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THE UNCERTAIN OVERSIGHT OF OFFSHORE AIRCRAFT MAINTENANCE: THE CASE OF AUSTRALIA

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ABSTRACT

In the last twenty years, aircraft maintenance outsourcing has driven strong growth in the third-party Maintenance Repair and

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Overhaul (MRO) facility industry. In the United States, deficiencies in safety oversight and regulation have played a role in some maintenance-related incidents. Since then, Congress wrote legislation to require the Federal Aviation Administration (FAA) to improve its safety oversight, particularly of offshore facilities. However, there has been no such pressure driving improvement in Australia. Questions have been raised about the poor practices in some offshore MRO facilities and about the safety oversight of offshored maintenance. This article argues that the existing system, based on International Civil Aviation Organization (ICAO) standards, cannot provide certainty that the planes of Australian-registered airlines are maintained to best practice standards. This is for two reasons: the regulations have gaps and enforcement of the regulations leaves much to be desired.

I. INTRODUCTION

THE USE OF THIRD-PARTY Maintenance Repair and Overhaul (MRO) facilities has grown over the last twenty years based on the outsourcing of aircraft maintenance that was previously undertaken by airlines in-house.¹ Such outsourcing has occurred particularly with heavy maintenance “D checks,” which occur every six years or so on conventional airliners and involve taking the aircraft apart for inspection and overhaul, often repainting.² Concerns about the safety implications, particularly when the outsourcing of D checks involve offshore work, arose in the United States following some maintenance-related incidents in which deficiencies in safety oversight played a key role.³ Since then, the U.S. Federal Aviation Administration (FAA) has been forced to improve its safety oversight of offshore facilities.⁴

¹ RACHEL TANG & BART ELIAS, CONG. RESEARCH SERV., R42876, OFFSHORING OF AIRLINE MAINTENANCE: IMPLICATIONS FOR DOMESTIC JOBS AND AVIATION SAFETY 4 (2012).

² Michelle Northcutt, Comment, *General Aviation Accident Rate: How General Aviation Differs from Commercial Airline Flight and How to Correct the Discrepancy*, 78 J. AIR L. & COM. 381, 405 (2013).

³ Michael Quinlan et al., *Outsourcing and Offshoring Aircraft Maintenance in the US: Implications for Safety*, 57 SAFETY SCI. 283, 283–86 (2013) [hereinafter Quinlan et al., *Outsourcing and Offshoring*]; Kendal Van Wagner, Comment, *Cutting Costs and Cutting Corners—The Safety Risks Associated with Outsourcing Aircraft Maintenance and the Need for Effective Safety Oversight by the Federal Aviation Administration*, 72 J. AIR L. & COM. 631, 641–43, 647–49, 652–54 (2007).

⁴ U.S. DEP’T OF HOMELAND SEC., OFF. OF INSPECTOR GEN., AV-2015-066, FAA HAS NOT EFFECTIVELY IMPLEMENTED REPAIR STATION OVERSIGHT IN THE EUROPEAN UNION (2015), <https://www.oig.dot.gov/sites/default/files/FAA%20oversight%20of%20foreign%20repair%20stations.pdf> [https://perma.cc/UH98-DBK8];

Questions were raised about the safety oversight of offshored maintenance in Australia as well, beginning in 2007.⁵ In 2014, a major government Aviation Safety Regulation Review (ASRR) questioned the effectiveness of domestic safety oversight.⁶ This inquiry, however, did not address the safety oversight of offshored maintenance; indeed, it barely mentioned maintenance at all.⁷ Airline representatives dismissed these concerns as misconceived because Australia's Civil Aviation Safety Authority (CASA) inspected and approved offshore MRO facilities.⁸

International Civil Aviation Organization (ICAO) regulations, expressed through national legislative frameworks, define the terms on which these approvals are issued.⁹ This article argues, first, that the ICAO regulations lack clarity, which undermines accountability for the safety oversight of offshored maintenance. Second, it argues that there are deficiencies in the CASA inspection and safety oversight regime. It observes that there have been instances of unsafe practices offshore that justify regulatory oversight. And, finally, it argues that the existing regulatory arrangements do not encourage confidence in the Australian government's ability to exercise its duty of care for the safety of those who fly in Australian-registered planes.

The article proceeds as follows. The next section briefly surveys the United States' debate over the safety of maintenance performed offshore. The third section surveys the debate in Aus-

Michael Quinlan et al., *Slow to Learn: Regulatory Oversight of the Safety of Outsourced Aircraft Maintenance in the USA*, 12 POL'Y & PRAC. IN HEALTH & SAFETY 71, 72–73 (2014) [hereinafter Quinlan et al., *Slow to Learn*].

⁵ See Australian Licensed Aircraft Engineers Association, Submission No 35 to Senate Standing Committee on Employment, Workplace Relations and Education, Parliament of Australia, *Inquiry into Workforce Challenges in the Transport Industry*, 29 June 2007, 4–7 [hereinafter ALAEA Submission 2007], www.aph.gov.au/Parliamentary_Business/Committees/Senate/Education_Employment_and_Workplace_Relations/Completed_inquiries/2004-07/transport_employment/submissions/sublist [<https://perma.cc/3RG2-YTTC>].

⁶ Minister for Infrastructure and Regional Development, *Aviation Safety Regulation Review*, May 2014, 1–121 [hereinafter *Aviation Safety Regulation Review*], http://www.infrastructure.gov.au/aviation/asrr/files/ASRR_Report_May_2014.pdf [<https://perma.cc/JZE8-HCEJ>].

⁷ *Id.*

⁸ Matt O'Sullivan, *Union Dossier—Engines Found 'Not Secured' After Offshore Maintenance*, SYDNEY MORNING HERALD (Mar. 15, 2014), <http://www.smh.com.au/business/aviation/union-dossier-claims-qantas-engines-not-secure-after-offshore-maintenance-20140314-34scl> [<https://perma.cc/8TSF-K8NB>].

⁹ See generally Int'l Civil Aviation Org., *Safety Oversight Manual*, ICAO Doc. 9734-AN/959 (2d ed. 2006), http://www.icao.int/WACAF/AFIRAN08_Doc/9734_par_ta_cons_en.pdf [<https://perma.cc/6UDF-6QDK>].

tralia and presents some evidence of poor maintenance practices in offshore facilities. Section four explains the regulatory system that is based on ratification of the Chicago Convention, which we argue cannot provide the necessary degree of certainty as to the safety of offshore maintenance. Section five returns to the debate about utilizing offshore maintenance facilities for Australian airlines. It presents an argument that a much stronger role should be played by Australia's regulator in policing maintenance in the offshore MRO facilities in which Australia maintains its planes. The ASRR argued that aviation regulation should be based on an approach similar to the Strategic Arms Limitation Treaty of the Cold War: "trust and verify."¹⁰ We argue CASA's existing approach trusts too much and verifies too little.

