Trans North Turbo Air Ltd. et al. v.
North 60 Petro Ltd. et al., 2003 YKSC 18

Date: 20030327
Registry: Whitehorse

IN THE SUPREME COURT OF THE YUKON TERRITORY

BETWEEN: S.C. No. 00-A0174

TRANS NORTH TURBO AIR LIMITED

PLAINTIFF

AND:

NORTH 60 PETRO LTD., PATRICK O'HAGAN and
BRIAN LARKIN

DEFENDANTS

AND BETWEEN: No. 00-A0226

ROBERT BRIAN CAMERON

PLAINTIFF

AND:

NORTH 60 PETRO LTD., PATRICK O'HAGAN and
BRIAN LARKIN

DEFENDANTS

AND BETWEEN: No. 00-A0211

ALMON LANDAIR LTD.

PLAINTIFF

AND:

NORTH 60 PETRO LTD., PATRICK O'HAGAN and
BRIAN LARKIN

DEFENDANTS

AND BETWEEN: No. 00-A0212

SUMMIT AIR CHARTERS LTD.

PLAINTIFF

AND:

NORTH 60 PETRO LTD., PATRICK O'HAGAN and
BRIAN LARKIN

DEFENDANTS

Appearances:

R. Patrick Saul and Darryl G. Pankratz	For Trans North Turbo Air Limited and Robert Brian Cameron
Peter Chomicki, Q.C.	For Almon Landair Ltd. and Summit Air Charters Ltd.
Rick B. Davison, Q.C. and Bruce Churchill-Smith	For the Defendants

Before: Mr. Justice R.S. Veale

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REASONS FOR JUDGMENT

INTRODUCTION

[1] On January 18, 1999, Hangar C at the Whitehorse airport burned to the ground. Trans North Turbo Air (TNTA), the owner of Hangar C, and other plaintiffs allege that the use of an oxyacetylene torch by two employees of North 60 Petro Ltd. (North 60) was the cause of the fire. North 60, and the two employees involved, deny liability and allege that the cause is undetermined or that other events caused the fire. As with many fire liability cases, no one can say with absolute or scientific certainty how the fire started, despite the fact that two witnesses were inside the hangar when the fire erupted and four witnesses observed the fire from a nearby restaurant. As a result, each party presented expert evidence to explain and buttress their position.

[2] In the normal course the onus is on the plaintiff, TNTA, to establish on the balance of probabilities that the negligence of the defendants was the cause of the fire. However, the plaintiffs allege an alternative legal position based on trespass, which would place the onus of disproving the allegation of intention and negligence upon the defendants.

[3] There are also significant disputes over the measure of certain damages claimed by TNTA and whether or not TNTA was contributorily negligent for the damage that resulted.

[4] There is no dispute that the defendants had a duty of care to the plaintiffs. Nor is it disputed that North 60 is vicariously liable for the acts of its employees, Patrick O'Hagan and Brian Larkin.

BACKGROUND

[5] Prior to the Second World War, there was no road through the Yukon Territory to the state of Alaska. In 1942, the Americans built the Alaska Highway and certain airstrips in the Yukon Territory for the purpose of defending Alaska from anticipated enemy attack or invasion.

[6] The Whitehorse airport was one such facility. The runway and four hangars, A, B, C and D, were built between 1942 and 1945. Hangar C was purchased by TNTA in 1970 to service and maintain its fixed wing and helicopter aircraft. It stood on 102,399 square feet of land leased by TNTA from the federal government. Hangar B, which was also owned by TNTA, was destroyed by fire in July 1993, when a roofing contractor applied a hot tar application to its roof. This is a fact that was widely known by residents of Whitehorse. Hangar B and Hangar C were similarly constructed.

[7] Hangar C was primarily of wood frame construction consisting of 44,000 square feet. It was set on a cement base at the edge of the tarmac or apron of the Whitehorse airport runway. The roof of Hangar C rose in a shed roof fashion from cement pillars and then became what is called a barrel roof. The shed and barrel roof were made of fir. The barrel roof reached a height of approximately 40-50 feet at its peak. The concrete buttresses along the east and west walls created eleven 20-foot bays along each side of the interior of the building. These were later converted into office space.

