

SUPREME COURT OF QUEENSLAND

CITATION: *McDermott & Ors v Robinson Helicopter Company Incorporated*
[2014] QCA 357

PARTIES: **GRAHAM JAMES McDERMOTT**
(first appellant)
JUANITA CAROL McDERMOTT
(second appellant)
NTB PASTORAL HOLDINGS PTY LTD
ACN 078 593 469
(third appellant)
v
ROBINSON HELICOPTER COMPANY
INCORPORATED
(respondent)

FILE NO/S: Appeal No 3840 of 2014
SC No 4573 of 2007

DIVISION: Court of Appeal

PROCEEDING: General Civil Appeal

ORIGINATING COURT: Supreme Court at Brisbane

DELIVERED ON: 19 December 2014

DELIVERED AT: Brisbane

HEARING DATE: 9 September 2014

JUDGES: Margaret McMurdo P and Holmes JA and Alan Wilson J
Separate reasons for judgment of each member of the Court,
Margaret McMurdo P and Alan Wilson J concurring as to the
orders made, Holmes JA dissenting

ORDERS: **1. Appeal allowed.**
2. The decision of the Supreme Court trial division is set aside and instead it is ordered that judgment be entered for the plaintiffs and that the matter be remitted to the trial division for the assessment of the plaintiffs' damages.

CATCHWORDS: TORTS – NEGLIGENCE – ESSENTIALS OF ACTION FOR NEGLIGENCE – STANDARD OF CARE – GENERALLY – where the first appellant was seriously injured in a helicopter accident – where the respondent manufactured the helicopter – where the appellants alleged at trial that the wording of the helicopter's maintenance manual failed to specify and require an adequate inspection procedure such that the defect which lead to the accident would have been discovered in time and the accident would have been prevented –

where the trial judge found that the manual adequately addressed the risks associated with the inspection procedure for the defect, and that the respondent had therefore not breached its duty of care – where the appellants argue on appeal that the trial judge made erroneous findings of fact, and inconsistent and contrary findings of fact, in relation to how the defect came about and if it was detected, and how and the extent to which the maintenance manual addressed the risk of that type of defect – whether the appeal should be allowed

TRADE AND COMMERCE – COMPETITION, FAIR TRADING AND CONSUMER PROTECTION LEGISLATION – CONSUMER PROTECTION – LIABILITY OF MANUFACTURERS OR IMPORTERS FOR DEFECTIVE GOODS – where the first appellant was seriously injured in a helicopter accident – where the respondent manufactured the helicopter – where the first appellant claimed compensation under s 75AD of the *Trade Practices Act 1974* (Cth) for his injuries suffered because of a defect in the helicopter and/or maintenance manual – where the second appellant claimed compensation under s 75AE of the *Trade Practices Act 1974* (Cth) for losses she has suffered because of the first appellant’s injuries – where the trial judge found that neither the helicopter nor the maintenance manual had a ‘defect’ within the meaning of s 75AC of the *Trade Practices Act 1974* (Cth), and that therefore neither the first nor second appellant could claim compensation under ss 75AD or 75AE – where the appellants argue on appeal that the trial judge erred in fact in making those findings – whether the appeal should be allowed

Trade Practices Act 1974 (Cth), s 75AC, s 75AD, s 75AE

Bale v Mills (2011) 81 NSWLR 498; [2011] NSWCA 226, cited
McDermott & Ors v Robinson Helicopter Company [2014] QSC 34, related

Suosaari v Steinhardt [1989] 2 Qd R 477, cited
Wyong Shire Council v Shirt (1980) 146 CLR 40; [1980] HCA 12, cited

COUNSEL: W Sofronoff QC, with M Eliadis, for the appellants
R G Bain QC, with M Hickey, for the respondent

SOLICITORS: Shine Lawyers for the appellants
Meridian Lawyers for the respondent

[1] **MARGARET McMURDO P:** In May 2004 a Robinson 22 helicopter crashed while being used to inspect fence lines on a cattle property close to the Northern Territory-Queensland border. The pilot, Mr Kevin Norton, was killed. The appellants, Mr Graham James McDermott, the sole passenger in the helicopter at the time of the crash; his wife, Ms Juanita Carol McDermott; and his employer, NTB Pastoral Holdings Pty Ltd, brought an action for damages against a number of parties, including the respondent, Robinson Helicopter Company Inc (Robinson). This appeal is from the primary judge's order dismissing the claim against Robinson.

- [2] I agree with Alan Wilson J's reasons for allowing this appeal, setting aside that order and instead entering judgment for the appellants. As the reasons of Holmes JA and the primary judge demonstrate, the resolution of this case was difficult and finely balanced. For that reason, I wish to make some additional observations. Holmes JA and Alan Wilson J have set out the relevant facts which I will not unnecessarily repeat.
- [3] The following matters were common ground at the trial. The accident was caused by the failure of bolt 4¹ in the helicopter's Forward Flex Plate² and this ultimately resulted in failure of the flex plate and the destruction of the helicopter, with tragic consequences for Mr Norton and serious injuries to Mr McDermott. Bolt 4 was a critical fastener in that, if removed or lost, it would compromise the safe operation of the helicopter with the risk of catastrophic failure.³ For that reason, the helicopter maintenance manual specified that a secondary locking mechanism, a palnut, must be placed on bolt 4 and that after the installation of the palnut, a torque stripe be applied across both bolt 4 and the palnut.⁴
- [4] There was no dispute in this appeal with the following findings of the primary judge. At some point more than 100 flying hours before the accident, bolt 4 was incorrectly assembled and soon after began to rotate.⁵ If a torque stripe had been properly applied when bolt 4 was incorrectly assembled, the stripe would have been visibly damaged shortly thereafter and this damage would have been apparent on the subsequent 100 hourly inspections conducted by the Licensed Aircraft Maintenance Engineers (LAMEs), Mr Fisher and Mr Bray.⁶
- [5] At relevant times prior to the accident, the manual required that the helicopter be inspected periodically to verify its airworthiness, with inspection intervals at a maximum 100 hours time in service or 12 calendar months, whichever occurred first.⁷ The manual stated in respect of the flex plate: "Inspect condition, particularly edges. Verify security. ...".⁸ Elsewhere, it relevantly provided in respect of bolt 4:
 "Torque seal (paint) is applied to all critical fasteners after palnut installation in a stripe across both nuts and exposed bolt threads. The stripe should extend to the part being fastened to show bolt rotation. Any subsequent rotation of the nut or bolt can be detected visually.
 ...
 Any nut damaged due to handling or whose nut drag has deteriorated appreciably must be replaced."⁹
- [6] In April 2007 after the accident, the manual was relevantly amended in these terms:
 "Torque seal (lacquer) is *conspicuously* applied to all critical fasteners after palnut ... installation in a stripe across both nuts and exposed bolt threads. The stripe *must* extend to the component in order to detect bolt rotation (reference Figure 2-1). Any subsequent rotation of the nut or bolt can be detected visually. Position torque stripes for maximum visibility during preflight inspections. *Torque stripes are subject to deterioration and must be periodically renewed....* ." (*my emphasis*)

¹ *McDermott v Robinson Helicopter Company* [2014] QSC 34, [14].

