

# **DETERMINATION INTO THE DEATH OF DONALD McANDREW UNDER THE FATAL ACCIDENTS AND SUDDEN DEATHS INQUIRY (SCOTLAND) ACT 1976 S. 6**

---

## **SHERIFFDOM OF GRAMPIAN HIGHLAND AND ISLANDS AT ABERDEEN**

### **UNDER THE FATAL ACCIDENTS AND SUDDEN DEATHS INQUIRY (SCOTLAND) ACT 1976**

#### **DETERMINATION**

by

**SHERIFF DOUGLAS J. CUSINE**

into the death of

**DONALD McANDREW**

**Under the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 s. 6.**

Aberdeen, 4 March 2004

The sheriff, having resumed consideration, determines under the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 as follows:-

- That in terms of section 6(1)(a) of the Act, Donald McAndrew (d.o.b. 30.3.57) who resided at 38 Bernham Avenue, Stonehaven, Kincardineshire died on 10<sup>th</sup> September 2003 at 12.47 at Aberdeen Royal Infirmary, life having been pronounced extinct. The death followed upon an accident which occurred at 10.30am in Anderson Drive, Aberdeen just north of the junction with Queen's Road.
- The causes of death were crush asphyxia and abdominal injury. Mr McAndrew's injuries were caused as he was descending into a manhole on the verge of the road. His body was only partly in the manhole when the wheel of a trailer owned by his employers, British Telecom (BT), which had been parked on a slope to the north of Mr McAndrew, rolled into the manhole. The wheel struck Mr McAndrew in the chest area, trapping him against the back of the manhole. While it is not entirely clear what he did, the most likely explanation is that he held on to a bar located in front of and to protect the rear nearside lights of the vehicle. The auto reverse system of braking on the vehicle did not engage the nearside wheel owing to the presence in the braking system of a triangular compensator which had been fitted by NIM Engineering Limited, replacing a rectangular one which had been supplied by the manufacturers of the braking system, Avonride.
- Reasonable precautions could have been taken by NIM who manufactured the trailer, but modified the braking system which had been supplied by

Avonride. In particular, NIM substituted a triangular compensator for a rectangular one without advising Avonride or BT of this, without knowing how far the rectangular compensator could move and without doing any calculations to see whether the triangular compensator would move sufficiently far to allow the auto reverse braking system to engage.

- There were no defects in any system of working which contributed to the accident resulting in the death.
- The trailer had been modified such that sideways or lateral pressure applied to it resulted in the auto reverse system failing to operate. Nevertheless, from tests carried out following upon the accident, the trailer complied with The Road Vehicles, (Construction and Use) Regulations 1986 as amended by The Road Vehicles (Construction and Use) (Amendment No. 4) Regulations 2001. The evidence at the Inquiry disclosed that other trailers and caravans, for example, might have auto reverse braking mechanisms which may not operate if lateral pressure is applied to them. In the present case, the lateral pressure applied may have been as little as 45 kg which could be the weight of a teenager. I do not have the power to direct the Department of Transport to do anything, but it is my hope that in the circumstances they will give the highest priority to considering what to do about existing vehicles with auto reverse braking systems, and to reviewing the relevant Regulations with a view to requiring additional testing of all new vehicles with auto reverse braking mechanisms in order to eliminate any movement of the vehicle following upon the application of lateral pressure.

### **Note**

The Crown is to be commended for being able to conduct a Fatal Accident Inquiry within five months of a death. I am grateful to the procurator fiscal depute, counsel and the solicitors involved in the Inquiry for the helpful way in which they elicited the evidence necessary for my determination. Their conduct in relation to the witnesses was appropriate, their submissions were clear and concise. This was against a background of twenty two Crown productions, one for British Telecom and two for NIM Construction. The Crown was represented by Mr Douglas Monaghan, procurator fiscal depute. Mr David Burnside, solicitor, Aberdeen represented the children of the deceased; Mr Alan Dewar QC represented British Telecom and Mr Robin Leith, solicitor, Aberdeen represented NIM Construction.

### **The site of the accident**

At the time of the accident, BT were involved in putting in a new cable in Anderson Drive, Aberdeen. BT employees were instructed on 9<sup>th</sup> September 2003 to carry out this task. In order to do that, the nearside lane of the northbound carriageway of Anderson Drive had to be coned off by the traffic operators. BT staff attended the following day, 10 September, at approximately 9.30am, by which time these traffic measures were not yet in place. In order to remove cables, a trailer which had a winching device attached to it was required. Two members of staff had towed such a trailer, MK5B, serial no. 4070/10, a cable recovery unit, to the site. Once the traffic measures were in place, the relevant section of Anderson Drive was inspected. Initially, a manhole some 200 yards north of where the accident took place had been identified as suitable, but it was later decided that it was unsuitable because the

trailer could not be moved sufficiently close to the manhole owing to the presence of a tree. A manhole further south was then identified as being suitable and the trailer was then taken to that spot, and reversed on to the verge. The cables are accessible from these manholes. The handbrake was put on, the trailer unhitched and the lorry which had towed it to site was moved away. At that point, the trailer was parked on a slope of 10 degrees. The lorry has to be moved in order to get into the back of it. No one thought that it was necessary to put chocks under the wheels at that point, because the trailer was not in its final position.

A preliminary inspection of the cables was to take place. That inspection revealed (a) that some existing cables would have to be removed to make room for the new one, and (b) that two other BT staff would be needed to inspect the existing cables in order to determine which one or ones could be removed.