This article draws from research of the safety oversight of offshore maintenance as part of a broader Australian Research Council-funded project.¹¹ The project is titled *The Future of Aircraft Maintenance in Australia: Workforce Capability, Aviation Safety and Industry Development*.¹² The specific research goal of this sub-project was to assess the safety, reliability, and quality issues raised by offshore maintenance.¹³ To this end, we undertook an extensive desk review of the regulatory literature, including the ICAO Convention and its Articles and Annexes, the Australian Civil Aviation Safety Regulations (CASRs), as well as literature on the aviation maintenance industry, including media documentaries.¹⁴ We examined statistical evidence of aviation safety in general and with regard to outsourcing and offshore maintenance in particular.¹⁵ We conducted more than forty interviews

¹⁰ *Aviation Safety Regulation Review*, *supra* note 6, at 1, 59. The phrase "trust and verify" comes from a reference to policing adherence to arms control treaties during the Cold War: "doveryai no proveryai," ironically, was a Russian proverb used by President Reagan, meaning "trust but verify." That is, to be sure people are playing by the rules, you have to inspect. *Id.*

¹¹ See IAN HAMPSON, DOUG FRASER, MICHAEL QUINLAN, ANNE JUNOR & SARAH GREGSON, *THE FUTURE OF AIRCRAFT MAINTENANCE IN AUSTRALIA: WORKFORCE CAPABILITY, AVIATION SAFETY AND INDUSTRY DEVELOPMENT* (2015) [hereinafter HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*], <https://www.business.unsw.edu.au/research-site/industrialrelationsresearchcentre-site/Documents/FutureAircraftMaintenanceReport.pdf> [<https://perma.cc/FY7V-PZB9>]. This is the Final Report of Findings from Australian Research Council Linkage Project 110100335. *Id.*

¹² *Id.*

¹³ *Id.* at 1.

¹⁴ *Id.* at 218.

¹⁵ *Id.*

and focus groups with “industry and regulatory experts, current and former CASA officials, training managers, employers, union officials[,] and license holders.”¹⁶ We surveyed workers in the aircraft maintenance industry, predominantly licensed and unlicensed engineers, and more than half of 708 respondents, about 380, wrote responses to a final open-ended question inviting comment on any issue of concern or interest for which about 170 of those responses spontaneously raised safety concerns.¹⁷

II. OFFSHORE MAINTENANCE AND SAFETY

A. DEVELOPMENTS IN THE UNITED STATES AND IN THE ACADEMIC LITERATURE

Following airline deregulation in the United States beginning in 1978, substantial restructuring took place in the airline industry, including the growth of low cost carriers and the outsourcing and offshoring of maintenance.¹⁸ A number of high profile incidents followed, including the loss of ValuJet Flight 597 in June 1995.¹⁹ The explosive growth in heavy aircraft maintenance that moved offshore from the United States arguably exceeded the capacities of the regulatory regime. Maintenance took place in locations where the FAA lacked oversight resources, specifically in uncertificated shops.²⁰ According to a report by the Office of the Inspector General (OIG) in the U.S. Department of Transportation, there were as many as 1,400 of these uncertificated maintenance and repair shops in 2005.²¹

Much debate took place in the media and eventually found its way into academic literature. For example, a Public Broadcast Service (PBS) Frontline documentary drew attention to maintenance practices in poorly regulated MRO facilities—significantly, not all of them offshore.²² This documentary alleged such practices as “pencil-whipping,” which is when an inspector

¹⁶ *Id.*

¹⁷ *Id.* at 111; Sarah Gregson et al., *Supply Chains, Maintenance and Safety in the Australian Airline Industry*, 57, J. INDUS. REL. 604, 610–12 (2015).

¹⁸ See Quinlan et al., *Outsourcing and Offshoring*, *supra* note 3, at 291.

¹⁹ *Id.* at 287–88.

²⁰ Van Wagner, *supra* note 3, at 634–37.

²¹ U.S. DEP'T OF HOMELAND SEC., OFF. OF INSPECTOR GEN., AV-2006-031, AIR CARRIERS' USE OF NON-CERTIFICATED REPAIR FACILITIES 6 (2005), <https://www.oig.dot.gov/sites/default/files/av2006031.pdf> [<https://perma.cc/UK6G-RAM4>].

²² *Frontline: Flying Cheaper*, PBS (Jan. 18, 2011), <http://www.pbs.org/wgbh/pages/frontline/flying-cheaper/> [<https://perma.cc/63LE-3R4N>].

signs off and thereby falsely asserts that a maintenance process has been completed, that all parts were approved, and that only properly trained and licensed employees were used; in reality the maintenance process is not complete, unapproved parts were used, and untrained and unlicensed personnel have been employed, including illegal immigrants with poor linguistic competence.²³ This does not qualify as academic research because the methods used by the PBS investigators to gain information would not likely meet the approval of Research Ethics Committees.²⁴ However, the investigators must resort to such methods because few MRO facilities open their doors to the media or academic researchers.²⁵ There seems to be, unfortunately, a climate of secrecy around the aircraft maintenance industry.²⁶

The academic debate polarized between one researcher who pointed to dangers in maintenance being outsourced and moved offshore,²⁷ another researcher who repeated the widely held view that “jet travel has consistently become safer decade by decade,”²⁸ and a final researcher who opined that there was no evidence that outsourcing and offshoring had decreased safety.²⁹ On the other hand, another researcher, a supporter of the relatively new “human resource management (HRM) in the aviation industry” literature, did not address the issue at all.³⁰

An unarguably more authoritative assessment comes from the 2014 International Air Transport Association (IATA) safety re-

²³ *Id.*

²⁴ *Background*, EUR. NETWORK OF RES. ETHICS COMMITTEES, <http://www.eurecnet.org/background> [<https://perma.cc/8KVL-UP6G>].

²⁵ Catherine Rentz, “The Making of This Report,” *Frontline: Flying Cheaper*, PBS (Jan. 18, 2011), <http://www.pbs.org/wgbh/pages/frontline/flying-cheaper/reporters-notebook/> [<https://perma.cc/QUB7-CUNM>].

²⁶ Interview by PBS with Peggy Gilligan, Assoc. Adm’r for Aviation Safety, Fed. Aviation Admin. (Nov. 23, 2010), <http://www.pbs.org/wgbh/pages/frontline/flying-cheaper/interviews/peggy-gilligan.html> [<https://perma.cc/9X7M-DUNA>].

²⁷ Van Wagner, *supra* note 3, at 631–33.

²⁸ Arnold Barnett, *Aviation Safety and Security*, in *THE GLOBAL AIRLINE INDUSTRY* 313, 319 (Peter Belobaba et al., eds., 2009).

²⁹ Kari L. Monaghan, *Examining the Relationship Between Passenger Airline Aircraft Maintenance Outsourcing and Aircraft Safety* 96–97 (Jan. 24, 2011) (unpublished Ph.D. dissertation, Northcentral University) (on file with SMU Dedman School of Law).