² Above, [10].

³ Above, [139].

⁴ Above, [45].

⁵ Above, [156].

⁶ Above, [157].

⁷ Para 2.000.

⁸ Para 2.410.

⁹ Para 1.310.

- [7] His Honour found that the effect of the instructions in the manual prior to the accident required a LAME carrying out a 100 hourly inspection to examine the condition of the torque stripe for bolt 4 and, if not as specified in the manual, to check the torque of bolt 4. Had this been done, the faulty installation of bolt 4 would have been discovered and the accident averted. It followed, his Honour found, that compliance with the manual was sufficient to prevent the accident.¹⁰ The primary judge found that Robinson took reasonable care to address the risk of failure of the flex plate from an inadequately torqued bolted joint. The relevant provisions of the manual, particularly the instruction to verify security together with the provisions relating to torque stripes, were adequate. His Honour concluded that Robinson took reasonable care to address that risk and neither the helicopter nor the maintenance manual had a defect for the purposes of s 75AD and s 75AE *Trade Practices Act 1974* (Cth).¹¹
- [8] In reaching that conclusion, the primary judge referred to the evidence of the appellants' expert, Mr Ogier, a LAME and an airworthiness inspector, that it was difficult for a torque stripe to adhere to a surface which was not clean and dry at the time of application as the stripe might slip as the surface moved.¹² His Honour noted that this concern was not raised in any other expert evidence and no other expert suggested that this prospect made torque stripes an unreliable indicator of bolt movement. His Honour rejected the notion that a torque stripe would be applied to a contaminated surface in the course of the manufacture of the helicopter and found it "unlikely that a LAME, familiar with the role assigned to torque stripes in the Maintenance Manual, would apply a torque stripe to a contaminated surface." The primary judge did not "accept that the risk that a torque stripe might be applied to a contaminated surface, and subsequently slip, is such as to render inadequate the use of a torque stripe as an indicator of bolt movement." His Honour considered it was likely that when bolt 4 was incorrectly assembled, the torque was not checked so that it was "quite unlikely that a torque stripe was applied at that time". But his Honour found that there was no need to consider whether the torque stripe was in place but slipped because it was more likely that when the bolt was incorrectly assembled no torque stripe was applied.¹³
- [9] Later when dealing with and ultimately rejecting the possibility of a missing palnut on bolt 4, his Honour apparently made a contradictory finding as to whether a torque stripe was applied to bolt 4. In discussing the evidence of the LAMEs Mr Bray and Mr Fisher, who completed the last two 100 hourly inspections on the helicopter preceding the accident, his Honour noted:
- "The weight to be given to their evidence is affected by the fact that each of them failed to detect the condition of the torque stripe for Bolt 4, which, on my findings must have at the time of their inspections indicated that Bolt 4 had rotated."¹⁴
- [10] There is no finding in his Honour's reasons to indicate when a torque stripe may have been applied to bolt 4 after it was incorrectly assembled. These apparently inconsistent findings as to whether a torque stripe was applied after bolt 4 was incorrectly assembled, and his Honour's abstention from finding whether a torque stripe over bolt 4 was in place but slipped, means that this question was unanswered in the judgment.

¹⁰ *McDermott v Robinson Helicopter Company* [2014] QSC 34, [216]

¹¹ Above, [244].

¹² Above, [149].

¹³ Above, [150].

¹⁴ Above, [202] and [234].

If an incorrectly applied torque stripe placed on the incorrectly assembled bolt 4 slipped without breaking, it would not have been an indicator of the ultimately catastrophic rotation of the bolt.

- [11] The evidence as to possible slipping of the torque stripe included the following. Mr Ogier was asked for his response to the following appellants' question for experts:

"If the bolt was [correctly installed] and the helicopter operated for 100 hours, would a torque stripe, placed anywhere on the bolted joint, necessarily be broken and reasonably able to be observed by a LAME at a subsequent 100 hourly inspection?"

- [12] He responded:

"In general, torque stripe compound (paint or lacquer) is difficult to adhere to surfaces unless they are clean (from oil water and other like contaminants), and dry at the time of application. The compound is designed to be brittle and crack. Depending on the thickness of the stripe *it may not break but rather slip as the surface below it moves*. If the stripe is relatively thin it may not fill a void as direction changes between surfaces and therefore is made to support its own weight with the potential for it to crack under vibration in service. It is not therefore a reliable indicator and will not necessarily be broken.

In answer then, a LAME should be able to observe a broken torque stripe but whether that triggers a maintenance response is moot given the unreliability of torque stripes in service."¹⁵ (*my emphasis*)

- [13] In a Conference Call Report on 30 August 2012, Robinson asked the parties' experts Messrs Boyle, Cox, Lay, Ogier and Whitehead, whether they agreed that if the incorrectly assembled bolt 4 was rotating, "it would of necessity break the torque seal stripe and probably have the stripe on the bolt not aligned with the stripe on the component?"

- [14] Mr Boyle and Mr Cox each responded, "yes". Mr Lay agreed, but only if the stripe was correctly applied:

"As stated in the [manual] the stripes are subject to deterioration and must be periodically renewed. In my experience inspecting the flex plates on Robinson helicopters, I have witnessed torque stripes being totally missing on all fasteners, applied to some of the bolts but missing on others, applied to the bolts, nuts and washer but not the component being fastened and I have seen the stripe applied correctly. This has been my experience with new helicopters and helicopters with many operational hours on them."

- [15] Mr Ogier responded, "Properly applied. Yes", noting that at the relevant time the manual had no instruction reference as to how the stripe was to be applied. Mr Whitehead responded, "Yes- providing that the torque seal adhered to all the components".

- [16] Later in the same report, in answer to the question, "Do you agree that a [LAME] should recognize a broken or non-aligned torque stripe as an indication of possible looseness of the bolted joint and investigate further?", Mr Boyle, Mr Cox and Mr Whitehead each responded, "yes". Mr Lay agreed that it was an indication of possible looseness. Mr Ogier responded

"No. It depends which surfaces the stripe is broken whether it is an indication of anything other than a deteriorated stripe. The [palnut] could

¹⁵ Ex 1. p 598, AB 1274.

lose its torque and the main fastener can still be properly torqued. The stripes can slip over time if the surface they are placed on is contaminated with oil or water. I am inclined to agree with Mr Lay's experience because that's what I see in the helicopters in the Australian fleet; missing, partially applied, broken and correctly applied stripes."¹⁶