### **The Trailer**

BT had ordered the trailer from NIM who assembled it and it was delivered to BT in 2002, as part of a batch of 29. The trailers were serviced four times per year, the first service being a small one, the second being a large one, the third one being a small one and the fourth one a large one. The trailer in question had undergone a large service in July 2003. Each service requires a test of the braking system in accordance with various paragraphs in the tester manual. These tests include looking for obvious defects including excess wear. Thereafter, each wheel is jacked up, the handbrake is put on and each wheel is spun until the brakes come on. No defect was spotted with the braking system following upon that service in July 2003. The testing, however, does not include parking the trailer on a hill.

The trailer weighs 2,840 kg. It has two wheels at the back and one, a jockey wheel, at the front. The jockey wheel is smaller than the other two and does not touch the ground when the vehicle is being towed. The trailer has a service brake which is used when the trailer is being towed and a parking brake, the handle for which is located immediately behind the jockey wheel. Immediately behind the handbrake, towards the rear of the vehicle, is a connecting rod which is attached to a compensator. Attached to the compensator are two cables going to the brakes attached to each of the rear wheels.

NIM did not manufacture the whole trailer. Avonride, which is a subsidiary of a German company called Knott, supplied various parts, including a parking brake system, the compensator on which was rectangular in shape. The purpose of the compensator is to allow the brake cables to move and the auto reverse braking system to function efficiently should the trailer be moved while the handbrake is on. The rectangular compensator supplied by Avonride has three holes, one for each of the brake cables and one, in the centre, for the connecting rod to the handbrake. The cables and the connecting rod are connected to the compensator by U-shaped metal yolks or clevises, as seen in Crown Production no.3 photographs 4, 5 and 9. If the trailer is moved while the handbrake is on, there should be sufficient energy in the braking system to re-apply the brakes. The trailer should move only a few inches. The normal position of the handbrake is at 45%, but if the auto reverse system operates, the position moves to nearer 90%.

When the braking system was delivered to NIM they observed, among other things, that the nose of the trailer was light and so in order to avoid the trailer tipping up, they decided that the trailer had to be modified. The axle was moved back, something of which BT were advised, and the effect of that was that there was a greater distance between the axle and the handbrake than previously. In NIM's opinion, that could be dealt with either by lengthening the connecting rod to the handbrake, or altering the compensator. There is no significant difference in the cost of these operations. NIM chose to alter the compensator from a rectangular one to a triangular one, which has a hole in each corner.

Having made that decision, NIM did not advise Avonride, or Knott, or BT about the change. NIM did not know how far the compensator had to move in order to activate the auto reverse braking system, nor did they do any calculations to ascertain whether the trailer's braking system would function properly with the triangular compensator. Had they done the calculations or compared the movement possible with the manufacturers' rectangular compensator with the movement possible with the triangular one, it would have been evident that the triangular compensator could not move a sufficient distance to enable the auto reverse braking system to operate on the wheels if the trailer was the subject of lateral force of as little as 45 kg.

BT's specification (Crown Production no. 7) included a requirement that the brakes on the trailers complied with the Construction and Use Regulations, referred to below. These Regulations require that the handbrake is able to hold the trailer on an 18% slope. All that NIM did in relation to the handbrake was to see if two men could move the trailer, either forwards or backwards, while the handbrake was on. They did not have a slope at their premises in order to test the trailer on such a slope. Following upon the accident, the trailer's brakes were tested on three occasions and on each occasion, the trailer's braking system was seen to comply with the Regulations.

### **Construction and Use Regulations**

The Regulations in force at the time of the accident were The Road Vehicles (Construction and Use) Regulations 1986 as amended by The Road Vehicles (Construction and Use) (Amendment No. 4) Regulations 2001. These Regulations have their genesis in and refer to Council Directive 98/12/EC of January 1998 which in turn refers to Council Directive 71/320/EEC.

Regulations 15 to 18 of the 1986 Regulations as amended, cover the braking systems of trailers such as the one with which this Inquiry is concerned. The Regulations in turn refer to the 1998 Council Directive, Article 2.2.2.1 of which provides, "The parking braking system with which the trailer or semi-trailer is fitted shall be capable of holding the laden trailer or semi-trailer stationary, when separated from the towing vehicle, on an 18% up and down gradient."

Regulation 89 provides, "No person in charge of a vehicle, or trailer drawn thereby, shall cause or permit such trailer to stand on a road when detached from the drawing vehicle unless one at least of the wheels of the trailer is...prevented from revolving by the setting of [a parking brake] or the use of a chain, chock, or other efficient device."

## **The Accident**

An initial inspection of the manhole in Anderson Drive had revealed that two other BT employees would be required to assist. These were Mr James Fergus and the late Mr Donald McAndrew. Mr Fergus has been employed for twenty-five years with BT as a telephone engineer. He first obtained a licence 20 years ago to operate this type of trailer, but was on a refresher course in the spring of 2003. The late Mr McAndrew was an experienced cable jointer, also employed by BT. He arrived on the scene shortly before 10.30 am. He was to descend the manhole along with James Fergus and between them, they would identify the cable(s) which would have to be removed prior to the installation of the new one.

Had that inspection taken place, the trailer would have been moved into its final position and its four steady legs or stabilisers would have been lowered towards the ground and been placed on wooden blocks. That would have had the effect of raising the rear wheels off the ground. The boom of the trailer would then have been put down the manhole to recover the cables. The proper use of the trailer for such an operation is set out in BT's Underground Cable Recovery Handbook (Crown Production no. 6) paragraph 3.2. This Handbook is available on the laptops of all crew, and Mr Fergus had one in the lorry which towed the trailer.