³⁰ Ian Hampson et al., *Missing in Action: Aircraft Maintenance and the Recent ‘HRM in the Airlines’ Literature*, 23 INT’L J. HUM. RESOURCE MGMT. 2561, 2561 (2012) [hereinafter Hampson et al., *Missing in Action*] (citing GREG BAMBER ET AL., *UP IN THE AIR: HOW AIRLINES CAN IMPROVE PERFORMANCE BY ENGAGING THEIR EMPLOYEES* (2009)).

port, which identifies maintenance as a factor in ten percent of accidents worldwide and around nine percent of fatal accidents.³¹ In particular, the most expensive and fatal single aircraft crash was, after a full investigation, unambiguously attributed to faulty maintenance.³² In 1985, pilots of a Japan Air Lines Boeing 747 lost control of the plane when the rear bulkhead blew out, which was caused by a faulty repair job on tailstrike damage from 1978.³³ This illustrates that the consequences of poor maintenance can lie dormant for many years. Another example is a defective repair job on tailstrike damage on a then-new Air China Boeing 747 in 1980. Twenty-two years later, on May 25, 2002, the repair gave way and resulted in total loss of the aircraft.³⁴ These cases make the point that poor quality maintenance can lead to catastrophic safety outcomes, sometimes a long time after the maintenance took place.

Much of the debate in the United States has taken place in academic, professional, or industry-specific areas, and the lessons learned are not readily transferable to aviation.³⁵ There is a growing body of work that links outsourcing and offshoring to catastrophic outcomes, both for occupational health and safety and for public safety.³⁶ This literature identifies several risk factors—economic and financial pressures, disorganization of the workplace through poor management practices, spill-over effects like eroded working conditions, and “non-compliance and poor regulatory oversight,” known as regulatory failure.³⁷

³¹ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 63–65; see INT’L AIR TRANSPORT ASS’N, SAFETY REPORT 2014, at 30–31 (2015), <http://www.iata.org/publications/Documents/iata-safety-report-2014.pdf> [<https://perma.cc/5HKH-9G8U>].

³² See ASN Aircraft Accident Boeing 747SR-46 JA8119, AVIATION SAFETY NETWORK, <http://aviation-safety.net/database/record.php?id=19850812-1> [<https://perma.cc/HBU5-H3XC>].

³³ *Id.* A tailstrike occurs when a plane lands at too steep an angle and its tail contacts the ground before the wheels. *Tail Strike Avoidance*, AERO, no. 4, 1998, http://www.boeing.com/commercial/aeromagazine/aero_04/textonly/tr01txt.html [<https://perma.cc/MDN5-MNX9>].

³⁴ ASN Aircraft Accident Boeing 747-209B B-18255, AVIATION SAFETY NETWORK, <http://aviation-safety.net/database/record.php?id=20020525-0> [<https://perma.cc/FPY2-SLZZ>].

³⁵ Quinlan et al., *Outsourcing and Offshoring*, *supra* note 3, at 284–86.

³⁶ *Id.*

³⁷ *Id.* at 285; see Quinlan et al., *Slow to Learn*, *supra* note 4, at 84; see also HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 72–75.

Two agencies to which the FAA is accountable—the OIG and the National Transportation Safety Board (NTSB)—pursued the issue of the inadequate oversight of uncertificated third-party MRO shops to which American airlines were sending an increasing amount of heavy maintenance.³⁸ The FAA’s inclination was to leave the responsibility with the carriers.³⁹ Only pressure from the above agencies, as well as from Congress itself, prevailed in requiring that FAA regulate for all “covered” maintenance work to be performed by certificated repair stations by 2015; establish a safety assessment system for all repair stations; and inspect the stations annually to maintain their certifications.⁴⁰ Subsequently, the FAA announced new rules requiring all airlines to “develop policies and procedures for contract maintenance acceptable to the FAA, include [the FAA] in [the airlines’] maintenance manuals, provide the FAA with a list of all persons contracted to undertake maintenance, and maintain surveillance of contract maintenance providers to ensure they complied with the carrier’s maintenance program.”⁴¹

B. AGENCY AND INFORMATION PROBLEMS

Regulatory oversight is particularly important when the principal-agent problem inherent in the contract relationship gives rise to suspect practices. This problem typically exists where an agent is contracted by a principal to perform a task and where the two parties’ interests and knowledge are asymmetrical.⁴² By moving to contract maintenance, the aircraft operator gives up control over the planes, and the maintenance provider may lack accountability that would exist if the provider flew the plane and was directly responsible for the welfare of crew and passengers. In an arm’s length relationship between aircraft operation and aircraft maintenance, accountability can fall through the cracks.⁴³

³⁸ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 99.

³⁹ *Id.* at 100.

⁴⁰ *Id.* at 100–01; see FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 308, 126 Stat. 11, 62 (2012).

⁴¹ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 101.

⁴² *Id.* at 80; see generally Kathleen M. Eisenstadt, *Agency Theory: An Assessment and Review*, 14 ACAD. MGMT. REV. 57, 58 (1989)).

⁴³ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 80.

Under the former model where maintenance was performed in-house, air operators made decisions about which maintenance operations were to be performed and how. Now, whether the third-party contractor is onshore or offshore, “decisions are increasingly shaped . . . through the mechanism of a contract where, by definition, the interests of the two parties do not always coincide.”⁴⁴ When the interests differ, the agency problem arises, particularly under a “compliance approach” when the contracted provider performs only in the way that is precisely set out in the contract.⁴⁵

The compliance approach is a particular hazard when a contract specifies that work must be completed within a particular timeframe. Heavy penalties may apply if the work is not completed on time. Also, problems arise if unexpected maintenance issues require extra work and extra time that is beyond the scope of the contract. New or different work may require renegotiating contracts or lengthening the time the plane is out of service. In some circumstances, the vendor may abide strictly by the contract obligations and ignore the extra work to avoid contractual issues.⁴⁶

Alternatively, the vendor may be pencil-whipping the additional work required, rather than actually performing the work, or may be performing the work too quickly. One example is covering up corrosion with filler and paint rather than removing it. The vendors do this not because they are unconcerned with the public’s safety, but because they must meet a deadline, which is the primary contractual obligation.⁴⁷

The contract maintenance [workers do] exactly what’s in the contract. If [they]’re going in there to just do a certain task and it’s not an inspection, irrespective of what damage is around there, they do the task and close it up because that’s the contract.⁴⁸

An alternative risk is that either party, or both parties, to the contract may be incentivized to bury a defect. If the operator feels real pressure to return the plane to service, he has the opportunity and incentive to ignore a defect and quickly return the plane. Conversely, if maintenance is ahead of schedule, and

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.* at 80–81.