- [17] Mr Lay gave oral evidence that, in 2004 prior to the accident, if he had seen a forward flex plate with a deteriorated torque stripe which did not look misaligned on bolt 4, he would simply have refreshed the stripe without doing more.¹⁷
- [18] In summary, Mr Lay, Mr Ogier and Mr Whitehead's affirmative response that a torque stripe over bolt 4 would have broken and indicated that bolt 4 was rotating, was dependent on the torque stripe having been properly applied.
- [19] The accepted evidence of the LAMEs, Mr Bray and Mr Fisher, who conducted the last two 100 hourly inspections, and of the pilots who examined the flex plate during at least 28 visual inspections prior to flying the helicopter, was that none noticed anything about the torque stripe which caused them to be concerned about the integrity of bolt 4.
- [20] I consider that, when Mr Bray, Mr Fisher and the pilots visually examined the flex plate, the evidence did not limit the possibilities to either no torque stripe having been applied to the incorrectly assembled bolt 4, or a torque stripe having been correctly applied and breaking soon after because of the rotation of the bolt. It is significant that in none of these inspections did any of these highly trained people notice anything unusual about the torque stripe. It is highly likely that at least one would have noticed had the torque stripe been absent or broken. In that event, they would have reacted and discovered that bolt 4 had been incorrectly assembled and the accident would have been averted. But another possibility consistent with Mr Ogier's evidence was that when bolt 4 was incorrectly assembled, so too was the torque stripe over it incorrectly applied, perhaps to contaminated surfaces. In that event, according to Mr Ogier, the stripe might slip as the surface below it moved and the stripe would not necessarily break when the bolt rotated. In that scenario, the stripe would not indicate that the bolt had been incorrectly assembled.
- [21] In any case, consistent with the evidence of both Mr Lay and Mr Ogier, the condition of torque stripes in 2004 was highly variable. If a stripe deteriorated but was not obviously misaligned, Mr Lay would have refreshed it without checking the palnut or bolt with a torque wrench or spanner. It followed that the various relevant inspections of the flex plate may have revealed a torque stripe over bolt 4 with some deterioration but without apparent misalignment so that those inspecting it did nothing more to verify the security of the bolt.
- [22] The manual as it was pre-accident did not make clear to LAMEs verifying security in the context of a periodic service that a visual inspection of torque stripes may not be sufficient to indicate whether critical fasteners like bolt 4 were correctly assembled. The evidence established that a torque wrench or a simple spanner could be easily used to verify that a bolted joint was not loose; any movement detected meant the bolt would have to be re-assembled and retorqued.
- [23] For these reasons, in addition to those of Alan Wilson J, I consider that the manual did not provide adequate instructions to LAMEs performing periodic inspections. Had

¹⁶ Ex 1, p 608, AB 1284.

¹⁷ T 3-34, AB 162.

those further, simple instructions been in the manual, the LAMEs would have followed them and inevitably detected movement in the incorrectly assembled bolt. The LAMEs would have re-assembled and retorqued the bolt and the accident would have been avoided.

[24] I note that it is unnecessary to consider Robinson's notice of contention which it abandoned at the appeal hearing.

[25] I agree with the orders proposed by Alan Wilson J.

[26] **HOLMES JA:** I have the advantage of reading the draft judgment of Alan Wilson J, but have come to a different conclusion as to the correctness of the trial judge's finding as to the adequacy of the instructions in the maintenance manual. I am grateful to his Honour for his lucid exposition of the evidence and issues, which has enabled me to set out my reasons relatively briefly.

The trial judge's findings and the challenge to them

[27] The trial judge regarded the maintenance manual as giving adequate instruction for inspection of the forward flexplate bolts because of the combination of the general instruction in relation to torque seals at 1.310:

“Torque seal (paint) is applied to all critical fasteners after palnut installation in a stripe across both nuts and exposed bolt threads. The stripe should extend to the part being fastened to show bolt rotation. Any subsequent rotation of the nut or bolt can be detected visually.”

and the specific instruction at 2.410, to inspect the forward flexplate to “verify security.” His Honour found that the information at 1.310 was

“sufficient to indicate to a LAME¹⁸ that it was necessary for the torque stripe to extend beyond the nuts and threads, onto the fixed component.”¹⁹

Taken with the instruction at 2.410, it would

“indicate to a LAME carrying out a 100 hourly inspection the need to look for a torque stripe on each critical fastener; and if it were missing, damaged, or incomplete, to take steps to determine whether the torque was adequate, and to reapply the torque stripe.”²⁰

That view of the effect of the maintenance manual was, his Honour said, supported by the evidence of the two LAMEs who had inspected the helicopter, Mr Fisher and Mr Bray.

[28] The appellants did not challenge two of the trial judge's findings: that the maintenance manual instruction to verify security required a LAME to examine the condition of the torque stripe and that the manual indicated to a LAME that it was necessary for the torque stripe to extend across all the relevant surfaces. What was challenged was the third: that a missing, damaged or incomplete torque stripe would alert a LAME to check the torque of the bolt.

[29] The appellants' contention was that the torque stripe was an unreliable indicator of looseness. That was evident, firstly, because the LAMEs who had inspected the helicopter prior to the fatal crash, Mr Bray and Mr Fisher, had not been challenged

¹⁸ Licensed Aircraft Maintenance Engineer.

¹⁹ *McDermott v Robinson Helicopter Company* [2014] QSC 34 at [152].

²⁰ At [159].

on the reasonableness of their approach and they, like the pilots who flew the helicopter, saw nothing amiss. The only possible conclusion was that there was a broken torque stripe which had deteriorated, which they did not regard as cause for concern. Secondly, it was clear from the evidence that different witnesses took different views about the significance of the torque stripe. Consequently, the manual should have specified that the tightness of the bolt and nut had always to be checked with a torque wrench or spanner. If it was loose, the next step would be to disassemble the bolted joint and reassemble it at the correct torque.

The LAMEs' and pilots' evidence as to torque stripes

- [30] Mr Bray said that his usual practice was to check bolts by applying a spanner to ensure that they were tight. A torque stripe normally ran across the nut to the object that the bolt was attaching. If a torque stripe were missing, he would remove the bolt, check the area and re-torque the bolt. If the torque stripe had deteriorated, provided it had not actually broken, he would put a spanner on the head of the bolt and apply a small amount of force to see if it moved. Mr Fisher said that if he saw a deteriorated torque stripe, he would check the torque of the bolt, replace it and paint another torque stripe on it. When he was asked if there was a possibility that he might have missed “some telltale sign” in working on the helicopter, he acknowledged with admirable frankness that it was a possibility.
- [31] Two pilots who had flown the helicopter gave evidence that they carried out visual inspections of the flexplate and confirmed by feel that the bolts and palnuts were in place. One of the two said that he would look for any cracking in the torque stripe; if he had found it he would have informed an engineer. The other said that he did not pay much attention to torque stripes which “had a tendency to fade away” and could be difficult to see given the position of some of the bolts.

The experts' evidence as to torque stripes

- [32] Each side nominated experts – LAMEs and mechanics – who had provided reports, to participate in the preparation of a joint report in which questions were answered. All of them, with the exception of Mr Lay, agreed with the proposition,

“that if the bolt was rotating in the hole it would of necessity break the torque seal stripe and probably have the stripe on the bolt not aligned with the stripe on the component.”

Mr Lay, an experienced helicopter pilot and LAME, agreed with the proposition only if the stripe were applied as directed in the later (post-trial) version of the manual. That qualification, however, did not, apparently, apply to an intact stripe, but was rather based on his experience that the paint stripes applied in accordance with the challenged manual were subject to deterioration and in some instances were not correctly applied.