[8] Hangar C had a length of 227 feet running south to north. It had a width of 202 feet. The aircraft entrance to the hangar was at the south end and consisted of large sliding doors which slid on rails and folded into tower-like structures at the southwest and southeast corners of the hangar. Each tower was part of the hangar and extended

into a flat overhang to house the sliding doors. The overhang ran across the front of Hangar C on the south side, but left an opening in the centre that allowed the tailwing of aircraft to enter and exit the hangar. The flat tower rooves were higher than the angled shed roof but intersected with the bottom portion of the barrel roof. Access to the tower roof and the shed and barrel roof of Hangar C was by means of a ladder from the ground to the shed roof and then a further ladder to the flat tower roof which provided access to the barrel roof. I will refer to the flat roof area where the North 60 sign was located as the “southeast corner roof”.

[9] The large sliding doors became difficult to open and close as the cement base expanded and contracted with temperatures that could range between extremes of -40°C in the winter and +30°C in the summer. As a result, in the early 1970s, TNTA simply left the sliding doors in an open position so that aircraft could always exit and enter the hangar. The significance of this is that the south end of the hangar was referred to as the “cold side” as it was open to the elements through the large open doors. It comprised approximately two-thirds of the hangar space.

[10] However, the north end of Hangar C was enclosed and insulated. The northwest side was called the helicopter shop. It was occupied by TNTA. The northeast side was called the fixed wing shop. It was occupied by TNTA and Summit Air Charters Ltd. (Summit Air), a smaller aircraft company that was the only other permanent tenant of Hangar C on January 18, 1999. The helicopter shop was renovated by TNTA when it purchased Hangar C in 1970. It had sliding doors for helicopters to enter and exit from the cold side with an insulated curtain on the inside. Similarly, the fixed wing shop was renovated in 1972 and 1973 by insulating it and installing sliding doors and an insulated

curtain on the inside. The helicopter and fixed wing shops also contained equipment for the repair and maintenance of the helicopters and fixed wing aircraft.

[11] The west side office space was renovated in 1972 and had offices for TNTA staff, Summit Air staff, a boiler room, a wash and paint bay and a parts room.

[12] The east side office space was also renovated in 1972 to provide a parts room for Summit Air, an avionics (radio communication equipment) shop, a welding shop, a storage shop, a carpentry shop, a storage room with a small boiler for hot water heat and three offices. One of the three offices was the southeast corner office, which was adjacent to the southeast corner roof.

[13] The southeast corner office had been leased to White Pass Transportation Limited (White Pass) by a lease agreement dated September 15, 1993 (the lease). The lease was assigned to North 60 Petro on January 1, 1995. Attached to the lease agreement was Schedule B, entitled *General Hangar Rules and Regulations* which contained the following paragraph:

> 5. No person, without the written consent of Trans North Turbo Air Ltd., is to carry out on or near the hangar premises hazardous operations such as painting, doping or welding.

[14] On January 18, 1999, the three offices on the southeast side were empty and the boiler shut down, although the above ground fuel tank was full. The offices and shops in the fixed wing shop and helicopter shop were heated from the main boiler on the west side, which had an underground fuel tank.

[15] There were numerous electrical boxes or panels in various parts of the building. There was also an electrical wire running from an electrical box in the welding shop to the southeast corner roof and ultimately to the peak of the barrel roof. This wiring was

connected to spotlights and the lights for the TNTA sign, both located near the south end of the barrel roof. The TNTA sign was mounted on the two southernmost air vents that vented out of the peak of the barrel roof.

[16] On the day of the fire, the cold side of Hangar C had nine 45-gallon barrels in the southeast corner by the doors, as well as three smaller tanks. The cold side was essentially used for storage and the southeast corner contained a Fleet Canuck aircraft with a car behind it, two boats and a utility trailer to the south of it. The Fleet Canuck aircraft was owned by Robert Cameron and was made of a very flammable outer material painted with aircraft dope, which was also very flammable. It also contained several tanks of aviation gas.

[17] On June 1, 1995, North 60 acquired the petroleum distribution and marketing assets of White Pass. White Pass formally assigned its lease of the southeast corner office of Hangar C to North 60 with the consent of TNTA. North 60 began to operate its sale of aviation fuel from the southeast corner office of Hangar C.