⁴⁸ *Id.*

there are no other waiting contracts to be performed, the vendor has the opportunity and incentive to classify minor imperfections as defects to create more work. Industry informants prove that this occasionally occurs:

The contract was written at a fixed price for routine work, but all work arising was charged extra, so the MRO workers would spend more time on those jobs as they made more money, the majority of these were minor cabin appearance issues, not airworthiness issues.⁴⁹

Another risk comes from the loss of the “whole-of-plane” approach to maintenance, which is when the maintenance provider examines the repair in relation to the remainder of the workings of the aircraft. The vendor’s responsibility allegedly begins and ends with the contract specifications, so there is a feeling that there is no responsibility once the work is done to check the repair in conjunction with the functioning of the remainder of the aircraft. If the aircraft operator did the work, the entire airplane would be verified. The problem may be compounded if the plane is destined for sale or is leased by the air operator.⁵⁰

The IATA argued in its 2014 Safety Report that outsourcing was a risk factor and reported that “very few MRO [facilities] are capable of completing a large work package . . . to a high standard under normal time pressures. MRO certification is not a guarantee of work quality.”⁵¹ IATA also noted the existence of “some anecdotal cases where the primary concern was that the paperwork for a work package was not done, when in reality the work itself had not been completed.”⁵²

III. THE AUSTRALIAN DEBATE

The FAA is subject to much greater political oversight than is Australia’s CASA, which only reports to Senate Estimates Committees, the Auditor-General, and the occasional Senate inquiry, and it has largely, until quite recently, escaped political direction.⁵³ By international standards, Australian airlines have been slower to utilize offshore maintenance as a competitive strategy.

⁴⁹ *Id.*

⁵⁰ *Id.* at 81–82.

⁵¹ *Id.* at 75; see INT’L AIR TRANSPORT ASS’N, *supra* note 31, at 78.

⁵² HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 75; see INT’L AIR TRANSPORT ASS’N, *supra* note 31, at 78.

⁵³ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 99.

They have, however, regularly offshored overflow maintenance, which is when several planes' maintenance needs coincide and exceed available capacity. Thus, when Qantas sought to increase its rate of offshore maintenance in the 2000s (the result of internal restructuring to cut costs), a regulatory and supervisory apparatus was there to enable it. This included a mechanism for CASA to approve offshore MRO facilities and for teams of experienced Qantas inspectors and licensed aircraft maintenance engineers (LAMEs), pronounced "lay-mees," to accompany the planes to ensure quality.⁵⁴

Offshore maintenance was politicized in 2007 when the Australian Licensed Aircraft Engineers Association (ALAEA) argued in a Senate inquiry that, despite the labor cost advantages to the company, offshoring was a drain on the national economy in terms of lost jobs, revenue, workforce capability, and safety.⁵⁵ The ALAEA submission raised a number of concerns, including: the ratio of licensed to unlicensed inspectors in overseas MRO facilities; the violation of occupational health and safety during component cleaning; and the alleged use of prison labor, which was strenuously denied by Qantas.⁵⁶ Through the next two years, as if on cue, Qantas suffered a number of mechanical issues that were arguably traceable to poor quality maintenance, and therefore linked to poor safety oversight of offshored maintenance. Some of these found their way into the media, and debates about the safety of offshored maintenance became embroiled in a number of industrial relations issues and processes, which are not the concern here.⁵⁷

A. SOME EVIDENCE OF QUALITY PROBLEMS IN OFFSHORE MAINTENANCE

Some evidence of unsafe maintenance practice exists,⁵⁸ supplemented by further evidence drawn from interviews with maintenance managers and inspectors, many of them LAMEs, who were participants in the first wave of Qantas offshoring from the mid-2000s. Lately, this source of evidence has disappeared, and there is no way of knowing whether the problems

⁵⁴ *Id.* at 22, 99–102.

⁵⁵ ALAEA Submission 2007, *supra* note 5.

⁵⁶ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 85–86; Hampson et al., *Missing in Action*, *supra* note 30, at 2570–72.

⁵⁷ Hampson et al., *Missing in Action*, *supra* note 30, at 2565–66.

⁵⁸ Gregson et al., *supra* note 17, at 607–13.

described have recurred.⁵⁹ However, the fact that they existed at all indicates that safety oversight of offshore maintenance requires special attention, specifically oversight of certain hazards of which the following is one example.

1. *The Introduction of Scribelines*

Scribelines are small scratches made in the aircraft hull as a result of using inappropriate tools to remove paint or sealant from the hull surface, panel joints, or around external fittings. Approved tools that will not scratch metal are far less efficient for paint removal than prohibited tools, such as paint scrapers, screwdrivers, pocket-knives, or angle-grinders—all tools that reportedly have been used in offshore facilities. With repeated cycles of pressurisation and depressurisation, the seemingly trivial and inconspicuous scratches develop into cracks and tears, which can eventually cause aircraft disintegration.⁶⁰

According to an Airworthiness Notice (AWN) from the Malaysian Department of Civil Aviation, scribeline damage concerns can be traced back to a 1988 incident in which an American-registered Boeing 727 “experienced cabin decompression after the fuselage skin peeled off from its stringers” as the result of scribelines that were “introduced during the aircraft maintenance.”⁶¹

It is obvious that such “scribe mark” scratches, if not repaired, will initiate fatigue cracks and result[] in widespread multi-site fatigue damage (MSD), which would result in rapid decompression and loss of aircraft in flight.⁶²

The AWN explicitly required MRO facilities to avoid generating scribelines using unapproved tools, following new Boeing requirements for extra care with scribelines that were incorporated in changes to structural repair manuals. However, Australian inspectors supervising maintenance shortly, only a couple of years, after the AWN was issued “continued to find instances of unsafe sealant removal practices.” But a diligent

⁵⁹ HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*, *supra* note 11, at 81.

⁶⁰ *Id.* at 83.

⁶¹ *Id.*; DEP’T OF CIVIL AVIATION OF MALAYSIA, AIRWORTHINESS NOTICE No. 91, at 1 (2005) [hereinafter AIRWORTHINESS NOTICE No. 91], <http://www.dca.gov.my/wp-content/uploads/2015/02/AN91.pdf> [<https://perma.cc/EA7U-7HYH>].

⁶² HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*, *supra* note 11, at 83; *see* AIRWORTHINESS NOTICE No. 91, *supra* note 61.

manager committed to safety “found the poor quality work and demanded it be redone to [meet the appropriate] standard.”⁶³

They were just walking around with knives cutting sealant off skin panels, leaving these . . . quite heavy scribelines in some cases[,] and when we were finding these and bringing it to their attention[,] they were in that case definitely just hiding the defects. . . . [T]hey were told to rework it in accordance with the SRM (Structural Repair Manual) and then allow us to inspect it . . .

I returned the next day, . . . [and] the sealant was on and the paint was already applied. I said, [“]well, hold on a [second] guys, I asked for us to inspect this.[”] [They replied, “]Oh no, that was going to take too long because we did this on the night shift and you were going to hold us up[.”] and I said, [“]well, I don’t care, take it off[.”] and it started a whole hoo-hah. . . . I had to sit down with the managers [and] sign . . . a customer agreement form basically that said I agree to the extra man-hours required to remove this and we’ll pay the bill and everything else. So I insisted they pull it off, [and] when I pulled it off, the scribelines hadn’t been repaired.⁶⁴

2. *The Issues with Scribelines Continue*

In another example, inspectors had to uncover the cause of decompression on one of two Boeing 747s that an Australian airline purchased from another airline. The two planes became known as the “Ugly Sisters” because they were plagued with faults. The cause of the decompression was a long, vertical, around-the-body crack in the frame, which was the consequence of using prohibited tools in paint removal. The scribeline, which looked like a pencil line, had been covered with sealant that had lifted from the frame when pressure had been exerted from within the fuselage, and it could not have been seen without prior experience.⁶⁵

B. OTHER MORE RECENT EVIDENCE OF POOR MAINTENANCE PRACTICES

ALAEA claimed, in an inquiry submission, that a D check on a Boeing 747 in Hong Kong revealed a number of engine mounting bolts had been installed upside down. A witness represent-

⁶³ HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*, *supra* note 11, at 83.