Prior to the inspection, the manhole was checked for the presence of gas and water was pumped out. Just prior to 10.30 am, Mr Fergus descended the manhole which he did by crouching down beside it and putting a hand on the first rung of the ladder which is at the north end of the manhole adjacent to where the trailer was located. Having descended, he went as far back as possible in the manhole to allow space for Mr McAndrew when he descended. There is sufficient space in the manhole for two people standing upright. Shortly afterwards, Mr McAndrew began his descent. Mr Fergus then heard distress sounds and a muffled sound. He realised that the trailer had moved and his immediate thought was for the safety of pedestrians. On looking up, he saw that the trailer wheel was in the manhole and that Mr McAndrew was trapped because the wheel was lodged against his chest and had wedged Mr McAndrew's back against the rear of the manhole. At that point, part of Mr McAndrew's body was in the manhole while the upper part was out of it. Another BT technician, David McKnockiter, was trying to remove the trailer with the assistance of Mr Bartlett who was passing at the time and offered his assistance. However, the trailer was too heavy and so the lorry was reversed, the trailer hitched up to it, and pulled away. After the trailer had been moved, the handbrake was still on. Mr Fergus shouted to Mr McKnockiter to summon an ambulance and the fire brigade. Shortly after that, Mr Fergus heard Mr McKnockiter using a mobile 'phone. At that point, Mr Fergus thought that Mr McAndrew was unconscious because he was very quiet.

Mr Fergus was aware of the trailer being pulled away from the manhole at which point Mr Fergus was holding the lower part of Mr McAndrew's body. The ambulance which had been summoned at 10.32 arrived at 10.40. Once Mr McAndrew had been removed from the manhole, Mr Fergus came out and was trying to come to terms with what had happened and why.

There was no evidence at the Inquiry to establish precisely what Mr McAndrew had done as he began his descent into the manhole. Mr Fergus' theory was that Mr

McAndrew had placed one of his hands on the metal bar which protects the light cluster at the nearside rear of the vehicle. Mr McAndrew was tall and Mr Fergus's evidence was that Mr McAndrew always used the bar to descend into and ascend from manholes and Mr Fergus himself did that from time to time. In doing so, Mr Fergus did not think that there was any risk attached. There is nothing in the Handbook for the trailer which indicates that it is not safe to pull on these handles. There had not been any problems prior to that.

Mr Fergus's theory accords with the opinion of Mr Martin Bell, a vehicle examiner with the Vehicle and Operator Services Agency, and that of Mr Russell Breen of the Health and Safety Executive who is a principal stress inspector of mechanical engineering, both of whom were present at examinations of the trailer following upon the accident. Their opinion was that some lateral force would have needed to be applied and that the trailer most likely moved as a result of Mr McAndrew's holding on to the metal bar protecting the light cluster as he was descending.

A post-incident inspection of the site by the police revealed a tyre mark where the nearside rear wheel had been. That was indicative of the brake being disengaged at the time. Had the brake been engaged, there would have been a general disturbance of the area around the wheel.

### **The Emergency Services**

The emergency call was routed to Inverness, and when the ambulance crew received the information about the accident, they were not told of the precise location in Anderson Drive. The crew, who were at the Accident and Emergency Department of the Hospital, decided to go north on Anderson Drive, but on discovering that there was no accident, they turned round, made their way south and were given the location *en route*. They observed the fire brigade at a building site on the opposite side of the road from the accident, but just as the ambulance crew stopped, they were summoned over to the other side by the BT staff.

At the scene, Roy Hopkins, an ambulance paramedic with some eleven years experience, who was there along with a colleague, attended to Mr McAndrew. Mr Hopkins' first impression, based on Mr McAndrew's very pale colour and the way that he was lying, was that he was already dead. He was unconscious, there was no pulse and he was not breathing. Mr Hopkins and his colleague pulled Mr McAndrew out of the manhole and immediately began CPR (Cardiac Pulmonary Resuscitation). That is designed to stimulate heart function. While there was some electrical activity, there was no pulse, which is usually detected from the carotid artery located in the throat area. Mr Hopkins' assessment was that there had been extensive internal blood loss from internal injuries. His colleague put a tube down Mr McAndrew's throat and they tried to ventilate his lungs. He was given drugs and a litre of fluid, after which they detected a slight pulse. He was removed on a stretcher and put into an ambulance. Further emergency treatment was administered *en route* to the hospital. At 11.05, Mr McAndrew arrived at the Accident and Emergency Department.

### **The Hospital**

On arrival, Mr McAndrew was treated by a team of doctors and nurses headed by Dr Hepburn a specialist registrar in accident and emergency. The Department had received a call from the ambulance crew who had given a brief account of the accident and some information about the patient's condition and in particular the fact that he was unconscious. The staff at Accident and Emergency were therefore ready to receive and attend to Mr McAndrew immediately on his arrival.

On arrival, it was obvious to Dr Hepburn that Mr McAndrew was in a serious condition and that he had sustained serious injuries. His team put in place the trauma life support procedures which are directed at seeking to secure clear airways, breathing and circulation - the so called "ABC" of First Aid. A further tube was inserted into Mr McAndrew's lungs permitting oxygen to get in. Initially, Mr McAndrew was breathing with the help of that intubation. His pulse was, however, very fast and his blood pressure was very low. His pupils were unresponsive which is an early indication of poor brain function caused by the deprivation of oxygen to the brain.

Unfortunately, Mr McAndrew's condition rapidly deteriorated and he went into cardiac arrest. As a result of further procedures, there was some improvement in the blood pressure and a brief output from the heart. There was, however, further deterioration, but he was resuscitated again. His abdomen then began to swell which was indicative of blood loss in that area. The decision was made to move Mr McAndrew to surgery in the Accident and Emergency Department. It was obvious from the internal examination that Mr McAndrew had suffered devastating injuries and it was observed that one of the main veins, the inferior vena cava, had been ruptured, an injury which was beyond repair. At 12.47, the decision was taken to discontinue treatment and Mr McAndrew was pronounced dead.

In Mr Hepburn's opinion, the injuries which Mr McAndrew had suffered at the accident scene meant that he would not have survived irrespective of the treatment which he received at the scene and in hospital.