- [33] Mr Lay was asked in cross-examination about his reaction to torque stripes in various conditions. A torque stripe with a hairline crack could still appear to be valid, but if it were misaligned he would take action. If the paint had cracked or broken on the bolt, he would remove the palnut, check the torque and then re-apply the torque striping. A missing torque stripe would be an alert for him. At the time the accident happened, if the torque stripe were just deteriorated, he would probably have merely refreshed the striping if it did not appear misaligned. Mr Ogier, a LAME and airworthiness inspector whom the appellants called as an expert, similarly said that misaligned or missing torque stripes would cause him to make further investigation. In his opinion, however, a deteriorated torque stripe was not necessarily significant; it merely indicated that the bolt had originally been torqued.

- [34] Dr Orloff, a helicopter pilot with a mechanic's license and a doctorate in mechanical and aeronautical engineering, said that a torque stripe that was missing, cracked or misaligned indicated the need for investigation. Asked about what he would do in response to a deteriorated torque stripe, he said that it depended on the nature of the deterioration. If the stripe were discoloured from age but was intact and appeared to be adhering to the surface, there would be no cause for concern. If parts of it had broken away, he would take the necessary steps to verify the torque and then re-apply the torque stripe. He did not consider it necessary that the manual expressly say that where there was a deteriorated rather than broken torque stripe, it was appropriate to take the part apart, reassemble and re-torque the joint, but he considered it obvious practice.
- [35] Dr Turnour, an employee of the respondent, who held a doctorate in aerospace engineering, said that it sufficed for an inspection to confirm that a joint had been correctly torqued by visually confirming that the torque stripe was intact. Cross-examined, he agreed that an open-ended spanner could be used to test the tightness of the bolted joint.

Conclusions

- [36] The thrust of the expert evidence and simple logic dictated that if the bolt were rotating, the torque stripe would no longer appear as a continuous stripe across the bolt onto the fixed component. It did not follow that a less than complete torque stripe must mean that the bolt was moving, because it might simply have deteriorated; but a stripe in that condition meant that there could be no confidence that it had not moved. It was clear that both Bray and Fisher were alive to the significance of an intact stripe: each man said that if he saw a stripe in a deteriorated state he would take action; Mr Bray, by checking that the bolt was not moving, and Mr Fisher, by checking its torque. Indeed, the appellants, as already mentioned conceded the correctness of the finding that the manual would indicate to a LAME that the torque stripe had to extend across the nuts and bolt threads to the part being fastened.
- [37] I do not think, with respect, that one can safely work back from the proposition that the LAMEs saw nothing about the torque stripe to alert them to the need to investigate, that there was, in fact, nothing. The bolt was, his Honour found, moving at the time of their inspections; inevitably, the torque stripe cannot have been complete. It is true that it was not put to Mr Bray or Mr Fisher that the torque stripe was missing or broken, but that was in a context where the fact that their inspections were defective was not in issue. It was the appellants' pleaded case that the fact that the bolt was not correctly tensioned was not properly examined for and identified in the inspections,²¹ an allegation which the respondent admitted.²² The appellants' argument, at least on the pleadings, was not that the inspections were competently carried out, but that the deficiencies in them were the product of inadequate instruction in the manual.
- [38] It may be noted, too, that Mr Bray said it was too long ago for him to have any independent recollection of the inspection. Mr Fisher similarly said he had no specific recollection of the work. He was asked whether it was conceivable he might have missed a telltale sign and conceded the possibility. In the circumstances, it was open to the trial judge to find, and indeed inevitable that he would find, that there was not a complete torque stripe present when the inspections occurred.

²¹ Seventh Amended Statement of Claim, paras 29(b) and 42(d).

²² Defence to the Seventh Amended Statement of Claim, para 33(a).

- [39] The trial judge's finding that it was unlikely that a torque stripe was applied does appear inconsistent with his later references to the condition of the torque stripe having broken and to its condition as indicating that the bolt had rotated, but those inconsistencies are inconsequential. On the evidence, the possibilities were that no torque stripe had been applied or that if it had, it had broken. Both entailed the absence of a complete torque stripe and either was sufficient to put a LAME on alert.
- [40] The views of other experts as to the significance of an incomplete torque stripe were of no relevance if the LAMEs who actually inspected the helicopter were alive to its importance. The fact that others might regard the manual as conveying something different was immaterial. If Mr Bray and Mr Fisher understood that it was essential that anything less than a complete stripe required checking of the bolt's security, any failure of the manual to communicate that necessity to a wider audience could not be causative of the appellants' damage. In my view, the evidence supported the trial judge's finding that the two LAMEs did have that understanding.
- [41] Accordingly, I consider that there is no error in the trial judge's findings that the instructions in the manual were adequate. I would dismiss the appeal with costs.
- [42] **ALAN WILSON J:** On 30 May 2004 a helicopter crashed at Tobermorey, a large cattle station west of the Queensland-Northern Territory border. Sadly the pilot, Mr Kevin Norton, did not survive his injuries. The first plaintiff Mr McDermott, the only passenger, did survive but was badly burned.
- [43] The crash occurred because a critical part of the helicopter's drive mechanism failed. Mr McDermott (and his wife, and his employer) sued the helicopter manufacturer Robinson Helicopter Company Inc and other parties for damages. All claims against other defendants were resolved before trial and this appeal is from the judgment in the case against Robinson, which the plaintiffs lost.²³
- [44] The part of the helicopter that failed is called the *forward flexplate*, within the mechanism by which power is transferred from the engine to turn the helicopter blades. It is a four-pointed, flexible metal sheet. Over time, two cracks developed in it and their growth eventually caused a piece to come away with catastrophic consequences – loss of power to the rotor and hence of control of the helicopter which, despite the best efforts of the pilot, brought it quickly down.
- [45] The failure occurred because one of four bolts through the flexplate had not at some earlier time been properly tightened, leaving a small gap between nuts on the bolt and the flexplate. With time, the gap grew. As it did, washers bonded to the flexplate at the hole through which the bolt passed began to come away, causing *fretting* on the surface of the bolthole in the flexplate, and the start of the two cracks. Despite inspections by expert helicopter mechanics and pilots between the time this process probably began, and the crash, neither the looseness of the bolt nor the existence or growth of the cracks (or the presence of signs of fretting) was detected.
- [46] All parties accept this description of the sequence of events and the explanation for the crash which it provided, as did the learned trial judge; but when, where or how the loose bolt was installed, and not properly tightened, remains a mystery. There was evidence that the bolt was in a proper condition when the helicopter was built by Robinson.²⁴ Some expert witnesses advanced the hypothesis²⁵ that the inadequately

²³ *McDermott & Ors v Robinson Helicopter Company* [2014] QSC 34.

²⁴ Reasons for Judgment, *McDermott & Ors v Robinson Helicopter Company* [2014] QSC 34, para [28].

²⁵ Mr Lay, Dr Orloff: Reasons for Judgment, para [29].

tightened bolt was installed when the helicopter was inspected in response to an Airworthiness Directive three months before the accident, on 17 February 2004. In any event, nothing turns on that: the case focused not upon how the bolt became loose but, rather, why its looseness was not detected.