⁶⁴ *Id.* at 83–84.

⁶⁵ *Id.* at 84.

ing CASA at the inquiry hearings claimed that “the problem was a trivial one and affected only one bolt on one engine.” But this upside down bolt violated procedure, at the very least, on one of the most heavily stressed parts of an aircraft, and it raised concern that the regulator had a relaxed approach to this safety breach.⁶⁶

One reason for such departures from safety standards is an extreme undersupply of qualified and licensed supervisory personnel. A desirable ratio of supervision in Australia is 1:3, with one LAME supervising the work of three unlicensed inspectors. In Europe, the average ratio is estimated at 1:5. The “most likely scenario” used by the ICAO in its labor requirement forecasts, based on representative observed practice across all member nations, sets the ratio for a large passenger or cargo jet at 1:3. However, ALAEA claims that the ratio in a Singaporean MRO facility, to which Qantas planes were sent for heavy maintenance in early 2000s, was 1:11. In Hong Kong, the ratio was 1:8 and in the Philippines, the ratio was 1:22.⁶⁷

Language barriers often increase supervision and oversight problems, according to one former maintenance inspector. He reported that one LAME would oversee twenty or more unlicensed inspectors, some of whom did not know English at all.⁶⁸

Some former inspectors suggest that there is a systemic link between safety outcomes and national differences in regulatory requirements. One maintenance inspector remarked that:

If we were seeing a lot of unusual defects or defects that were unusually severe in their extent[,] we would go back and look at the previous check[,] and nearly always the previous check would've been done at a foreign MRO.

I've actually worked on the [de-identified] aircraft in our maintenance facilities before. We used to do some of their engine maintenance and we found some rather unnerving things. We found drills broken off inside fuselage [pins] and a rivet head had basically been cut from the rivet and glued over the top of the rivet hole. . . . So [we] X-rayed the panel and we found a drill bit stuck inside the fuselage. . . . [O]nce again whether that was done by [de-identified] Airlines[,] maintenance itself, or whether it was done by an MRO that they used, obviously we can't find that out.⁶⁹

⁶⁶ *Id.* at 85.

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *Id.* (alteration in original).

It is clear that inadequate maintenance practices have occurred, which makes a strong case that all MRO facilities should be subject to strong and effective safety oversight to counter the negative effects. How effective is the current international system at providing that oversight?

IV. THE UNCERTAIN REGULATION OF OFFSHORE AIRCRAFT MAINTENANCE

An environment in which an ever-growing proportion of maintenance occurs outside the state of registration is imposing new strains on the international regulations meant to ensure safety. It has exposed lack of clarity in the regulations, and the ICAO Universal Safety Oversight Audit Program (USOAP), which is supposed to reinforce the international system, has lost much of its previous functionality, specifically that it no longer performs regular audits of national regulators. Other standards-setting and monitoring processes have arisen, such as those operated by the European Aviation Safety Agency (EASA), the IATA Operational Safety Audit (IOSA), and the FAA's International Aviation Safety Assessment Program (IASAP), but these are beyond the scope of this article. In any case, both IASAP and IOSA are based on ICAO standards, and Australia is committed by treaty and its own legislation to employ regulatory oversight processes based on the ICAO system.⁷⁰

A. LACK OF CLARITY IN ICAO REGULATIONS

There are 191 members to the Chicago Convention (the Convention), which set up the ICAO as an arm of the United Nations. The ICAO sets the standards for regulation of the international aviation system, which guide national legislative and regulatory practice.⁷¹ There are tensions between the Convention's various Articles and Annexes, which produce lack of clarity and comprehensiveness in safety regulation. The regulations specify that the safety of maintenance is the responsibility of the state of registry, but it allows for such responsibility to be offshored to contracting states.⁷²

⁷⁰ *Id.* at 91–99.

⁷¹ *About Us*, U.S. MISSION TO THE INT'L CIVIL AVIATION ORG., <http://icao.usmission.gov/about-us.html> [<https://perma.cc/R4D7-85EW>]; see Paul Stephen Dempsey, *Aviation Security: The Role of Law in the War Against Terrorism*, 41 COLUM. J. TRANSNAT'L L. 649, 661 (2003).

⁷² HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*, *supra* note 11, at 91–95.

For example, Article 31 and Annex 8 insist that the state of registry has overall responsibility for the safety of its planes. Annex 8 requires that the state of registry have an ongoing inspection regime that should not be delegated to another state.

The State of Registry also has the responsibility to make certain that every aircraft on its register is maintained in an airworthy condition throughout its operational service life. . . . Although methods of discharging the foregoing State airworthiness responsibilities may vary, and in some cases, may involve the transfer of certain tasks to authori[z]ed organi[z]ations or other States, *such arrangements do not relieve the State of Registry from its overall responsibility.*⁷³

On the other hand, Article 33 encourages contracting states arrangements, which require mutual recognition between states provided their practices “are *equal to or above the minimum standards* [that] may be established from time to time pursuant to this Convention.”⁷⁴ This means that a certificate of airworthiness issued in another state, where the offshore maintenance occurred, must be rendered valid by the state of registry. This is true despite difficulties of verification posed by sovereignty, under the assumption that the offshore maintenance state follows standards that are equal to or above the minimum standards.⁷⁵ Article 33 not only allows, but arguably *requires* reciprocal recognition arrangements that transfer certain functions of a national regulator to other countries, including safety oversight.⁷⁶ This is a significant regulatory inconsistency; it makes the state of registry responsible for safety oversight without giving it the means of discharging that responsibility.

The mechanisms by which ICAO standards are monitored and verified are crucial to the working of the system. The issue, however, is that the Convention allows ICAO to notify contracting states of violations of the guidelines of the Convention but does not provide authority for safety compliance and enforcement. The effectiveness of the Convention in ensuring

⁷³ *Id.* at 93 (alteration in original); *see* Convention on International Civil Aviation art. 31, annex 8, Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295 [hereinafter Chicago Convention].

⁷⁴ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 93 (quoting Chicago Convention, *supra* note 73, art. 33 (emphasis added)).

