



Outsourcing and offshoring aircraft maintenance in the US: Implications for safety

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ABSTRACT

Since the 1990s the safety implications of outsourcing aircraft maintenance in the US airline industry have become the subject of regulatory scrutiny and public debate. The discussion has emanated from a number of well-publicised crashes that have been attributed primarily to faulty outsourced maintenance, including the loss of a ValuJet airliner in Florida in 1996 and the crash of an Air Midwest commuter aircraft in 2003. While the overall safety performance of air travel has improved, concerns have been raised that increased outsourcing and offshoring of aircraft maintenance may contribute to a dangerous nexus between cost-cutting and weaker regulatory oversight with negative implications for future aviation safety. Drawing primarily on official investigations, we examine a number of serious aviation incidents and accidents in the USA where maintenance was outsourced to see what lessons can be drawn. Our study found that the existing modes of inquiry into the dangers of aircraft maintenance fail to draw upon recognised failure mechanisms associated with outsourcing/subcontracting trends in other industries, such as economic pressures, contingent employment, training deficits and poor regulatory oversight that can undermine safety outcomes. While we do not seek to establish a statistical association between rates of outsourcing/offshoring and rates of accidents and incidents, this article highlights a range of potential risk factors present in the US airline industry that provide salutary warnings for the global industry.

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1. Introduction

Since the 1990s the safety implications of outsourcing aircraft maintenance in the airline industry have become the subject of regulatory scrutiny and public debate. In the USA (FAA, 2003; OIG, 2008b; Wagner, 2007) this can be linked to a number of well-publicised incidents and accidents, including the crashes of a ValuJet airline in Florida in 1996 and an Air Midwest commuter plane in 2003.^{1,2} However, in a textbook for future aviation managers, Belobaba et al. (2009: 319, 307) stated that ‘jet travel has consistently become safer decade by decade’ and argued there was no evidence that outsourcing and offshoring have decreased safety. Similarly, a recent PhD dissertation found no statistically significant

association between rates of outsourcing measured in dollar values and accidents and incidents – although there was some association between rates of outsourcing and pilot deviation rates (Monaghan, 2011). At the same time, the accuracy of statistical associations between outsourcing and safety can be affected by the extent to which official investigations report whether a maintenance related failure originated in-house or via an external provider. In the case of the National Transport Safety Board (NTSB) reports examined below, these connections were both investigated and identified. However, whether this applies to investigation reports by other agencies such as the Federal Aviation Administration (FAA) in the USA or elsewhere like the Australian Transport Safety Board (ATSB) or other incident/accident data-sets like those produced for particular airlines is a moot point. Leaving the question of statistical associations to one side, by examining a number of incidents this paper indicates there are grounds to suggest that existing practices are generating ‘latent failures’ (Reason, 1997) and that academic disciplinary and industry silos are preventing the deployment of the appropriate conceptual equipment to highlight risks.

Although the FAA plans to move away from reactive assessments of the causes of aviation safety incidents towards proactive risk identification and mitigation (GAO, 2012: 4), we identify deficiencies in regulatory and investigative practices that potentially undermine such strategies. We have commented elsewhere on the divisions between the academic literatures that address

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¹ In brief, an accident involves the serious injury/death of a person or persons or serious damage to an aircraft from the commencement of embarkation until the last person has left the plane. An incident is a safety event that could have resulted in an accident and indicates the presence of potential problems. ECCAIRS 4.2.8, Data Definition Standard, 17 September 2010, p. 2.

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aircraft maintenance (Hampson et al., 2011); here we are concerned with industrial silos that inhibit policymakers from drawing on salient literatures from outside the aviation sector concerned with outsourcing and safety.

Outsourcing refers to the practice where a public or private organisation contracts another organisation or individual – usually through a process of competitive tendering – to undertake specified tasks, such as cleaning, transport or maintenance or even provision of a product. All or part of these tasks may in turn be sub-let to other parties – a practice known as subcontracting, or multi-tiered subcontracting when a succession of subletting of work occurs. Subcontracting is not a new practice for organising work. Indeed, subcontracting and multi-tiered subcontracting has long been common in some industries, like construction and road transport. However, over the past 30 years these practices have become more pervasive across a wide range of industries, including aviation (Johnstone et al., 2001; Nenonen, 2011). Offshoring, which refers to the process of moving tasks to another country, has also increased. Offshoring does not necessarily entail contracting to an external party, because the organisation may simply relocate its workplace. Nevertheless, the two practices are commonly combined, especially as part of a global supply chain in which a sequence of contracts is designed to provide for the creation and delivery of a good or service.