### **BT's actions following the accident**

On 10<sup>th</sup> September 2003, immediately following the accident, BT removed the 29 trailers from service. On 3<sup>rd</sup> October 2003, they issued a Mandatory Safety Notice (BT's Production no. 1) which was directed at "All Operators, anyone that may be involved in towing/handling the trailers and anyone who may be required to work in the vicinity of trailers." The Notice which was sent to all BT workshops and all other workshops used by BT, deals with (i) uncoupling a trailer from the towing vehicle; (ii) parking the vehicle/trailer for operational use and parking when not in use; and (iii) the use of wheel chocks which are triangular blocks placed behind the wheels on a downward slope preventing further movement. There is diagram attached to the Notice showing the correct and incorrect position of the chocks in relation to the wheels and the correct and incorrect positions of the chocks against the tyre tread. Reference was made to this Notice in submissions and as it may provide guidance to others, it forms an Appendix to this Determination. The triangular compensators on the BT trailers have been, or are in the process of being, replaced by rectangular ones.

### **Other actions following the accident.**

Knott, the German company which manufactured the braking system for this type of trailer, have advised the Scottish Motor Trade Association and the National Trailers' Association of the dangers arising from the use of a triangular compensators, and from lateral pressure being applied to this type of trailer.

### **Inspection of the trailer**

Following the accident, three examinations of the trailer were conducted or observed by Martin Bell whose Report is Crown Production no. 15. Mr Bell is a vehicle examiner based at the Perth District office of the Northern Scotland Area of the Vehicle and Operator Services Agency. Various other persons were present at these examinations, including representatives of BT and the Health and Safety Executive.

#### **First Examination**

This examination took place on 12<sup>th</sup> September 2003. This included a simple test of the handbrake operation by applying the handbrake and using a socket and bar to try to turn the wheels both forwards and in reverse and it was noted that this could not be done. The trailer was then subjected to an applied brake roller test on the handbrake in both forward and reverse applications and it was noted that there was a significant difference in the figures for the reverse application which gave a far lower reading than was expected. It was noted however that the results could have been affected by the operation of the auto reverse braking mechanism. Accordingly this examination was inconclusive, and a further examination was arranged when more technical information was available and a more efficient way of checking the braking operation and deficiencies had been found.

#### **Second Examination**

This was held on 24<sup>th</sup> September 2003, in the presence of, among others, a representative of Knott. BT engineers used a calibrated load link and a brake load test was carried out. The trailer was towed and then reversed and the results of these tests are as follows:-

Results of forward brake pull test:Actual Trailer Weight 2840kg

Brake Force1770kg

Efficiency62%

Results of rearward brake pull test:Actual Trailer Weight 2840Kg

Brake Force499kg

Efficiency17.5%

A further test was carried out by attaching the load link to the nearside rear of the trailer in an attempt to replicate as far as possible what was thought to have happened at the time of the accident. When the trailer was pulled, the auto reverse brake system activated which released the nearside wheel whereupon the brake

compensator along with the stored energy in the handbrake system attempted to re-apply the nearside brake. It is noted in the Report, "Unfortunately in this instance the brake compensator fitted to the trailer cannot travel the distance required to operate the cable fully as the yolks of the cable end 'bottom' out on the compensator."

The results of the tests are as undernoted:-

The results of nearside rear pull test: Actual Trailer Weight 2840kg

Brake force 78kg

The results of offside rear pull test: Actual Trailer Weight 2840Kg

Brake Force 84kg

It was noted that the brake compensator fitted to the trailer was not the one supplied by the manufacturers. Measurements were taken of the compensator on the trailer.

It was decided to remove the wheels and drums in order to examine the brake shoe and fitments and to check the drum condition. A physical examination was also carried out on the auto reverse mechanisms on both sides and it was noted that everything was fitted properly. The brake shoes and drums were re-dusted and the drums and wheels re-fitted, the brake shoes, cables and rods were then adjusted to manufacturers' specifications and further tests were then carried out. The result of the forward brake test is as follows:-

Results of 2<sup>nd</sup> forward brake pull test: Actual Trailer Weight 2840kg

Brake Force 1970kg

Efficiency 69%

The same test was then carried out in a rearward direction:

Results of 2<sup>nd</sup> rearward brake pull test: Actual Trailer Weight 2840kg

Brake Force 750kg

Efficiency 26%

The results in relation to the nearside and offside wheels are as undernoted:

The results of 2<sup>nd</sup> nearside rear pull test: Actual Trailer Weight 2840kg

Brake force 100kg

The results of 2<sup>nd</sup> offside rear pull test: Actual Trailer Weight 2840kg

Brake force 45kg

(Crown Production no. 15 pp. 160-161)

The Report then goes on to state, "It was also noted that the compensator again could not re-apply the handbrake as the restricted travel in the cable yolks prevented the handbrake cables from travelling fully" (p. 161).

A further investigation was carried out by Mr Bell which involved making replicas of the NIM's and Avonride's compensators. A graph was then produced showing brake rod deflection and compensator/bar movement when the trailer was pulled from the rear either left or right. These results are Crown Production no. 21 (using the NIM compensator) and Crown Production no. 22 (using the Avonride compensator). Mr Bell's Report states, "The results show that when the Trailer is pulled left or right with the handbrake applied the side which is pulled activates the auto reverse mechanism and releases the brake on that side, in which case the stored energy in the handbrake lever piston should re-apply the brake on the side which has started to turn. However the geometry of the NIM compensator is such that it could not re-apply the handbrake as all the stored energy is now going in a straight line to the cable on the side where the brake is already applied. This is due to the triangular shape of the compensator which causes a major deflection of the handbrake rod to the left or the right before brake application, therefore any stored energy in the handbrake lever piston is greatly reduced." That "major deflection" is clearly seen in Crown Production no. 3, photograph 5. The compensator was required to travel a minimum of 28mm to allow the brakes to re-apply, whereas the replica of the NIM compensator could move a maximum of 22mm.