[18] Brian Larkin was originally employed by White Pass in 1973. In approximately 1974, Mr. Larkin became a supervisor and ultimately the bulk plant manager in Whitehorse and the direct supervisor of Patrick O'Hagan. Mr. O'Hagan was hired by Mr. Larkin in April 1996 as a mechanic and welder second class. It has been agreed that Messrs. O'Hagan and Larkin were at all material times acting in the course of their employment with North 60.

[19] In 1993 or 1994, on behalf of White Pass and with the consent of TNTA, Mr. Larkin caused a Chevron sign to be erected on the southeast corner roof of Hangar C.

The Chevron sign was erected on a metal base which had been constructed by or on the direction of White Pass. The angle iron used in the metal base was between $^{3}/_{16}$-inch and $^{1}/_{4}$-inch thick. It was supported by 6-inch by 6-inch wooden posts, which were approximately 24 inches in height from the surface of the roof. The two bolts fastening the angle iron to the wooden posts were $^{5}/_{8}$-inch in diameter.

[20] In 1996, Mr. Larkin replaced the Chevron sign with a sign 4 feet wide by 8 feet tall displaying the words “North 60 Petro Aviation Fuel” (the North 60 sign). The North 60 sign was secured to the metal base by means of a steel sleeve over a metal pole and attached by a single bolt. The consent of TNTA was sought and given for the sign change.

[21] North 60 remained a tenant of TNTA in Hangar C until it vacated the southeast corner office on September 18, 1998, to move into its own building at the Whitehorse airport. North 60 left its sign on the southeast tower roof of Hangar C until January 18, 1999, the date Hangar C burned to the ground.

[22] On January 18, 1999, Tom Martin, the manager of North 60 in the Yukon, directed Mr. Larkin to remove the North 60 sign from the southeast corner roof of Hangar C. Mr. Larkin instructed Mr. O’Hagan to remove the sign. They met at Hangar C and proceeded to do so with the assistance of an oxyacetylene torch. TNTA was not informed about, nor was it aware of, the removal of the North 60 sign. No consent was requested by North 60 or given by TNTA for a welding operation.

[23] Having given this background, I will proceed to review the evidence and the law on an issue-by-issue basis.

THE ISSUES

[24] The following issues arise in this case:

1. Were Patrick O'Hagan and Brian Larkin negligent in using an oxyacetylene torch to remove the base of the North 60 Petro sign from the southeast corner roof of Hangar C?
2. If Patrick O'Hagan and Brian Larkin were negligent, did that negligence on a balance of probabilities cause the fire that destroyed Hangar C?
3. Was North 60 directly liable for the fire as a result of its own negligent training and supervision of Messrs. O'Hagan and Larkin?
4. In the alternative, did the acts of the defendants amount to a trespass requiring the defendants to establish the absence of intention and negligence?
5. Was TNTA contributorily negligent and thus responsible for some or all of the damage?
6. What are the damages that flowed from the fire?

The majority of the damage was suffered by TNTA. Robert Cameron, Almon Landair Ltd. and Summit Air also brought damage claims for property destroyed in the fire.

Credibility of Messrs. O'Hagan and Larkin

[25] It is common knowledge at the time of trial that on January 18, 1999, Messrs. O'Hagan and Larkin were instructed by their superior at North 60 to remove the North 60 sign from the flat southeast corner roof of Hangar C. It is also common knowledge, at the time of trial, that the metal base of the North 60 sign was removed by

Mr. O'Hagan, with the assistance of Mr. Larkin, using an oxyacetylene torch to remove the two metal bolts that fastened the metal base to the timber posts attached to the roof.

[26] However, Messrs. O'Hagan and Larkin lied and denied the use of the oxyacetylene torch from January 18, 1999 to the fall of 2000, when they disclosed it to North 60 after service of the Writ of Summons in this case. It was not until February 6, 2001, that they admitted to RCMP Corporal Campbell that they had used the oxyacetylene torch on the southeast corner roof of Hangar C on January 18, 1999. Corporal Campbell requested a statement in writing and on March 19, 2001, Messrs. O'Hagan and Larkin delivered identical brief statements which concluded:

> As stated, a torch was used to remove the base of the North 60 sign at the Trans North hangar on January 19/1999 (*sic*). No other reference to above issue will be made.