Outsourcing and offshoring of activities like aircraft maintenance can offer a number of advantages for airlines. Contractors may provide access to specialist skills not available within the principal organisation and economies of scale generated by the creation of a hub of skilled workers, job opportunities and knowledge generation for innovation. The greater volume of work in repair stations can enhance the speed of task completion. Outsourcing can also be used where demand exceeds the baseline capacity of in-house maintenance (FAA, 2003). There may also be advantages (technical, quality and volume) in contracting specific activities like significant engine maintenance to the engine manufacturer. Finally but not least, airlines may secure important cost savings from outsourcing maintenance due to a lower price for specific maintenance, repair and overhaul (MRO) activities in comparison to in-house operations. Costs are also decreased by reducing/eliminating the cost of maintenance infrastructure, especially where longer intervals between routine maintenance can be achieved. Negating the need to maintain capacity with regard to types of aircraft that are only a small part of the airline's fleet or retaining sufficient resources to deal with unexpected events delivers additional cost benefits (FAA, 2003: 6–1).

In aviation, as in some other industries like mining and road transport, while there is a well-developed safety literature and policy discussion, the reference points for much of the debate tend to be confined to that industry. Detailed examination of specific technical, regulatory and market characteristics of an industry are constructive, but can mean that safety debates occur in a series of industry silos where there is little knowledge of, or learning from, research and policy debates in other industries. For example, a report prepared by the US Federal Aviation Administration (FAA, 2003) *Practices and Perspectives in Outsourcing Aircraft Maintenance* was entirely reliant on sources drawn from the aviation literature. The report made no mention of a growing body of research dealing with the risks associated with outsourcing/subcontracting or even government reports on other industries where this issue has been raised. The same applied to an Office of Inspector General (OIG, 2008b) audit of FAA activities entitled *Air Carriers' Outsourcing of Aircraft Maintenance* produced five years later. By way of contrast, the official investigation report into the 2010 Pike River mine disaster in New Zealand (Royal Commission on the Pike River Coal Mine Tragedy, 2012) makes explicit reference to lessons learned from other high hazard industries. The Pike River report reflects

a growing awareness at both policy and research levels of the need to move beyond industry silos in work safety.

Notwithstanding the distinctive characteristics of the aviation industry and the benefits contracting can offer, we argue, nevertheless, that regulators and others have something to gain from considering the broader research literature on the links between outsourcing/subcontracting and safety risks as well as the experience of other industries in this regard. To help overcome these silos, the next section of this article summarises the literature on outsourcing and safety, identifying a number of risk factors associated with adverse outcomes in occupational health and safety, a literature that has not yet addressed aviation maintenance. Our second section establishes the extent of aircraft maintenance outsourcing and offshoring in the US. Our third section explores six serious aircraft incidents and accidents, in which maintenance has been implicated and where each has been associated with certain of the risk factors identified in the 'outsourcing and occupational health and safety' literature. This is followed by a discussion section which examines the more general findings from the incidents and accidents when viewed together. The concluding section highlights the potential latent failures arising from poor maintenance practice associated with outsourcing of aircraft maintenance to uncertified and poorly regulated shops.

2. Outsourcing/subcontracting and safety: reviewing the literature

Evidence linking the contracting out of maintenance or other work to safety and health problems, including catastrophic events, is neither new nor confined to the aviation industry. While the 1996 ValuJet aircraft crash focused attention on the outsourcing of aircraft maintenance, it was by no means the first time outsourcing of maintenance had been linked to catastrophic workplace – and planes are workplaces as well as a means of public transport – events in the USA. Indeed, several multiple fatality explosions at petrochemical plants in the late 1980s linked to this very issue resulted in the introduction of a new regulatory regime – the Process Safety Management Standard – to apply in major hazard facilities (Rebitzer, 1995; Johnstone et al., 2001). Similar incidents were also occurring in other countries. For example in Australia, under federal government direction, the Australian Defence Forces entered into widespread outsourcing of maintenance and other activities. In May 1998, four seamen died when leaks to flexible fuel lines caused a fire in the engine room of the supply ship, HMAS Westralia. During the official inquiry, evidence was presented that the contractor supervising the manufacture and installation of the fuel hoses had been understaffed and had not used suitably qualified personnel. Lack of expertise or failure to assess the competencies of contractors has been identified in other serious incidents and the official inquiry also identified deficiencies in the Navy's management of contractors (Yates, 1999: 64). In September 2001, an explosion at the AZF chemical factory in Toulouse, France, killed 30 people, including 21 workers. Again the official commission of inquiry (Loos and Le Deaut, 2002) determined that problems with contractor safety management were a critical factor in the incident and recommended a ban on multi-tiered subcontracting on 'Seveso' major-hazard sites.

Findings from investigations into serious events have not been the only evidence that outsourcing/subcontracting can have a significant adverse effect on safety and health – both public and occupational. Since the late 1980s a small but growing body of academic research has reached similar conclusions. For example, a study of the French nuclear power industry by Thebaud-Mony (2011) found that the 30,000 subcontracted workers brought into perform maintenance received 80% of the total annual occupa-

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