- [47] The helicopter was regularly serviced at proper intervals, including every 100 hours, by properly trained and qualified *Licensed Aircraft Maintenance Engineers* (LAMEs). One was conducted on 27 March 2004 by a Mr Fisher and another on 12 May 2004 by Mr Bray, both LAMEs. Neither detected the problem. Nor, apparently, did the deceased pilot Mr Norton or four other pilots who had flown the helicopter in 2004.
- [48] The plaintiffs' case was directed to the wording of Robinson's maintenance manual for the helicopter which, it is alleged, failed to specify and require an adequate inspection procedure such that the defect would have been discovered in time. In particular it was alleged that the manual, in its directions to servicing mechanics (and pilots), failed to require that the tightness of the four bolts through the flexplate should be checked by a method more stringent than simply looking to see if markings on the bolts, called *torque stripes*, were in a proper condition.
- [49] Torque stripes are strips of paint over the length of the bolt. The manual said that the servicing LAME should inspect the condition of the flexplate and '*verify (the) security*' of the bolts.²⁶ This was to be done by a visual inspection of them for signs of looseness and correct installation. That inspection, according to another part of the manual,²⁷ was to focus on the torque stripes and said: '*Torque seal (paint) is applied to all critical fasteners after palnut installation in a stripe across both nuts and exposed bolt threads. The stripe should extend to the part being fastened to show bolt rotation. Any subsequent rotation of the nut or bolt can be detected visually.*'
- [50] Some further short technical discussion is necessary. The offending bolt was referred to throughout as *Bolt 4*. It is one of a number of parts of the helicopter called *critical fasteners* which, if incorrectly installed or removed or lost, jeopardise the safe operation of the helicopter²⁸ with potentially catastrophic results.²⁹ When originally installed, Bolt 4 should have been tightened ('*torqued*') with a special tool called a *torque wrench*, which can and should be set so that the bolts achieve a specified degree of tightness, and no more. Each bolt has a primary locking nut and some washers, including two attached to each side of the flexplate called *bonded washers*. *Palnuts* are an additional, secondary locking nut.
- [51] In theory, if the bolts are properly installed they will not loosen and, therefore, never need to be '*re-torqued*'. Moreover, according to that theory, the strips of paint – the torque stripes – will indicate if something has nevertheless gone awry and the bolt has moved: they will break, and the break can be seen.
- [52] The defendant successfully argued at trial that this was sufficient. The movement of Bolt 4, Robinson submitted, would and should have been detected if this procedure had been followed. In any event, Robinson said, whatever the state of the torque stripe on Bolt 4 during the two 100 hour services performed about nine weeks, and less than three, before the crash, and during inspections by pilots as the helicopter operated around Tobermorey, it is not obliged to warrant the work of LAMEs (including the

²⁶ Appeal Book (AB) Volume 3, p. 1405 (Maintenance Manual para [2.410]).

²⁷ AB Vol 3, p. 1363 (Maintenance Manual para [1.310]).

²⁸ Reasons, paras [44] and [45].

²⁹ Reasons, para [138].

LAME who originally installed Bolt 4, but did not properly tighten it) and, rather, can assume that they do their job competently.

- [53] In particular Robinson asserted that in publishing a manual, it can properly rely upon their expertise to correctly install and torque the bolts through the flexplate, and check the proper tension of a bolt if the torque stripes are broken – or if, as other evidence suggested was possible, the stripes had deteriorated, or did not extend for the full length of the bolt and its associated parts or, even, were not present at all.
- [54] The manual, Robinson contended, said enough to mean this was clear to LAMEs; and, there, the defendant’s duty properly ended. The learned trial judge accepted this argument, and decided accordingly.
- [55] Unsurprisingly, a great deal of the evidence focused on the torque stripes and the question whether reliance upon them to ‘verify security’ of these bolts was a safe practice. The learned trial judge found that the parts of the manual mentioned earlier were sufficient to alert a LAME to the need to check the torque on any bolt on which the stripe was ‘*missing, damaged, or incomplete...*’³⁰ because this was the effect of the evidence of the two LAMEs, Mr Fisher and Mr Bray, and some expert witnesses. That finding accords with the evidence of the LAMEs to the effect that anything but a complete, unbroken stripe, even though it might have deteriorated, would put them on their mettle – evidence which was never challenged.
- [56] In particular, it was never put to them that the torque stripe on Bolt 4 was missing, or had a break in it, or was otherwise in a condition to alert them to the need to check the torque on it.
- [57] As the appellants framed part of their appeal, the question is whether there is anything consistent with an hypothesis, a scenario, a conjunction of events which explains the LAMEs’ uncontested evidence about the care they took *and*, despite that care, the presence of a loose bolt. If that possibility existed, the appellants say, the correct finding must be that the manual is defective, because reliance upon the torque stripes was not a sufficiently safe practice to determine that the bolts were properly tightened when installed, and remained so at the time of subsequent inspections.
- [58] The respondent did not argue that incorrect installation/inadequate torquing of a bolt by someone working on this helicopter did not create a foreseeable risk of injury, according to the accepted test³¹ and its submissions on appeal conceded that the instruction in the manual to ‘*verify security*’ required servicing LAMEs to visually inspect the four bolts for signs of looseness ‘*and correct installation*’.³²
- [59] Notwithstanding that concession the respondent, elsewhere in its appeal submissions, appeared to argue that the plaintiffs’ case rested upon allegations that Robinson should have foreseen something more: that a LAME might install a bolt incorrectly, that subsequent LAMEs might fail to identify that error, and that the manual should have addressed that by including ‘*... an instruction to a following LAME to identify the first LAME’s earlier error.*’³³
- [60] But that was not the case the learned trial judge was, on the pleadings and the evidence and the submissions, called upon to decide. The very phrase in the manual, ‘*verify*

³⁰ Reasons, paras [159], [160].

³¹ *Wyong Shire Council v Shirt* (1980) 146 CLR 40, per Mason J at 47.

³² Respondent’s Outline of Argument filed 4 September 2014, para [12].

³³ Respondent’s Outline, para [36].

security, carries a tacit but compelling acknowledgment from the manufacturer Robinson that, despite being properly torqued at the time of installation or last inspection, bolts may (for whatever reason) be or become loose. The learned trial judge found that Bolt 4, when last installed, was left loose.³⁴ The case his Reasons then address was advanced, by both parties, as one in which the question of negligence was to be determined by deciding whether Robinson's manual adequately addressed the risk created by a loose bolt.³⁵ The learned trial judge was not asked, as part of the case pleaded by both parties, to decide how or why that occurred.