[27] The plaintiffs submit that the perpetuation of the lie by Messrs. O'Hagan and Larkin had very serious ramifications. It clearly protected their own self-interest, but it also misled and detracted the investigators who searched for evidence of the metal base of the sign.

[28] The defence takes the position that the plaintiffs' submission about the impact of the lie was nothing more than "self-righteous indignation". They submit that the lie was admitted from the inception of the trial and is "completely irrelevant" to the issues before the court. I can agree with this latter assertion only to the extent that the lie does not establish a causal connection between the use of the oxyacetylene torch and the fire. However, the credibility of Messrs. O'Hagan and Larkin is a pervasive aspect in this case. It affects the evidence on the issue of negligence and the evidence of some

defence experts, which was premised upon the evidence of Messrs. O'Hagan and Larkin.

[29] I do not take the view that "once a liar, always a liar" and reject their evidence in its entirety. However, a lie is rarely an isolated incident and it often has impacts beyond the specific incident. The following are some of those impacts in this case:

1. The lie was allegedly concocted by Messrs. O'Hagan and Larkin in a three- to four-minute conversation before meeting with the RCMP on the morning of January 19, 1999, the day after the fire. However, Messrs. O'Hagan and Larkin were both in a vehicle and watching the fire for a short time on the night of January 18, 1999. I find it incredible that, at trial, they both denied any discussion of the use of the oxyacetylene torch while watching the fire. They also deny any discussion of the use of the oxyacetylene torch or the lie after the police interviews.
2. The lie was not easy to execute, as it required the disposal of the metal base which might have had flame or heat marks on it. Mr. O'Hagan showed the police the single bolt and the sign post sleeve to demonstrate the absence of flame marks. In evidence at trial, Mr. O'Hagan denied there were flame marks on the metal base and said he did not disclose the existence of the metal base because the police never asked for it. This, too, is incredible, as there would be no reason not to disclose the metal base if it were unmarked.
3. At trial, Mr. O'Hagan testified that he lied to the police about the use of the

oxyacetylene torch because he felt they would be blamed for the fire and they would not get a fair and impartial investigation. Mr. Larkin made a similar point, although in a more incredible fashion, saying that he lied to make sure there would be a complete investigation. These positions are quite incredible given that they deliberately allowed the metal base to be disposed of, a critical piece of evidence for any fair and complete investigation. The failure to produce the metal base also leads me to believe that Messrs. O'Hagan and Larkin either had little confidence in their position or had something to hide.

4. A serious consequence of the lie was the effect it had upon the fire investigators who spent a great deal of wasted effort trying to determine if there was evidence of the use of the torch in the ashes of the fire. Defence counsel ultimately was quite critical of the fire investigators for not spending more time in other areas of Hangar C, which would have been possible if there had been no lie.
5. Messrs. O'Hagan and Larkin perpetuated the lie as they denied the use of the oxyacetylene torch to their superior, Mr. Martin, on at least three separate occasions. On one occasion, Mr. Larkin denied using an oxyacetylene torch with the explanation that the hoses could not reach the roof — another lie. When the lie came to light, it had an impact on their employment with North 60.

6. Mr. Larkin lied to a *Whitehorse Star* journalist when asked about the use of the torch, following public statements by Al Kapty of TNTA that an oxyacetylene torch had been used.
7. When Messrs. O'Hagan and Larkin gave the police their letters of March 19, 2001, it clearly indicated they would not discuss it further with the police, despite the RCMP request for a further statement. At trial, Mr. O'Hagan suggested they might have reconsidered if the police had come around and asked again. Once again, incredible evidence given their letter of March 19, 2001 to the RCMP declaring no further reference would be made to the use of the torch.
8. Significantly, Corporal Campbell recalled on February 6, 2001, when advising Mr. O'Hagan that he would consider a public mischief charge, that Mr. O'Hagan was a bit perplexed and said, "Everybody lies to the police". This leads me to question Mr. O'Hagan's commitment to tell the truth when it affects his self-interest.

[30] I will return to the issue of credibility when I consider the weight to be given to the evidence of Messrs. O'Hagan and Larkin.

ISSUE 1: Were Patrick O'Hagan and Brian Larkin negligent in using an oxyacetylene torch to remove the base of the North 60 Petro sign from the southeast corner roof of Hangar C?