In evidence, Mr Bell's opinion was that NIM ought to have advised Avonride of the change to the compensator and that the designers at NIM could have done the calculations which he had done to show that the triangular compensator could not move the requisite minimum distance to permit the auto reverse braking mechanism to function.

### Third Examination

This was carried out on 9<sup>th</sup> October 2003. Two new brake equalising bars and an adjusting link rod were manufactured and supplied by NIM. One of these bars was made to the Avonride specification and one was 10mm less in breadth in order to allow full travel of cable yolks. The handbrake was applied and the trailer when pulled gave an initial reading of 70kg. The auto reverse brake was activated on the side being pulled when the stored energy in the handbrake re-applied the brake immediately the wheel began to turn and that gave a reading of 296kg which locked the wheel as a result. It was noted that the handbrake had travelled fully and was fully applied. The Avonride equalising bar was removed and the NIM specification equalising bar was fitted and the brake road adjusted as a result. The same pull test was carried out giving similar readings to the one achieved by the Avonride bar namely 45kg and 290kg. Once again the handbrake operated efficiently when the trailer was pulled. (Crown Production no. 15 p. 162)

When the original NIM triangular compensator was refitted to the trailer and the same test was carried out, it was noted that an effort of only 60kg was needed to

move the wheel and that the handbrake was not re-applied and accordingly the trailer could move with little effort.

Mr Russell Breen of the Field Operations Directorate Scotland Specialist Group which is part of the Health and Safety Executive attended the tests carried out on 24<sup>th</sup> September and 9<sup>th</sup> October 2003. His Report is Crown Production no. 16. He noted that when the trailer was pulled forward the handbrake operated satisfactorily, generating a brake force in the order of 1,800kg and that when the trailer was pulled centrally from the rear it also gave satisfactory but reduced results, the brake force being between 500kg and 750kg. He noted that, "Under normal circumstances the park brake could be expected to hold the trailer on the reported 10% gradient at the accident scene" (paragraph 5.3). He went on to note however, that when the trailer was pulled from either the left or the right rear corner, significantly less effort was required to cause the trailer to move. That effort ranged from 45kg to 100kg. When the vehicle was pulled from the left, the right brake remained operative, but the trailer rotated around that braked wheel (paragraph 5.4). He went on to say, "Much of the movement to apply the brake was lost as a result of the triangular compensator plate rotating around its connection to the brake cable for the fixed wheel." (paragraph 5.5). His explanation for the accident is set out in paragraph 6.3 in which he says, "Once released the brake would not reapply and, on the incline, the trailer would continue to roll backwards, rotating around the braked wheel on its opposite side."

He noted that in terms of the Construction and Use Regulations, the park brake was compliant when the trailer was pulled in either a forward or reverse direction when the pulling force was applied centrally. While he did not believe that the NIM triangular compensator arrangement was satisfactory, he did note that the Construction and Use Regulations did not make any mention of resistance to additional externally applied forces (paragraph 7.3).

His conclusions which are set out in paragraph 8 of his Report show that the park brake would under normal circumstances hold the trailer on a gradient of 18% as required by the Construction and Use Regulations. It did not, however, hold the trailer under all circumstances and in particular when additional external force was applied rearwards to one side the brake was released under the action of the auto reverse system on that side but not reapplied. This therefore allowed the trailer to rotate around the opposite fixed wheel.

He accepted in evidence that the brakes complied with Regulation 89 of the Construction and Use Regulations in that when the trailer was at rest, at least one of the wheels could not move once the handbrake had been applied. In his opinion, good practice dictated that NIM advise Avonride or Knott of the change to the compensator, but he would not have expected NIM to do the calculations done by Mr Bell. He was, however, surprised at the results when the lateral pressure was applied to the trailer, but he thought that the information from Knott (Appendix 1 page 1 to his Report) would have revealed the problem.

### **NIM's Involvement**

BT ordered a fleet of 29 trailer recovery vehicles MK5B from NIM. The specification document relating to this type of vehicle is Crown Production no. 7. Of particular

importance is the paragraph dealing with brakes (paragraph 7) which states, "Over-run. The brakes fitted to the trailer shall be of the over-run type and comply with the current legal auto reverse requirements. The brakes shall conform with specification MT6040," which is in the First Inventory of Productions for NIM (no. 1). Paragraph 13.5 provides, "Parking brake efficiency shall be tested to hold a fully laden trailer on a 1 in 6.25 gradient."

Mr Clive Watson, a technical assistant with BP, was present at NIM's premises when tests on the first trailer off the production line ("the proto-type") were carried out. He was aware that the axle on the trailer had been moved backwards because the nose of the trailer was light. This had resulted from cladding being added to the engine to suppress noise and that, in turn, had resulted in the nose of the trailer being light. Mr Watson was not aware that the braking system of the vehicle had been altered. If he had been aware of that, he would have carried out tests, but the tests which he would have carried out would have been "straight-line" testing, i.e. not lateral pressure. At NIM's premises, he carried out a general inspection of the trailer, but did not inspect the braking system. He had been told by NIM that the braking systems had been tested, but he asked for and was given evidence demonstrating that the service brake had been tested. That is Crown Production no. 10, a Mintext Churchill Brake efficiency recorder test card, which shows efficiency just short of 40%. That is dated 17<sup>th</sup> November 2001. Mr Watson did not receive any certification in relation to the handbrake, because there was no procedure for such certification. The proto-type would have been the subject of a six-week trial and after BT took delivery, there would have been random sampling of the trailers. In the First Inventory of Productions for NIM, (no. 2.) there is a copy vehicle quality report in respect of trailer 4070/10 which shows that it had been "checked," which meant that Mr Watson had checked it and no defects were revealed.