- [61] That approach to the question of negligence was plainly, with respect, right. This is a product liability case against the manufacturer of a helicopter, focusing on its service manual. There was '*... a risk of catastrophic failure if one of the bolted joints for the flexplate became loose*'.³⁶ The '*... circumstance that the product is inherently extremely dangerous, or, that the gravity of the risk of injury which negligence creates is serious, only requires that a higher duty of care be exercised...*'.³⁷ In light of the terms of the manual, with its clear wording directed towards checking the security of the bolts, and in light of the way the case was advanced for Robinson, the plaintiffs were not required to prove that the manual failed to address the risk of incompetence or negligence by LAMEs; only, rather, that it failed to adequately address an identified, and accepted, risk – that, for whatever reason, bolts might be loose. Insofar as Robinson appears to advance a different case on appeal, its arguments to that end must be rejected.
- [62] A great deal of expert evidence was presented concerning the likely time when Bolt 4 was installed but left incorrectly torqued, and loose. That is unsurprising, in light of the need for an enquiry into the opportunity LAMEs (and pilots) might have had to detect the problem. One expert, Robinson's employee Dr Turnour, gave evidence of a prolonged test he conducted to see how long the flexplate would survive with that defect.³⁸ Other experts also addressed the question.³⁹ Ultimately, the learned trial judge determined that it was very difficult to identify when the bolt was left loose but, in any event, the evidence fell short of establishing that it *must* have been left loose before the service carried out on 17 February 2004.⁴⁰
- [63] Notwithstanding that uncertainty, the learned trial judge was prepared to find that the loose bolt began to rotate shortly after it was assembled and, in any event, more than 100 hours before the accident; and, that, if a torque stripe had been properly applied at the time of incorrect assembly it would have broken relatively shortly thereafter and would have been visible at a 100 hour inspection.⁴¹ The finding that the effects of the loose, rotating bolt began to manifest some considerable time before the accident accords, with respect, with the weight of the expert evidence.⁴²
- [64] The finding, in the context of later findings about what subsequently happened in the course of inspections, relates to the question whether there was some indication of the problem which could be detected by an examination of the torque stripe on Bolt 4 during subsequent inspections. But it is, with respect, irrelevant to the issue whether Robinson discharged its duty to take all reasonable steps to ensure that its

³⁴ Reasons, para [26].

³⁵ Reasons, paras [31]-[33].

³⁶ Reasons, para [139].

³⁷ *Suosaari v Steinhardt* [1989] 2 Qd R 477, per Cooper J at 487 (CA).

³⁸ Reasons, paras [109]-[123].

³⁹ Dr Romeyn, and Dr Casey: Reasons, paras [124]-[132].

⁴⁰ Reasons, para [133].

⁴¹ Reasons, para [157].

⁴² Dr Turnour: Reasons, para [132].

designated inspection procedures at a 100 hour inspection were sufficient to detect, prevent or minimise the risk the loose bolt created. The presence of a loose bolt may, or may not, be detected at a subsequent inspection; here it was not detected at, it seems probable, two 100 hour inspections, with disastrous results.

- [65] Critical to the learned trial judge's decision that the manual was adequate were findings that '*... this risk is adequately addressed by the direction to verify security, in light of **the provisions of the Maintenance Manual relating to torque stripes***',⁴³ and that '*... the effect of the instructions in the Maintenance Manual required a LAME, carrying out a 100 hourly inspection, to examine the condition of the torque stripe for Bolt 4; that if the condition of the torque stripe was not as specified in the Maintenance Manual, then the LAME was required to take further steps to ensure that the torque was in accordance with the Maintenance Manual; and that accordingly, **compliance with the Maintenance Manual was sufficient to prevent the accident***'.⁴⁴ (emphasis added)
- [66] Earlier, the learned trial judge had found that: '*I consider it more likely that, when the bolt was incorrectly assembled, **no torque stripe was applied***'.⁴⁵ (emphasis added)
- [67] A little further on, he found that: '*... rotation commenced at Bolt 4 shortly after the joint was incorrectly assembled, and more than 100 hours before the accident. **If a torque stripe had been correctly applied at the time when the bolted joint was incorrectly assembled, it would have broken relatively shortly thereafter, and would have been visible on a subsequent 100 hourly inspection***'.⁴⁶ (emphasis added)
- [68] Later the learned trial judge considered the question whether palnuts, including the one on Bolt 4, were missing before the accident. (Palmuts, it will be remembered, were additional nuts affixed to each bolt as a secondary locking mechanism.) In finding that they were not missing and referring, to that end, to the evidence of the two LAMEs Mr Bray and Mr Fisher, he said: '*The weight to be given to their evidence is affected by the fact that **each of them failed to detect the condition of the torque stripe for Bolt 4, which, on my findings must have at the time of their inspections indicated that Bolt 4 had rotated***'.⁴⁷ (emphasis added)
- [69] Indispensable to the learned trial judge's reasoning that the manual provided sufficient instruction to meet the risk which arose here is the premise that reliance upon the torque stripes as an indicator of the 'security' of each bolt is sufficient – and that, of course, was the finding upon which the plaintiffs' case foundered.
- [70] That finding must stand or fall upon the reliability of the stripes as indicators of a need to do nothing, or something, by way of checking each bolt manually rather than visually. For the reasons which follow the evidence in my view fell short of permitting that finding, to a degree which means it cannot stand.
- [71] First, there is the dichotomy between the findings set out above, from paragraphs [150] and [202] of the Reasons, about the absence or presence and, if present, the condition of the torque stripe on Bolt 4. The first finding is that none had been applied and the stripe was, therefore, absent; the second, that one was present and, moreover, had broken so as to indicate movement in the bolt. While paragraph [202] was argued, by the respondent, to be equivocal so far as an actual finding is concerned, the clear

⁴³ Reasons, para [168].

⁴⁴ Reasons, para [216].

⁴⁵ Reasons, para [150].

⁴⁶ Reasons, para [157].

⁴⁷ Reasons, para [202].

indication that such a finding was intended is confirmed elsewhere in the judgment at paragraph [234], where the learned trial judge said: ‘*While it is not clear precisely when the torque stripe broke, that occurred some time well before 30 May*’. (emphasis added)