(a) Facts

[31] The North 60 lease of premises in Hangar C terminated on September 15, 1998. North 60 vacated the premises, but the North 60 sign was left on top of the southeast corner roof.

[32] On January 18, 1999, Mr. Martin directed Mr. Larkin to remove the North 60 sign. Mr. Larkin instructed Mr. O'Hagan to meet him at Hangar C for the purpose of removing the North 60 sign.

[33] Mr. O'Hagan arrived at approximately 1:30 p.m. and went up the ladder from the ground to the shed roof where a second ladder led to the flat roof of the southeast corner. Mr. O'Hagan testified that he used a shovel to remove some snow to reach the second ladder. About that time, Mr. Larkin arrived. The collection of snow on the shed roof at the bottom of the second ladder is also apparent from historical photographs.

[34] Mr. O'Hagan testified that the depth of snow at the base of the second ladder was "roughly a foot". He indicated that the depth of snow to the right of the second ladder increased to about three feet as the shed roof proceeded to its intersection with the barrel roof.

[35] Mr. O'Hagan then took issue with the location of the ladder on the model of Hangar C constructed by the defendants for the trial. He wanted to move the ladder over a few feet to the right, contrary to the view of those more familiar with the roof and all photographic evidence of the location of the second ladder. It appears that this was

an attempt to get the ladder closer to the place where the flat roof of the southeast corner meets the barrel roof. The place where the two rooves join would likely have more than one foot of snow. However, I find that the second ladder to the southeast corner roof was adjacent to the North 60 sign and located as depicted in the defendants' own model.

[36] In chief, Mr. O'Hagan said he climbed the second ladder to the flat southeast corner roof, which had snow near the ladder two to three feet deep. In cross-examination, he said the depth of snow at the top of the ladder was three or four feet. He claimed to have shoveled the snow at the location of the ladder, but not at the North 60 sign.

[37] He described the snow at the sign as "sort of crusty" and "probably between eight inches and a foot" in depth after their movement in the area. There was no intentional packing down of the snow by Mr. Larkin and Mr. O'Hagan. In his statement to the police, Mr. O'Hagan described the flat roof as having "about two feet of snow roughly on top of the building here and here" (*sic*).

[38] Mr. Larkin said there was three feet of snow at the top of the ladder and at least a foot of snow, probably more, at the North 60 sign. Both Messrs. O'Hagan and Larkin said their walking on the roof packed the snow down. They did not intentionally pack the snow down.

[39] There is no photographic evidence of the snow depth on the flat roof of the southeast corner on January 18, 1999. There is a photograph of the roof of the Whitehorse airport terminal building taken on January 19, 1999, depicting the smouldering ruins of Hangar C and the roof of the terminal building. That photograph

was taken from the air traffic control tower looking down on the ruins of Hangar C and the airport terminal roof.

[40] The snow on the airport terminal roof can be described as spotty, in that some portions of the roof were almost devoid of snow while others had swirls or drifts of snow, but never to a great depth. One cannot make exact comparisons of the two rooves. While both rooves are flat, the airport terminal building roof had a slight lip on the edge and the southeast corner of Hangar C had no lip at all. There is no evidence on precisely how wind speed and direction would affect the snow collection.

[41] There was also a tendency for the barrel roof of Hangar C to direct the snow towards the flat roof and collect there. That would explain the greater depth of snow at the point where the ladder came up from the shed roof.

[42] Evidence was presented by Glenn Ford, a hydrology technologist, about snow depth at certain test sites near the airport. The records indicate snow depth of 16.5 inches from a sample taken on February 26, 1999 at a site approximately 700 metres south of the airport terminal. These measurements cannot be accurately related to the depth of snow on the southeast corner roof of Hangar C. Test sites are generally selected for lack of wind and drifting, whereas the flat roof in question would be affected by wind either in scouring away the snow in some areas or piling it up in others.

[43] Although Mr. Kapty told the RCMP he thought the snow depth was one to two feet on the tower roof, he had not been on the roof and I cannot give any weight to his speculation.

[44] I am unable to make a finding of the snow depth near the posts supporting the sign. However, I give very little weight to the depths described by Messrs. O’Hagan and

Larkin for the reason that I have found their evidence to be incredible, particularly where it directly affects their self-interest.