Mr Geoffrey Wileman, the vehicle supply manager for BT, explained that BT had been using trailers like the one which is the subject of this Inquiry since 1961, and that these had been supplied by NIM or their predecessors. He confirmed that an order for 29 trailers had been placed with NIM on 15 February 2001, as BT were replacing 29 out of their 35-strong fleet. He had gone to NIM and discussed BT's requirements. He confirmed that BT would inspect the proto-type. He had seen the certification for the service brake (Crown Production no. 10), but confirmed that there are no specific tests for the parking brakes. However, he had seen the type of trailer being pulled with a winch while the handbrake was on, but did not test the handbrake on the proto-type, because the brakes had been checked on previous occasions. The type of trailer had been in operation since 1961 and BT had not had any problems with parking brake systems since then. Mr Wileman was also unaware of the change to the compensator on these trailers, but had he known, he would have carried out the straight-line testing only, as there is no known "lateral" testing. On receipt of the vehicle, he would have put it on a slope and the usual handbrake tests would have been done. He was, however, satisfied that the proto-type trailer complied with the Basic Trailer Specification MT6040 for Centre Axle Trailers up to 3500KG gross weight. (NIM Production No 1/1) In particular, it complied with paragraphs 4.1., 4.6 and 4.7. Paragraph 4.7 states, "The parking brake shall be capable of holding a fully laden trailer on a 18% gradient both uphill and downhill by mechanical means with a pull on the lever not exceeding 40kg."

Mr Ian Tungate, the drawing office manager of NIM, was responsible for all drawing work and the technical aspects of the trailers. He was aware of the BT specification, but because NIM do not manufacture brakes, the brakes came from Avonride as a kit, the brakes themselves being manufactured by Knott their German parent company. NIM did manufacture the connecting rod to the axle, and a new triangular compensator because they thought that a triangular compensator was more efficient. A diagram of this compensator is Crown Production no. 12. Mr Tungate did not, however, do any tests, or otherwise attempt to ascertain whether the triangular compensator would be as efficient as a rectangular one. He was unaware of how far the compensator would have to move in order to be efficient. Following upon these modifications, the service brake was tested at 20 mph (Crown Production no. 10). Mr Tungate would have expected some testing of the handbrake. He accepted that the triangular compensator caused the accident, but did not believe that the testing of the brakes which was required in order to comply with the Regulations would have revealed the problem, because in all these tests, the triangular one had proved to be as efficient as the rectangular one.

There are two appendices to Mr Breen's Report. The first of these is produced by Knott (UK) Limited and is entitled, "Instructions for Brake System Tensioning" and the second which is entitled "Brake Type Approval and Hitch Compatibility Test Report", includes a certificate from TUV, a German organisation, to Knott which states that the brakes comply with EC Directive 98/12/EC. Mr Tungate had not received Appendix 1 from Avonride and had not seen Appendix 2 until after the accident. He said that he knew of anecdotal evidence about other trailers which had rectangular compensators which had also had problems with their braking systems.

Mr Keith Ireland, NIM's quality assurance manager for the last 10 years, became involved with the trailers only after their completion. He knew about the BT specification, (Crown Production no. 7) and he tested the trailer in the presence of Mr Wileman and Mr Watson from BT. The service brake worked when the trailer was pulled and pushed at 20 mph. He knew that the parking brake should be tested on a slope of 16%. He accepted that NIM did not have such a slope, but that one could have been made. Instead of that test, two men tried to push the trailer backwards and forwards. That, in his opinion, would indicate whether the parking brake was working, but, he accepted, not whether it was working efficiently. That push/pull test was one which Mr Bell would have used on a roadside inspection of a trailer, and there was no slope available to him at the various premises at which he tested the trailer after the accident. Mr Ireland knew about the change in the compensator and accepted that more testing of the trailer should have and could have been done on the parking brake system.

### **Submissions**

All parties were agreed that my determination under section 6(1)(a) should be that Mr McAndrew died at Aberdeen Royal Infirmary on 10<sup>th</sup> September 2003 at 12.47 following upon an accident at Anderson Drive near to its junction with Queen's Road at approximately 10.30 am.

Under section 6(1)(b), the Crown invited me to determine that the death resulted from crush asphyxia and abdominal injuries caused when a Mark 5 Cable Recovery

Vehicle rolled backwards following upon the application of lateral pressure to it. The background to this accident was that an order had been placed by BT with NIM for the supply of this and 28 other trailers, that NIM had substituted a triangular compensator for the rectangular one supplied by Avonride, the result of which was that the auto reverse braking system on the nearside rear wheel did not re-apply following lateral pressure being applied to the trailer.

Mr Burnside and Mr Leith agreed with that, as did Mr Dewar, but he invited me to add some more factual detail about NIM's failures.

Under section 6(1)(c), both the Crown and Mr Leith submitted that I should not make any determination.

Mr Burnside submitted that I should determine that BT were responsible for the safety of their employee, Mr McAndrew, and that they could not escape responsibility by failing to enquire of NIM about any possible modifications which had been made to the trailer. He submitted further that, when the trailer was being parked on an incline, chocks should have been put under the wheels, or the trailer should have been re-hitched to the lorry.

Mr Dewar submitted that the reasonable precautions which could have been taken were the various things not done by NIM, namely not checking for themselves the effect of replacing the compensator and failing to draw the change to the attention of either Avonride or BT. His submission was that what BT had put in place immediately following the accident (the Mandatory Safety Notice) should not be construed as a failure on their part to take reasonable precautions to prevent the accident. That was because they could not have anticipated any problems with the trailer. The Mandatory Safety Notice should be seen as an interim measure only. There should not be any mention of chocks in my determination, except as an interim measure, because reliance might be put on the chocks, rather than on the efficiency of the handbrake mechanism. I should not determine that the vehicle should always be parked downhill from a site because that might not be possible.