⁷⁵ *Id.*

⁷⁶ *Id.*

safety in aviation “is based on the assumption that each contracting State adheres to the organi[z]ation’s safety standards.”⁷⁷

B. VERIFYING INTERNATIONAL COMPLIANCE: THE UNIVERSAL SAFETY OVERSIGHT AUDIT PROGRAM

Article 38 imposes an obligation on member states to declare differences if they do not comply with ICAO standards.⁷⁸ Non-compliance created a major safety concern in the mid-1990s because some states that were not observing standards were also not filing differences. Thus, ICAO established the USOAP in 1998.⁷⁹ The goal of the program was as follows:

Determine States’ capabilit[ies] for safety oversight by assessing the effective implementation of the critical elements of a safety oversight system and the status of States’ implementation[s] of safety-relevant ICAO Standards and Recommended Practices, associated procedures, guidance material[,] and safety-related practices.⁸⁰

Typically, ICAO officials conduct USOAP audits after signing a Memorandum of Understanding between ICAO and the audited state. This process confirms the principle of sovereignty despite the compulsion or pressure states feel to accept the audits. Certain states pushed against ICAO’s “policing” of their safety systems.⁸¹ However, one author argues that a nation state’s obligations to enforce safety oversight in its territory should be viewed as obligations to all, which justifies the role of a centralized international institution like ICAO as the enforcer.⁸² Others argue for decentralization of enforcement, in which states act against a noncompliant state, despite no direct connection. Article 33 supports this argument in that it allows for noncompliant state certificates to be refused recognition by

⁷⁷ *Id.* at 94; see Jiefang Huang, *Aviation Safety, ICAO and Obligations Erga Omnes*, 8 CHINESE J. INT’L L. 63, 66 (2009); Olga Barreto, *Safety Oversight: Federal Aviation Administration, International Civil Aviation Organization, and Central American Aviation Safety Agency*, 67 J. AIR L. & COM. 651, 654 (2002).

⁷⁸ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 94.

⁷⁹ *Id.*

⁸⁰ *Id.*; see Chicago Convention, *supra* note 73, art. 33.

⁸¹ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 94.

⁸² *Id.*; see Huang, *supra* note 77, at 71–72.

other contracting states. The FAA regulatory system follows this practice, as well as the EASA regulatory system.⁸³

USOAP is crucial to the workings of the system because it helps verify if states' safety regulations comply with ICAO standards. The first round of safety audits, beginning in 2000, were used to verify that regulators implemented the Standards and Recommended Practices (SARPs) contained in Annexes 1, 6, and 8.⁸⁴ By 2006, ICAO reported that nation states had made significant progress in implementing state corrective action plans and including key elements of a safety oversight system. Transparency concerns continued, however, because only general disclosures were available on the ICAO website, rather than the broad publications that were promised.⁸⁵

The initial series of audits ended around 2009, and there were concerns about their relative infrequency. USOAP was then upgraded to the Continuous Monitoring Approach (CMA), which gathers information on an ongoing basis and does not include the infrequent audits. But the upgrade was not without its faults, one of which being that CMA relies partly on self-reporting by the regulators being audited.⁸⁶ The extent to which Australia has implemented the CMA is not known at the time of writing this article.

There is no doubt that the ICAO programs have limitations, but they have also identified "fundamental weaknesses in the safety programs of many States, resulting in significant differences in safety standards around the globe."⁸⁷ In the 2013 Safety Report, ICAO found that the percentage of compliance in implementing the "critical elements" of safety oversight was sixty-one percent across all nations audited, while the percentage for airworthiness oversight was somewhat higher at seventy-three

⁸³ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 94; see Michael Jennison, *The Future of Aviation Safety Regulation: New US-EU Agreement Harmonizes and Consolidates the Transatlantic Regime, But What is the Potential for Genuine Regulatory Reform?*, 38 AIR & SPACE L. 333, 334–35 (2013).

⁸⁴ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 94.

⁸⁵ *Id.*

⁸⁶ *Id.* at 94–95; see *The USOAP Evolved: Realizing the Promise of the Continuous Monitoring Approach*, 65 ICAO J., no. 5, 2010, at 1, 25–26; *Evolving ICAO's Universal Safety Oversight Audit Programme: The Continuous Monitoring Approach*, 65 ICAO J., no. 4, 2010, at 1, 24.

⁸⁷ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 95.

percent, which is still not entirely encouraging.⁸⁸ The significant differences that ICAO identified have not led to an adjustment in the default rule to treat all national licenses and certificates as equivalent.⁸⁹

To sum up, the international regulatory scheme is one in which the international body has no substantive powers to act on its own initiative for violations of its standards; the enforceability of the scheme depends on the willingness of individual nations to apply sanctions; the provisions can be overridden by bilateral or multilateral agreements between individual member countries; and, most seriously, there is a regulatory inconsistency between Articles 33 and 31 and Annex 8 of the Convention.⁹⁰ Therefore, confidence in the international regulatory system of aircraft maintenance safety oversight—at least insofar as it is based on the ICAO system—is misplaced.

V. UNCERTAINTY IN AUSTRALIAN SAFETY OVERSIGHT OF OFFSHORE MAINTENANCE

Reference was made above regarding concerns that standards could decline during the gaps between USOAP audits.⁹¹ This is relevant to Australia, which was last audited in 2008⁹² at the beginning of major aircraft maintenance regulation reforms aimed at harmonizing the regulations with the EASA regulatory system. The resulting program following reform, called the Regulatory Reform Program (RRP), strained relations between the regulator and the industry leaders.⁹³ The government's ASRR found that the transition process was having a "negative impact on effective safety oversight."⁹⁴ In particular, the capacity of

⁸⁸ *Id.*; see INT'L CIVIL AVIATION ORG., 2013 SAFETY REPORT 7–8 (2015), http://www.icao.int/safety/documents/icao_2013-safety-report_final.pdf [<https://perma.cc/FXN4-P338>].

⁸⁹ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 95.

⁹⁰ *See id.* at 92–95.

⁹¹ *See supra* notes 80–85 and accompanying text.

⁹² See INT'L CIVIL AVIATION ORG., FINAL REPORT ON THE SAFETY OVERSIGHT AUDIT OF THE CIVIL AVIATION SYSTEM OF AUSTRALIA (2008) [hereinafter 2008 AUSTRALIA AUDIT REPORT], http://amroba.org.au/wp-content/uploads/2015/08/ICAO_USOAP_Final_Report2008.pdf [<https://perma.cc/GFQ2-9K4Y>].

⁹³ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 109–13.

⁹⁴ *Aviation Safety Regulation Review*, *supra* note 6, at 91. The ASRR reported on domestic, not international, regulatory oversight because it astoundingly regarded the latter as beyond the purview of its review of safety regulation. *Id.*

CASA's inspectors to perform their roles has been called into question.⁹⁵ We consider these points in turn.