[45] I have the following additional reasons to those previously stated for not finding the evidence of Messrs. O'Hagan and Larkin credible regarding the snow depth on the roof of the southeast corner of Hangar C:

1. The depth of snow stated by Mr. O'Hagan differed in his RCMP interview, his evidence in chief and his cross-examination. I find the reason for the discrepancies lies in the fact that the depth of snow was not a factor in the RCMP interview because Mr. O'Hagan denied the use of the oxyacetylene torch. However, at trial, where the depth of snow was in issue, his evidence became more precise.
2. There was no mention of packing the snow down to the RCMP. However, at trial, this evidence was dwelt upon.
3. In my view, the evidence of Messrs. O'Hagan and Larkin at trial was well-rehearsed and tailored to be exculpatory.
4. The evidence they did give at trial about snow depth was not consistent and indicated to me that it is doubtful whether Messrs. O'Hagan and Larkin considered the snow depth at all that day.

[46] It is clear to me that they did not consider the depth of the snow from a fire hazard perspective before deciding to use the oxyacetylene torch. Mr. O'Hagan assumed that the snow cover would provide an adequate protection. There was no discussion between Messrs. O'Hagan and Larkin about the possibility of having a shield or guard to protect the roof, despite the fact that Mr. O'Hagan had fireproof blankets in

his van. There was no discussion between Messrs. O'Hagan and Larkin while on the roof about the depth of the snow, the quality of the snow or the merits of packing the snow in the roof area to improve its protective quality.

[47] It was not a difficult task to remove the North 60 sign from the steel sleeve. Mr. O'Hagan used a crescent wrench and pair of pliers to remove the single bolt from the steel sleeve over the metal pole attached to the base. The North 60 sign was simply lowered to the shed roof and then to the ground, where it was put in the North 60 van used by Mr. O'Hagan.

[48] There were two rusted metal bolts to remove from the metal base attached to the timber posts, and Mr. O'Hagan was not successful in removing them with his wrench. They decided to use the oxyacetylene torch to cut the nuts and bolts so that the two bolts and the steel saddle could be removed. I will, at this point, focus on the safety considerations that were taken into account by Mr. Larkin and Mr. O'Hagan before using the oxyacetylene torch.

[49] It is generally agreed by the experts in this case that an oxyacetylene torch produces sparks and globules of molten metal that reach temperatures of 2500-3000° C. In the cutting process, the sparks, globules, or slag travel at 180 kilometres an hour and can move a distance of 35 feet in the cutting process. Hence, the requirement for safety considerations before an oxyacetylene torch is used. It is in this context that the decision to use the oxyacetylene torch must be considered.

[50] Messrs. O'Hagan and Larkin also relied on the presence of a 200-pound fire extinguisher sitting on the ground at the southeast corner of the hangar. However, they had no idea whether its hose would reach the roof. Mr. Larkin said the hose was five or

six feet in length. Mr. O'Hagan said it was about 50 feet. Mr. O'Hagan took the usual personal safety precautions of using a striker, gloves and goggles. He had two fire extinguishers in the van, one on the inside wall and the other on the back door of the van.

[51] Mr. Larkin was present throughout the cutting operation in the event something caught fire. Mr. O'Hagan testified that he ignited the torch and adjusted the flame to achieve a neutral blue flame. He knelt down facing north, preheated the metal and made the two cuts which he claimed lasted 10 to 12 seconds. He claimed that each nut was picked up and placed on top of the metal base. He claimed the nuts were later thrown to the ground by the van. He applied snow to the holes in the base where the ready rod was removed and to the wooden base. Mr. O'Hagan also stated that the metal base was put in the van. He then went up on the southeast corner roof for a last time to do a safety check and final inspection to see if any tools had been left. Both Messrs. O'Hagan and Larkin stated that they remained on the roof for five to ten minutes after the torch-cutting operation was completed.