Under section 6(1)(d) the Crown, Mr Dewar and Mr Leith invited me not to make any determination.

Mr Burnside submitted that a defect in the system of working was parking the trailer uphill rather than downhill of the manhole. As BT are now requiring a risk assessment to be done if the trailer is to be parked uphill, that indicates a defect in the system prevailing at the time of the accident.

Under section 6(1)(c) and (d), Mr Leith submitted that the brakes complied with the Construction and Use Regulations and that any problems arising from the modification of the compensator could not have been foreseen. There was evidence that BT had been present at the testing of the vehicles and that BT themselves were supposed to test the trailer. In relation to the failure to consult Avonride, there was no one from Avonride represented at the Inquiry and so it is not possible to say what if anything they would have done had they been consulted. There was nothing inadequate about the push/pull test or the failure to use a slope for testing. Mr Bell would have used the push/pull test at a roadside test and he had not tested the

trailer by putting it on a slope. Although there was a failure by NIM to advise Avonride and BT of the change in the compensator, there was no evidence of any causal connection between these failures and the accident.

Under section 6(1)(e), all parties submitted that the existing Construction and Use Regulations were in need of reconsideration by the Department of Transport because they required only that the handbrake should hold on an 18% incline. The Construction and Use Regulations do not seem to require testing of the handbrake to see the effect of lateral pressure being applied to the trailer. As it was that type of pressure which caused the accident, and relatively little pressure at that, there was a need to consider whether that type of test should be introduced. There was also a concern that existing trailers and other vehicles might have triangular compensators fitted, or even rectangular ones which might not permit the auto reverse braking system in these vehicles to operate properly, if lateral pressure were applied.

Mr Burnside submitted that it was a matter of concern that the ambulance personnel were not given accurate information about the location of the accident. That might be accounted for by the fact that the call was routed to Inverness where those operating the system might be less familiar with Aberdeen than someone working in Aberdeen itself. Such a person might ask for information about, or be familiar with, local landmarks.

### **Determination.**

The purpose of a Fatal Accident Inquiry is not to identify criminal activities, nor matters which may give rise to a civil claim. In terms of the 1976 Act, the sheriff is required to determine the following:-

- where and when the death and any accident resulting in the death took place;
- the cause or causes of the death and any accident resulting in the death;
- the reasonable precautions, if any, whereby the death and any accident resulting in the death might have been avoided;
- the defects, if any, in any system of working which contributed to the death or any accident resulting in the death;
- any other facts which are relevant to the circumstances of the death.

As there was broad agreement among the parties about the appropriate determinations under sections 6(1)(a) and (b), I need say no more about these.

For the purposes of section 6(1)(c) I am required to consider "The reasonable precautions, if any, whereby the death and any accident resulting in the death might have been avoided."

I have no difficulty in determining that NIM ought not to have altered the compensator, an essential part of the braking system of the vehicle, without considering whether that change might have had an adverse effect on the efficiency of the auto reverse braking system. NIM did not know how far the compensator needed to move, but they could have calculated how far the rectangular one supplied by Avonride moved, and they could then have compared that with how far the triangular compensator could move. I cannot see any reason why they could not

have done the necessary calculations, similar to those done by Mr Bell, and had these been done, they would have revealed the inadequacy of the triangular compensator. In addition, they should have consulted with Avonride, and advised BT. It is correct to say that there is no evidence at the Inquiry about what Avonride would have done. However, they would have known about the change and it would have been for them to determine what advice to give NIM. Avonride were not given that opportunity. BT would have carried out their own tests had they been advised, but these would have been "straight line" tests.

For the purposes of s. 6(1)(d), there was no defect in BT's system of working. They had used these trailers, albeit with modifications, since 1961 and had not had any problems with the braking system drawn to their attention by their operators, nor had any been discovered in the course of servicing these trailers. It is accepted that BT did not test the trailers by applying lateral pressure, but no one thought about such a test, given the absence of problems in the past. Furthermore, it has to be noted that there was evidence at the Inquiry that Mr McAndrew used the bar protecting the rear lights on numerous occasions both to descend into and ascend from manholes. The issuing of the Mandatory Safety Notice does not, in my opinion, indicate a defect in any system operating at the time of the accident. Some aspects of the Notice are simply repetitive of what was done prior to the accident. It has to be accepted, however, that the instructions regarding the use of chocks were not in existence prior to the accident. In my opinion, it would be impracticable to insist upon chocks being used every time the trailer is moved because there might have to be a number of manoeuvres of fairly short duration before the trailer is in its final position, immediately prior to its being operated for cable recovery. There is, in any event, a risk that there could be undue reliance on chocks, and less attention being paid to the need to ensure that the handbrake is properly applied. It would also be impractical to require that a trailer should always be parked downhill of any work, simply because the terrain may not permit this. BT have addressed this point, by requiring a risk assessment to be done if a trailer is to be in this position.

There cannot be any doubt that BT were responsible for the safety of their workforce, including Mr McAndrew. However, I am not persuaded that they ought to have ascertained whether or not any changes had been made to the specification. They employed NIM, presumably because they had manufactured previous trailers for BT which had not given rise to any problems. BT were, in my opinion, entitled to assume that NIM would produce the trailers according to the specification, and that is what they did. It is only with the benefit of hindsight that the problem with the triangular compensator in relation to lateral pressure was identified. Even if BT had carried out tests, they would have been "straight line" tests, which, in all probability, would not have indicated any problem with the auto reverse braking system.