CASA has previously issued a number of approvals to overseas MRO facilities, under Australian law, consistent with Article 31 and Annex 8 of the Convention. These offshore authorizations have increased the burden on Australian oversight because approvals require regular auditing and inspection under Annex 8 of the Convention. In response, the Australian regulator increasingly relies on other countries' National Airworthiness Authority (NAA) decisions to provide safety oversight of offshore maintenance of Australian registered planes. This reliance comes from the creation of Bilateral Aviation Safety Agreements (BASAs), which ultimately treat domestic and overseas spaces as identical for regulatory purposes.⁹⁶

A. AMBIGUOUS AUSTRALIAN SAFETY OVERSIGHT

The ambiguities described above are reproduced within Australian legislation, regulation, and practice. Australia's Civil Aviation Act of 1998 (the Act) states:

CASA shall perform its functions in a manner consistent with the obligations of Australia under [the Convention] and any other agreement between Australia and any other country or countries relating to the safety of air navigation.⁹⁷

Australia's State Safety Program (SSP) supports the Act and holds CASA "responsible for the safety regulation of both civil air operations in Australian territory and Australian aircraft operating outside Australian territory."⁹⁸ According to CASA's understanding, the Act grants authority to CASA to maintain air safety.

[The Act] places responsibility on CASA to conduct the safety regulation of civil air operations in Australian territory[,] and the operation of Australian aircraft outside Australian territory, by means that include "developing effective enforcement strategies to secure compliance with aviation safety standards."⁹⁹

The means of enforcement may include automatic acceptance of other countries' standards and approvals, which is con-

⁹⁵ *Id.* at 88.

⁹⁶ HAMPSON ET AL., THE FUTURE OF AIRCRAFT MAINTENANCE, *supra* note 11, at 97–98.

⁹⁷ *Id.* at 96 (quoting *Civil Aviation Act 1988* (Cth) s 11 (Austl.)).

⁹⁸ *Id.* (quoting *Australia's State Aviation Safety Program 2012* (Cth) s 1.2 (Austl.)).

⁹⁹ *Id.*

sistent with Article 33 of the Convention, as explained above. The practice of automatic acceptance has a history. With respect to licensing, CASA has, under Civil Aviation Regulation (CAR) 1988 Division 5, historically treated approvals given by an ICAO contracting state as being, to all intents and purposes, equivalent to those in Australia. The relevant regulation is as follows:

(1) The holder of the certificate of registration for an Australian aircraft on which maintenance has been carried out outside Australian territory must not fly the aircraft, and must ensure the aircraft is not flown, if each of the following requirements is not satisfied:

(a) the completion of the maintenance has been certified by:

(i) a person who would have been permitted by regulation 42ZC to carry out the maintenance if the aircraft had been in Australia; or

(ii) if the maintenance was carried out in a Contracting State – a person who would be permitted under the law of the Contracting State to certify the completion of the maintenance if the aircraft were registered in the Contracting State[.]¹⁰⁰

Under this regulation, the final provision effectively makes Australian aircraft maintenance quality “hostage to the training, licensing[,] and approval processes of another country.”¹⁰¹ Notably, this regulation does not apply to the Regular Public Transport (RPT) sector. Regulation of RPT was done under CAR30 but now is in transition to the new EASA-based regulations, specially Civil Aviation Safety Regulation (CASR) 1998.¹⁰²

The introduction of Part 42 of CASR establishes that a registered operator is responsible for the continuing airworthiness of an aircraft used for [RPT] as described under CAR 206(1)(c). Further[,] Part 42 of the CASR has set up legislative requirements under clause 42.295 of Subpart 42 D - Maintenance [that] states that all aircraft involved in RPT Operations must be maintained by a Maintenance Organi[z]ation that is approved by CASA under Part 145 of CASR.

All offshore maintenance work for aircraft conducting RPT operations is governed under the requirements in Parts 42 and 145 of

¹⁰⁰ *Id.* at 96–97 (quoting *Civil Aviation Regulations 1988* (Cth) pt 4A div 6 reg 42ZN (Austl.)).

¹⁰¹ *Id.* at 97.

¹⁰² *See id.*

CASR. Any offshore organi[z]ation conducting maintenance work for an RPT aircraft has to go through an identical [approval] process as applicable for a domestically located organi[z]ation.¹⁰³

Approval of an offshore facility, to be equivalent to a domestic approval consistent with the requirements of ICAO standards, must be directly administered by CASA following its own inspections. This process is distinguishable from ongoing inspections necessary to ensure retention of approval. Previously, if CASA found problems, it could withdraw approval from the foreign shop. However, “mutual recognition” of each other’s regulatory authorities, consistent with Article 33 and expressed in BASAs, remove this possibility.¹⁰⁴ An example of the scope of these agreements is the 2013 Technical Agreement (TA) between Australia and Singapore:

By signing the TA, CASA acknowledges that maintenance organi[z]ations, approved in accordance with [relevant law] and qualifying under the terms of the TA are considered equivalent to an Australian [maintenance shop] approved under [CASR 1998] Part 145.¹⁰⁵

Through this mutual recognition and the supporting agreements, Australia’s regulator must take the approval of its counterpart organization at face value. This is true even without personal knowledge of the conditions in the MRO facilities or of the quality of the subcontractors to which the MRO facilities might outsource work. There is also no way for the regulator to track what plane, or part thereof, is being maintained where because there is no requirement on airlines to inform CASA where and when Australian airlines’ planes are being maintained. In the acceptance of an approval granted by an overseas NAA, the Australian regulator makes assumptions about the supply chain of the foreign MRO facility. Some assumptions are, for example, that the facility is secure against the entry of fake parts and that the approved MRO facility is not outsourcing work to non-approved MRO facilities.¹⁰⁶ Further, some NAAs, Singapore’s spe-

¹⁰³ *Id.*

¹⁰⁴ *Id.* at 97–98.

¹⁰⁵ *Id.* at 98.

¹⁰⁶ The FAA has a rigorous Parts Manufacturer Approval (PMA) process, covering both design and production approval for aircraft replacement parts and modification items. Bilateral recognition agreements based on PMA approvals can be extended to the production and installation of items on certain products in other countries. See *Parts Manufacturer Approval (PMA)*, FED. AVIATION ADMIN. (May 3,

cifically, are not only safety regulators, but also are required to play a role in supporting *their* country's aviation sector and *their* country's MRO industry, meaning that they must also be industry policy advocates.¹⁰⁷ This makes regulatory capture possible, and Australia's ASRR argued that it was not appropriate to combine the roles in this way in Australia.¹⁰⁸

B. THE ROLE OF THE INSPECTORATE

An adequately trained and resourced inspectorate using an appropriate array of enforcement tools is critical to the effective implementation of safety regulation. There is evidence, both in aviation and other fields, that changes to work organization, such as outsourcing, can pose a significant challenge to the inspectorate's capacity to fulfill its role.¹⁰⁹ It adds a layer of complexity to their responsibilities for oversight.¹¹⁰ Where work is moved to another jurisdiction, as by offshoring, it is especially difficult to maintain adequate regulatory oversight.

The recent ASRR found that Australia's domestic inspection regime was flawed in a number of respects.¹¹¹ Our argument here is that since the capability of Australia's inspectorate apparently falls below "international standards" in the domestic sphere, we would be unwise to rely on its capacity for effective monitoring of maintenance in the international sphere.

