096 possible hours, meaning 93.55 percent. By comparison, availability in 2017 was 97,08 percent. On the whole, this reduction in availability was due to sickness absence / crew shortage for other reasons. In 2018, 3036 hours were caused by sickness / lack of crew compared to 886 hours in 2017. The number of hours of "unfit" increased from 51 hours in 2017 to 217 hours in 2018. Technical out-of-service reasons was almost identical in 2017 and 2018." (Luftambulansetjenesten HF (2019b), my translation). This was particularly the case in April and May 2018: In April 2018 sickness absence / crew shortage for other reasons led to 220 hours of out-of-service; in May 2018 the equivalent reason caused 572 hours of out-of-service (Luftambulansetjenesten HF, 2018e and 2018g).

These figures do not establish a causal relationship between the tendering process and crew shortage. However, when compared to the stability in availability in the period 2011-2017 and combined with findings from interviews with pilots showing that pilots experienced this period (April-May 2018) as particularly demanding, it is plausible that sickness absence was partially related to the tendering process.

I have not obtained exact overviews over pilot resignations during the transition phase and in previous years. Newspaper articles (e.g., Endresen, 2018) informed that 13 pilots had resigned by the end of May 2018. Though it cannot be established that all of these were related to the tendering process, Lufttransport interviewees stated that the number of resignations this was considerably higher than normal in the period November 2017 and May 2018 and that it later stabilized. Luftambulansetjenesten HF (2019c) informed that the lack of pilots affected availability in 2018.

Sources Appendix 4

Endresen, R. (2018, 24 May). Luftambulansekrisen: 33 piloter på vei ut – frykter kollaps [The air ambulance crisis: 33 pilots on their way out – fear of collapse]. *Nordlys. https://www.nordlys.no/ politikk/helse/17-mai/luftambulanse-krisen-33-piloter-pa-vei-ut-frykter-kollaps/s/5-32-108772?key=2023-05-10T08:54:23.000Z /retriever/5b62e63a8243e9bed902c6339453b0218e23f0bb*

Luftambulansetjenesten HF (2018a). Activity report presented at LAT HF board meeting 22.03.2018.

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Luftambulansetjenesten HF (2018c). Activity report presented at LAT HF board meeting 13.09.2018.

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Luftambulansetjenesten, 2019a. *Feil i krav til levert beredskap i ambulanseflytjenesten [Errors in requirements to preparedness in the fixed-wing ambulance service]*. Published 04.10.2019. Retrieved from: http://luftambulanse.no/feil-om-krav-til-levert-beredskap-i-ambulanseflytjenesten

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Luftambulansetjenesten HF (2019c). *Aktivitet luftambulansetjenesten 2018. [Activity air ambulance services 2018]*.

Luftambulansetjenesten HF (2020a). Activity report presented at LAT HF board meeting 28.01.2020.

Luftambulansetjenesten HF (2020b). 2019 activity report presented at LAT HF board meeting 28.01.2020.

Luftambulansetjenesten HF (2021). Activity report presented at LAT HF board meeting 28.01.2021.