I have decided not to make any determination in relation to the re-routing of the emergency call to Inverness. There was no evidence at the Inquiry about what was said in the 999 call about the precise location of the accident, but it would not be unreasonable to assume that whatever information was received in Inverness was transmitted to the emergency services, and in particular to the ambulance crew. While it is unfortunate that the ambulance crew initially went in the wrong direction because of the lack of precise details of the location, it has to be accepted, sadly, that even if they gone directly to the scene of the accident, that would not have made

any difference to the outcome of this unfortunate accident. The evidence from the paramedic was that this system of re-routing calls to Inverness works "by and large OK." While I have some sympathy with the view that people located in Aberdeen might have some greater familiarity with Aberdeen and the surrounding areas than people located in Inverness, there was no evidence at the Inquiry about how sophisticated the information is which those in Inverness have to hand. I merely observe in passing that while the delay in the arrival of the emergency services would not have made any difference in this case, it is quite clear that in many other cases a delay of two minutes could be significant, and perhaps even vital.

So far as the consideration of The Road Vehicles (Construction and Use) Regulations is concerned, there is no doubt that because of the problem tragically highlighted in this case, it is of the utmost importance that these Regulations are revisited as soon as possible. There was evidence at the Inquiry, albeit anecdotal, that other vehicles may be fitted with compensators, whether rectangular or triangular, which may not permit the proper operation of their auto reverse braking operations when lateral pressure is applied to them. This is a matter of some public importance, particularly when the lateral pressure which resulted in this trailer moving could have been as little as 45kg. It is true that greater force would be needed to move a trailer which was on level ground, but the testing which is in place at present is properly directed to trailers on a slope, which this trailer was at the time of the accident.

Any reconsideration of the Regulations ought therefore to consider vehicles already constructed, and, of course, the tests to be used on future vehicles. It should also address the question whether a vehicle's braking system must be tested on a slope, or whether it would be sufficient, if for example, a trailer was pulled using a particular force, and/or for a particular distance. I make this comment against the background of the evidence of Mr Bell and Mr Breen who were of the view that attempting to pull, or push the vehicle with the handbrake on was as efficient as leaving it on a slope.

### **Final Comment.**

I should say that throughout the Inquiry, I was impressed with all of the witnesses who gave their evidence candidly. For some of them, this was difficult. A Fatal Accident Inquiry is an unpleasant experience, particularly for the relatives and close friends of the deceased, as it inevitably forces them to relive the events which gave rise to the Inquiry. It is therefore helpful where such an Inquiry is conducted as this one was within a relatively short time of the death, but also where the evidence is brought out in a highly professional manner by those who represented the various parties.

THIS IS THE APPENDIX REFERRED TO IN THE DETERMINATION DATED 4 MARCH, 2004 IN THE FATAL ACCIDENT INQUIRY INTO THE DEATH OF DONALD McANDREW.

### **"MANDATORY SAFETY NOTICE**

**Safety when Working with Trailers fitted with overrun brakes (Non Air Braked)**

A serious accident occurred recently that resulted in the tragic fatality of a BT engineer. The accident involved a Mk5 Cable Recovery Trailer (CRT -805 code) parked adjacent to a

manhole. The trailer unexpectedly moved and caused crush injuries to the engineer. As a precaution all CRT's were immediately removed from service.

The Health & Safety Executive (HSE) and BT are currently investigating the incident looking at all aspects of the trailer including the braking system.

**Some other BT trailers and non-BT towed trailers such as caravans may also be capable of behaving in this way and as a precaution the following procedures are to be applied to all trailer types fitted with overrun brakes until investigations are complete.**

**These are mandatory for all operators, anyone that may be involved in towing/handling the trailers and anyone who may be required to work in the vicinity of trailers.**

If you have any questions or require clarification regarding this notice or the following procedures please discuss with your line manger.

Technical support can be obtained from BT Fleet, Line of Business Safety Professionals or the Group Safety Adviser where necessary.

## **UNCOUPLING A TRAILER FROM THE TOWING VEHICLE .**

Ensure the handbrake is **firmly** applied, lower the jockey wheel and adjust the height until it supports the weight of the towing hitch. Disconnect all electrical and trailer coupling connections.

Ensure that the towing hitch is adequately supported before withdrawing the pin.

Disconnect the towing hitch and drive the vehicle away from the trailer. Avoid pulling the trailer from the vehicle if at all possible.

You **MUST NOT** use any part of the Trailer frame as a handhold when entering or exiting the manhole.

## **PARKING THE VEHICLE/TRAILER FOR OPERATIONAL USE AND PARKING**

### **WHEN NOT IN USE**

Leave the trailer coupled to the towing vehicle wherever possible.

The stabilisers (where fitted) must be fully deployed if the trailer is to be operated while coupled to or uncoupled from the vehicle.

Trailers should be parked/operated on a firm, smooth and level surface whenever possible.

If the trailer needs to be operated on sloping ground, it should be positioned down slope of the area in which the work is to be carried out wherever possible.

If the surface is on a slope and the trailer is to be uncoupled, park the trailer with the front of the trailer (tow hitch) facing down the slope whenever possible.

If a trailer needs to be positioned facing backwards down an incline above a manhole, the line manager should be contacted to carry out an onsite risk assessment before any entry into the underground structure is undertaken whilst the trailer is in this position. Further Advice is available from the Line of Business Safety Manager or Group Safety Adviser if necessary.

### **Wheel Chocks (Mk5 Cable Recovery Trailers only).**

When detached from its towing vehicle and parked the **wheels on Mk5 Cable Recovery Trailers MUST be chocked** (in addition to firmly applying the handbrake). Place a Wheel Chock behind each wheel as shown in Appendix I.

You should contact the BT Fleet Workshop responsible for the trailer maintenance to arrange collection of the Wheel Chocks (2 per trailer). The Wheel Chocks should be kept with the trailer when not in use and stored preferably in the forward side locker or the Steel Basket on the rear left side of the trailer, using draw rope or similar to secure."