[52] There was conflicting evidence about the structure of the base of the North 60 sign. I prefer the evidence of Silvio Ferro, the maintenance and repairman for TNTA. He had more opportunities to observe the base of the sign over the years. Mr. Larkin had only seen the base on three occasions. Mr. O'Hagan initially told the adjuster that the metal saddle extended approximately halfway down the horizontal wooden beam between the two wooden posts. This would leave exposed wood for the sparks and slag to strike. The adjuster drew a diagram confirming Mr. O'Hagan's initial description. However, at trial, Mr. O'Hagan insisted that the sides of the metal saddle extended to

the bottom of the wooden beam, which would reduce the amount of wood exposed to the sparks and hot slag from cutting with the torch. I accept the model prepared by TNTA as the most accurate depiction of the base of the North 60 sign. The nuts and bolts were $^{5}/_{8}$-inch. They passed through the posts and were approximately 18 inches from the surface of the southeast corner roof. However, there were only two nuts and bolts, as opposed to the four depicted in the model, and they passed through the posts to fasten the metal saddle.

[53] Messrs. O'Hagan and Larkin were certainly aware of the exposed wood, both on the posts and on the horizontal wooden beam. They were not aware of a nearby drain. They had no idea of the composition of the roof, nor did they make any inquiries with TNTA. I will discuss the precise composition of the roof later as it relates to causation. But generally, the roof was made of a fir plank or board covered by a sheet of donnaconna, a fibrous material used for insulation. Both of these materials are combustible or flammable. They were covered with roofing compounds, primarily concerned with preventing cracks and avoiding water leaks. The roofing compounds were Swepco Products. They were applied by a cold application process which involved two layers of bitumen or asphalt and two layers of glue covered with aluminum paint. All of these products are designed to prevent water leaks.

[54] There is one final matter to address. In my view, there was no necessity at all to remove the metal base of the sign. The sign itself was removed without difficulty. Messrs. O'Hagan and Larkin went to great lengths to explain that they like to leave a clean work site. Mr. O'Hagan also made the ludicrous suggestion that the metal was a safety hazard to aircraft. Even if I accepted these justifications, there was another

method that could have been employed with far less risk. Mr. McKeown, the plaintiff's expert welder, stated that the nuts could have been heated first to see if they could be removed by a wrench. This less risky procedure was not considered by Messrs. O'Hagan and Larkin.

(b) Duty of Care

[55] The common law imposes a duty of care when an oxyacetylene torch is used on or near property of others. (See *Jones Street Hardware and Furniture Co. Ltd. v. Spizziri* (1985), 51 O.R. (2d) 641 (H.C.J.) and (1987), 62 O.R. (2d) 385 (Ont. C.A.) and *Alberta Wheat Pool v. Northwest Pile Driving Ltd.,* [1998] B.C.J. No. 1425 (B.C.S.C.) (QL) and (2000), 80 B.C.L.R. (3d) 153 (B.C.C.A.))

(c) Standard of Care

[56] The standard of care is based on the concept of negligence and whether or not the acts of the defendants were reasonable in the circumstances of this case. The standard of care may be found in the safety procedures prescribed by statute or custom in the industry when using oxyacetylene torches.

[57] The statutory standard for the Yukon is set out in the *Fire Safety Regulations,* pursuant to the *Fire Prevention Act*, R.S.Y. 1986, c. 67, which provides that:

> 2. For purposes of determining that proper precautions are taken against fire and the spread of fire, the requirements of
>
> …
>
> (b) the National Fire Code of Canada, 1975 edition, as amended from time to time, shall be deemed as an acceptable minimum standard by the enforcing authority.

[58] The National Fire Code of Canada 1995 was revised to June 30, 1997. The Guide to the Use of the Code describes it as “essentially a set of minimum requirements respecting fire safety in existing buildings and within the community at large.” Part 5 of the Code is entitled “Hazardous Processes and Operations” and contains the following relevant provisions:

> **Section 5.2. Hot Works**
>
> **5.2.1. General**
>
> **5.2.1.1 Application**
>
> **1)** This Section shall apply to hot works involving open flames or producing heat or sparks, including, without being limited to, cutting, welding, soldering, brazing, grinding, adhesive bonding, thermal spraying and thawing pipes.
>
> **2)** Except as provided in this Section, hot works described in Sentence (1) shall conform to CSA W117.2, “Safety in Welding, Cutting, and Allied Processes.”
>
> **5.2.1.2 Training**
>
> **1)** Hot works shall be performed only by personnel trained in the safe use of equipment in conformance with this Section.
>
> …
>
> **5.2.1.3 Prevention of Fires**
>
> **5.2.3.1. Location of Operations**
>
> **1)** Except as provided in Sentence 2), hot work shall be carried out in an area free of combustible and flammable contents, with walls, ceilings and floors of *noncombustible construction* or lined with noncombustible materials.
>
> **2)** When it is not practicable to undertake hot work in an area described in Sentence (1),

a) combustible and flammable materials within a 15 m distance from the hot work shall be protected against ignition in conformance with Article 5.2.3.2.,

b) a fire watch shall be provided during the hot work and for a period of not less than 60 min after its completion in conformance with Article 5.2.3.3., and

c) a final inspection of the hot work area shall be conducted 4 h after completion of work.