In the early years of maintenance offshoring between 2006 and 2010, Qantas sent its own inspectors to supervise the work of overseas shops. Some of these Qantas inspectors questioned the rigor of inspections undertaken by CASA:

2016, 1:30 PM), http://www.faa.gov/aircraft/air_cert/design_approvals/pma/ [<https://perma.cc/B5TZ-8ZV8>]. Bilateral recognition agreements may weaken the line of defense of parts quality, but a more serious issue is the possible introduction of counterfeit and non-approved parts due to insufficient regulation and monitoring of maintenance subcontracting to non-approved MRO facilities down the supply chain. *Id.*

¹⁰⁷ *Aviation Industry Development*, CIVIL AVIATION AUTHORITY OF SINGAPORE, http://www.caas.gov.sg/caas/en/About_CAAS/Our_Strategic_Thrusts/Aviation_Industry_Development/?__locale=en [<https://perma.cc/9423-7ZNG>].

¹⁰⁸ *Aviation Safety Regulation Review*, *supra* note 6, at 22–23.

¹⁰⁹ DAVID WALTERS ET AL., *REGULATING WORKPLACE RISKS: A COMPARATIVE STUDY OF INSPECTION REGIMES IN TIMES OF CHANGE* (2011); Quinlan et al., *Slow to Learn*, *supra* note 4, at 72.

¹¹⁰ WALTERS ET AL., *supra* note 109; Quinlan et al., *Slow to Learn*, *supra* note 4, at 72.

¹¹¹ *Aviation Safety Regulation Review*, *supra* note 6, at 1–5.

Well, I mean in all of the times that I was away[,] I only ever saw, or knew of and essentially didn't really see[,] CASA at one site and there apparently were guys there[;] I saw some gentlemen walking around [but] never spoke to them. They did a general walk-around and then disappeared[,] and that's the only time that I ever saw any input from CASA at any of these MRO [facilities].¹¹²

Now with paper audits, the inspection does not directly reach the workplace and faults remain that avoid the paper trail of the company's safety management system. This displacement of on-the-ground inspection procedures has been unofficially acknowledged by CASA employees:

We only look at paperwork now. We very rarely actually look at an aircraft to see if the work [is] done properly. [We o]nly look at the processes. If the paperwork [is] fine [but] something goes wrong[,] then you just blame the company.¹¹³

CASA inspectors' absences from the hangar floor may be partly accounted for by changes in the nature of safety auditing. According to the ASRR, the verification of maintenance facilities has changed from inspecting actual shop floor processes to auditing Safety Management Systems (SMS).¹¹⁴

New methods of safety oversight are being introduced for high-risk sectors. Regulators are having to step back from prescriptive hands-on inspection processes and apply systems approaches to safety oversight.¹¹⁵

Yet the SMS concept is almost certain to make CASA's oversight task even harder.¹¹⁶

Performance-based rules and the application of SMS, along with risk-based surveillance concepts, require a change in how safety agencies work. These changes bring challenges, placing more responsibility on regulated organi[z]ations and changing how regulators conduct oversight.¹¹⁷

The ASRR also noted that such inspections were often not performed under international best practices, or in compliance

¹¹² HAMPSON ET AL., *THE FUTURE OF AIRCRAFT MAINTENANCE*, *supra* note 11, at 97–98.

¹¹³ *Id.* at 87.

¹¹⁴ *Id.* at 105 (citing *Aviation Safety Regulation Review*, *supra* note 6, at 58).

¹¹⁵ *Id.* at 105 (quoting *Aviation Safety Regulation Review*, *supra* note 6, at 58).

¹¹⁶ *Id.*

¹¹⁷ *Id.* (quoting *Aviation Safety Regulation Review*, *supra* note 6, at 57).

with ICAO standards, because CASA inspectors were not sufficiently well-trained in the techniques.¹¹⁸

[S]ome inspectors lack adequate knowledge and understanding of the sector they are regulating to ensure correct and consistent regulatory decisions. Interviews with industry representatives and CASA staff indicated that adequate audit training is not provided.¹¹⁹

Thus, the ASRR echoed findings of the ICAO's report from its 2008 USOAP audit of Australia's aviation maintenance oversight system. Australia must upgrade its ability to retain technical expertise within CASA, and the experience and knowledge of auditors needs upgrading through CASA's internal training.¹²⁰

VI. CONCLUSION

The only way to achieve an acceptable degree of certainty in the safety of maintenance offshored from Australia is to toughen the inspection regime. CASA must take its verification task more seriously, the ICAO USOAP process must improve to underpin a regime of mutual recognition, or a new program could be formed from yet unconceived international institutions. For now, Australia is, or should be, firmly committed to the fundamental principle that the state of registry is responsible for the safety oversight of the aircraft on its national register, including during and as a consequence of the maintenance of these aircraft in offshore spaces.

There have been a significant number of problems with maintenance quality in offshore facilities. Although planes may not (yet?) be falling from the sky, the oft-quoted argument used to brush aside safety concerns, the reassuring statistics cannot and should not be used to justify a continuing erosion of safety protections. The absence of an accident does not mean that the system is "safe."¹²¹ Rather, during a long period without an accident or serious incident, the greatest enemy of safe practice is complacency, as layers of safety protection are eroded by cost-cutting. Safety regulators also prefer the term "compliant" more

¹¹⁸ *Id.* at 106 (citing *Aviation Safety Regulation Review*, *supra* note 6, at 78).

¹¹⁹ *Id.* (quoting *Aviation Safety Regulation Review*, *supra* note 6, at 78).

¹²⁰ *Id.*; see *Aviation Safety Regulation Review*, *supra* note 6, at 3–5; 2008 AUSTRALIA AUDIT REPORT, *supra* note 92.

¹²¹ See *Frontline: Flying Cheap*, PBS (Feb. 9, 2010), <http://www.pbs.org/wgbh/pages/frontline/flyingcheap/etc/script.html> [<https://perma.cc/S8JL-CJDC>] (statement of Miles O'Brien).

than “safe,” which only means the maintenance is compliant to the safety management systems that allegedly ensure safety but do not necessarily do so.

The article’s argument needs to be carefully put because it is easily, and perhaps conveniently, mistaken for xenophobia, or worse. That is not intended. Rather, there are serious questions about the regulation of outsourcing and offshoring maintenance—observations that are entirely consistent with long-standing research on regulating outsourcing in other industries. Because offshoring involves another national space, a transnational mechanism is needed, such as a revitalized ICAO USOAP, to ensure that national regulators do their jobs. If national regulators find it difficult enough to keep up with the oversight of outsourced maintenance in their own national jurisdictions, it is difficult to see how they can exercise their responsibilities to ensure that planes registered to them are provided with adequate safety oversight in other countries. Nevertheless, national regulators will find it easier to subject MRO facilities within their national spaces to the most potent weapon in the inspector’s arsenal: the surprise inspection.

In the event that the ICAO USOAP is reconstituted and revitalized and the regulatory tension between Article 33, Article 31, and Annex 8 is resolved, the next steps are creating greater transparency about where maintenance is performed and implementing an improved maintenance rating system, based on assessments by independent public agencies to which airline customers could refer when choosing the airlines on which they fly. In that way, if regulation on its own cannot do the job, perhaps the market, appropriately shaped by regulation and informed choice, will do so.