- [72] Over and above the inherent tension between these apparently conflicting findings is the shadow of the weight of the evidence which, in my respectful view, pointed strongly to the conclusion that *either* condition would have alerted the last LAMEs who serviced this helicopter (at a time when, it was also found, the process of cracking must have commenced) to check Bolt 4 itself, with a torque wrench or, at least, a spanner – something which, however, on the evidence, did not occur.
- [73] Secondly, the Robinson manual was otherwise found by the learned trial judge to be inadequate in a number of other important respects concerning the detection of fretting dust,⁴⁸ cracks in the flexplate,⁴⁹ and the failure of the bonding on the washers meant to be bonded to the flexplate.⁵⁰ There was no challenge to those findings. While there can be no dissent from the learned trial judge’s conclusion that the manual must be read ‘as a whole’⁵¹ it is compelling that the exercise, at least in regard to what the manual said about proper inspection of these critical parts – the flexplate, and the bolts through it – gives rise to suspicion, not comfort, about the sufficiency of the instructions in it.
- [74] Third, the weight of the evidence about the adequacy of the torque stripes as an indicator was, in my respectful view, against the proposition that they provided a ready, safe and reliable indicator of the ‘security’ of the bolt – i.e., that it had originally been, and remained, tightened to the required degree of torque.
- [75] A number of photographs of torque stripes on other operational helicopters were tendered which showed that stripes, with weathering and exposure to the harsh conditions in which this helicopter worked, deteriorate over time by ageing and fading, and cracking or losing pieces by chipping off or breaking away, so that large parts of the stripe disappear. This deterioration, the evidence also showed, is not indicative that a defect exists – but it does render the stripes, effectively, useless as indicators of bolt movement or slippage.⁵²
- [76] The same photographs also provided examples of torque stripes with other shortcomings – in particular, failing to cover the entire length of the bolt⁵³ (whether by inadvertence, or deterioration⁵⁴); and, cracking.⁵⁵ Importantly, in my respectful view, the photographs show that torque stripes can deteriorate to a point where a crack (signifying rotation and, therefore, looseness) may be present but is not actually, or readily, visible or discernible.
- [77] Nothing in the Robinson manual instructed LAMEs to re-torque, and apply a new torque stripe to, bolts on which the stripe had deteriorated by fading, or on which parts had broken off or chipped or cracked away – something that one of its own expert witnesses, Dr Orloff, said those circumstances called for.⁵⁶
- [78] Fourth, the evidence of the LAMEs and the pilots who were called left only one possible finding open: that the condition of the torque stripe on Bolt 4 was *not* such as to

⁴⁸ Reasons, para [181].

⁴⁹ Reasons, para [190].

⁵⁰ Reasons, para [193].

⁵¹ Reasons, para [138].

⁵² Trial Exhibit 15, Appeal Book Vol 8, pp. 3413 and following.

⁵³ See, e.g., photo at AB Vol 8 p. 3422.

⁵⁴ Ibid, pp. 3417, 3457.

⁵⁵ Ibid, p. 3479.

⁵⁶ AB Vol 1, p. 235; that evidence was apparently accepted by the learned trial judge: Reasons, paras [159], [160].

alert any of them to the need to investigate further. Mr Fisher, who performed the 100 hour service on 27 March, said that the condition of torque stripes ‘*varies a lot*’⁵⁷ but if he saw a deteriorated one, he would ‘*have to check the torque of the bolt*’.⁵⁸ Mr Bray, who performed the last service on 12 May, was asked what he would do if the stripe had deteriorated, and said: ‘*So long as the torque stripe is there and not broken, it shouldn’t be a problem, but you would still check the torque on that bolt if it was the critical part*’.⁵⁹

- [79] It was not put to either LAME that the torque stripe on Bolt 4 was missing, or broken, or that they were mistaken or lying in saying, as each did, that there was nothing at the time each serviced this helicopter to alert them to the possibility that Bolt 4 was loose. Nor was it put to them that the torque stripe was deteriorated. While Mr Fisher conceded (in cross-examination) that, working under pressure, he might have missed a ‘tell-tale sign’,⁶⁰ it is compelling that, in context, his response was nothing more than an acknowledgement of human fallibility by an, otherwise, apparently honest witness. In any event it was not put to him that he had, in fact, overlooked a missing or broken torque stripe on Bolt 4.
- [80] Another very experienced LAME, Mr Lay, said that he would certainly investigate a broken torque stripe, but if he saw one which had simply deteriorated he would have only ‘*... probably refreshed the torque striping if it didn’t look like they had misaligned and let it go at that*’.⁶¹
- [81] Two pilots who had recently flown this helicopter also gave evidence. They were required to perform pre-flight inspections. One, Mr McKendry, said he would investigate a broken torque stripe; but it was not put to him that he should also investigate a deteriorated stripe.⁶² Another, Mr Lewis, was asked if he was ‘*interested*’ in torque stripes and replied that they ‘*... had a tendency to fade away*’.⁶³ Again, it was not put to either that the stripe on Bolt 4 was broken, or missing. Other pilots also flew this helicopter, and between the services on 17 February and 12 May there were 29 documented inspections by pilots. None apparently reported any defect, or indicia of one, when carrying out the mandated inspection of the flexplate.
- [82] Fifth, the oral and photographic evidence actually identified four possibilities with respect to the torque striping on a loose bolt: never applied, and therefore missing; correctly applied, but broken; incorrectly applied, so as not to adhere to both the bolt as well as the fixed components, so that the stripe could move with the rotating bolt and not crack; and, deteriorated to a degree which meant the stripe lacked utility as an indicator of movement of the bolt.
- [83] All of these contingencies were mentioned in the judgment.⁶⁴ The range of possibilities, considered in the light of the poor condition seen on many of the photographs of torque stripes on other helicopters, raises immediate questions about the reliability and dependability of the stripes as a safe method of verifying the security of these bolts.

⁵⁷ AB Vol 1, p. 181.

⁵⁸ AB Vol 1, p. 181.

⁵⁹ AB Vol 1, p. 176.

⁶⁰ AB Vol 1, p. 186.

⁶¹ AB Vol 1, p. 162.

⁶² AB Vol 2, p. 557.

⁶³ AB Vol 2, p. 574.

⁶⁴ Reasons, paras [150], [17], [202], and [58].

- [84] Sixth, there was evidence that applying a torque wrench or a spanner to Bolt 4 would certainly have revealed that it was loose. The application of a torque wrench to every critical fastener on a helicopter was, some evidence suggested, impractical; a properly assembled joint will not fail and rechecking every bolt during servicing carries its own dangers – the rechecking process itself increases the possibility of error.⁶⁵ The learned trial judge nevertheless accepted that the use of a torque wrench was the only fail-safe method of checking the torque on a bolt; and, that the manual did not specify its use on the bolts through the flexplate.⁶⁶
- [85] In any event, no such disadvantage attached to the use of a simple, inexpensive spanner⁶⁷ to check the each bolt in the flexplate for looseness and Dr Turnour, who is employed by Robinson, readily conceded that.⁶⁸
- [86] A mechanical engineer called by the plaintiffs, Dr Gilmore, gave evidence that the process of checking the torque on a bolt could also be performed quickly and non-intrusively with the use of a tool which was specifically mentioned in manual.⁶⁹ The Reasons make specific reference to that evidence, in terms which, again, indicate its acceptance by the learned trial judge.⁷⁰
- [87] Nevertheless it was found that none of these steps was necessary to address the risk of a loose bolt, because that risk was ‘... *adequately addressed by the direction to verify security, in light of the provisions of the Maintenance Manual relating to torque stripes*’.⁷¹ There was no finding that the use of a torque wrench (with or without the adaptor mentioned by Dr Gilmore) or a spanner was, or was not, required.
- [88] Seventh, Robinson’s manual did not instruct LAMEs that a deteriorated or incomplete torque stripe (as opposed to one that was broken) should, as an indicator of possible rotation, be investigated by checking that the bolt with a stripe in that condition was properly torqued – and, that the stripe should be re-applied.
- [89] Following this accident the Robinson manual was changed, to emphasise the need for torque stripes to be conspicuous by requiring them to be painted on in lacquer, rather than paint; for their placement for maximum visibility during pre-flight inspections; to stipulate that they ‘*must*’ rather than ‘*should*’ be applied across all parts of the bolt, the nuts, and the part being bolted; for their periodic renewal; and, importantly in my respectful view, for renewal if they were deteriorated. The manual explained the reason for these changes: to permit detection of bolt rotation.⁷²
- [90] The appellants’ submissions make the compelling point that, after this change, the renewing of *deteriorated* torque stripes would necessarily also involve ensuring that the bolt itself was properly torqued.⁷³
- [91] Eighth, and in the context of manuals, the service manual for at least one other similar helicopter (albeit one without a flexplate) specifically required that the actual torque on critical fasteners be checked, with a torque wrench, at periodic services.⁷⁴

⁶⁵ Evidence of Mr Cox, AB Vol 1, p. 304; and Mr Fisher, Vol 1, p. 178.

⁶⁶ Reasons, para [168].

⁶⁷ The actual spanner is Ex 29.

⁶⁸ AB Vol 2, p. 631.

⁶⁹ AB Vol 3, pp. 1309-10; and, see Ex 1 at AB Vol 2, Tab 12, pp. 624I and J.

⁷⁰ Reason, para [44] and footnote 34.

⁷¹ Reasons, para [168].

⁷² AB, Vol 6 p. 2439; Reasons, paras [59], and [147].

⁷³ Appellants’ Amended Outline filed 29 August 2014, para [43].

⁷⁴ AB, Vol 1, pp. 252-256.

- [92] Ninth, the finding that the defect had existed for more than 100 hours and, if there was a torque stripe present, it would have broken and been visible at a 100 hour inspection⁷⁵ if the instructions on the manual had been complied with by the LAMEs,⁷⁶ necessarily involves a concurrent finding: that a broken stripe *was* missed by the LAMEs or one of them, and the pilots.
- [93] There is a finding that the pilots probably did the limited job required of them, in pre-flight inspections, and that their failure to detect the looseness of Bolt 4 does not connote any inadequacy in those inspections.⁷⁷ There is, however, an adverse finding against the LAMEs to this very effect at paragraphs [202] and [234] of the Reasons but, again, that finding sits uncomfortably with the earlier finding that there was no torque stripe on Bolt 4, at all.
- [94] Those inconsistent findings do not, with respect, affect the proper conclusion in this matter. There was, again with respect, no evidence to support the earlier finding that a torque stripe had never been applied to Bolt 4 and was, therefore, missing when at the time of each LAMEs' inspection. The evidence and the weight of evidence pointed to only one possible finding about the condition of the torque stripe on Bolt 4: that, whatever its actual state, it was not such as to alert any LAME (or any pilot) to the fact that the bolt was loose, and rotating. That was the unchallenged evidence of each of the two LAMEs who last serviced this helicopter.
- [95] The first difficulty which arises is that no reasons have been given either for the finding that the LAMEs overlooked a missing torque stripe on Bolt 4, or that one was present but broken, and they missed it. Either finding must involve a rejection of their evidence about what they did see, but nothing explains that conclusion and it is, with respect, surprising when neither eventuality was actually put to them, and their credit tested. The rule in *Browne v Dunn* applies, it has been said, to courts as well as parties.⁷⁸ In the absence of reasons justifying those findings they cannot, in my respectful view, stand.
- [96] The second is that, on the evidence, other possible findings were in fact open: that the torque stripe on Bolt 4 was present but had been incorrectly applied so as not to adhere to both the bolt and the fixed component⁷⁹, and had rotated with the moving bolt – a possibility noted by the learned trial judge at paragraph [58] but not, otherwise, addressed; or, as seems more likely in the face of the abundance of oral and photographic evidence about the wide variety of states in which these stripes are found during inspections, that the stripe on Bolt 4 had deteriorated but not to a degree which attracted, or excited, the LAMEs' (or the pilots') attention.
- [97] In any event in the absence of any evidence of, or any basis for finding that, the LAMEs were negligent in their inspection of Bolt 4, the actual state of the torque stripe on it can only be a matter of speculation.
- [98] Once that is appreciated, the evidence that the stripes could deteriorate or slip means that reliance upon them, for inspection purposes, is insufficient. It was the reliance, in the manual, upon torque stripes as a method of verifying security that was inadequate – the stripes were not, in light of the weight of the evidence, a trustworthy or reliable indicator.

⁷⁵ Reasons, para [157].

⁷⁶ Reasons, para [167].

⁷⁷ Reasons, para [233].

⁷⁸ *Bale & Anor v Mills* (2011) 81 NSWLR 498, at 515 per Allsop P, Giles JA and Tobias AJA.

⁷⁹ Evidence of Mr Lay, AB Vol 3, p. 1284.

- [99] The manual said nothing to the effect, or on the lines that, a deteriorated torque stripe might indicate looseness. Nor did it counsel checking the torque on a bolt with a deteriorated stripe. The later changes to the manual manifest an attempt to remedy this apparent deficiency – albeit one which, in light of the critical nature of these parts of the machine, seems less than adequate or ideal.
- [100] Ground 1 of the appellants’ notice of appeal⁸⁰ relates to the finding that, when Bolt 4 was incorrectly assembled, no torque stripe was applied. That finding was not, on the evidence, reasonably open and was, for reasons already explored, contrary to the unchallenged evidence of the LAMEs. Ground 3, which relates to the contradictory finding that the condition of the stripe was such as to indicate to them that Bolt 4 had rotated, must be upheld on the same basis. The inconsistency inherent in these two findings also means that Ground 2, which attacks the implied finding that whatever the condition of the torque stripe it was sufficient to alert them to the problem, must be upheld.
- [101] The finding that it was not possible to establish that a bolted joint was correctly torqued save with the use of a torque wrench, but that the manual did not specify that, goes a good way towards establishing that the instructions in the manual were inadequate. The evidence that these stripes deteriorated, in a variety of ways, and that their reliability as indicators was thereby reduced, and that in that circumstance security could only be confirmed by applying a torque wrench (with, or without, an adaptor tool) or, simply, a spanner means that the finding of adequacy was, with respect, erroneous, and Grounds 5-10 are also made out.
- [102] The appellants also advanced a case based upon provisions of the *Trade Practices Act 1974* (Cth) and, in particular, ss 75AC, AD and AE relating to defects in goods, and consequential rights to compensation.⁸¹ The learned trial judge concluded that the legislation might apply even though the ‘defect’ existed in the manual, not the machine itself;⁸² that conclusion is not disputed and, with respect, is not amenable to argument. Once it is appreciated, however, that the plaintiffs’ case established the presence of a defect in the manual then the adverse finding (Reasons, paragraph [216]) against them cannot stand, and Grounds 18 and 19 are made out.
- [103] In light of these conclusions the appeal should, in my respectful view, succeed. I am also persuaded that they warrant setting aside the decision below and, in lieu, ordering that judgment be entered for the plaintiffs and that the matter be remitted to the trial division for the assessment of the plaintiffs’ damages.

⁸⁰ AB, Vol 12, pp. 5673-78.

⁸¹ Discussed at Reasons, paras [204]-[218].

⁸² Reasons, para [217].