3) When there is a possibility of sparks leaking onto combustible materials in areas adjacent to the area where hot work is carried out,

a) openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or

b) Sentence (2) shall apply to such adjacent areas.

5.2.3.2. Protection of Combustible and Flammable Materials

1) Any combustible and flammable material, dust or residue shall be

a) removed from the area where hot work is carried out, or

b) protected against ignition by the use of noncombustible materials.

5.2.3.3. Fire Watch

1) The exposed areas described in Sentences 5.2.3.1.(2) and (3) shall be examined for ignition of combustible materials by personnel equipped with and trained in the use of fire extinguishing equipment.

[59] The CSA W117.2-94, "*Safety in Welding, Cutting, and Allied Processes*", referred to in s. 5.2.1.1(2) of the National Fire Code, also provides minimum requirements and

recommendations to protect persons and prevent damage to property. The relevant provision is 10.7, which states as follows:

10.7 Fire Prevention and Protection

10.7.1

The following precautions shall be taken:

(a) Where practicable, the object to be wielded or cut shall be moved to a location free from fire hazards.

(b) If the object to be welded or cut cannot be moved, all movable fire hazards shall be removed to a minimum safe distance of 15 m (50 ft.).

(c) If the object to be welded or cut cannot be moved, and if all the fire hazards cannot be removed, appropriate guarding shall be used to confine the heat, spills, and slag in order to protect adjacent immovable fire hazards.

10.7.2

Where the nature of the work to be performed falls within the scope of Item (c) of Clause 10.7.1, the following additional precautions shall be taken:

(a) Combustible floors shall be swept clean and protected by thoroughly wetting with water or covering with wetted soil, or shall be protected with fire-resistant shields. Precautions such as sealing the cable joints in plastic or tape, elevating the cable, and wearing rubber boots shall be used to protect welders from the hazard of electric shock when floors are wetted.

(b) If there is a possibility of sparks leaking through the floor openings or cracks onto combustible materials, precautions shall be taken to protect these materials. The same precautions shall be taken with any openings that may allow sparks to ignite combustible materials in adjacent areas.

(c) Approved fire-extinguishing equipment appropriate to the fire hazard shall be located and kept accessible at the welding site. Such equipment may consist of a pail of water, bucket of sand, fire hose, or portable extinguishers.

(d) Fire watchers shall be required whenever cutting or welding is performed in locations where the following conditions exist:

(i) combustible material is closer than 15 m (50 ft.) to the point or site of welding or cutting;
(ii) combustible material is more than 15 m (50 ft.) away but is easily ignited by sparks;
(iii) wall or floor openings within a 15 m (50 ft.) radius expose combustible material; and
(iv) combustible material is adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and is likely to be ignited by heat conduction or heat radiation.

(e) Fire watchers shall

(i) be trained in the use of available and approved fire-extinguishing equipment;
(ii) know the location of the nearest fire alarm;
(iii) watch for fires in all exposed areas;
(iv) be trained to extinguish only those fires that are within the capacity of the available fire-extinguishing equipment;
(v) continue the fire watch for at least 30 min after completion of the welding or cutting operation.

(f) When welding or cutting has to be performed in a location not designated for such purposes, inspection and authorization shall be required in writing (sometimes referred to as the “Hot Permit”) before any such operations shall commence.

(g) If welding or cutting is to be done near automatic sprinkler heads, smoke detectors, or automatic fire alarms, fire-resistant shields and damp cloth guards shall be positioned to prevent actuation of these devices. These shields and guards shall be removed at the completion of the welding or cutting operation.

[60] The CSA standard W117.2-94 was also the standard adopted in Part 12 of the Yukon Occupational Health and Safety regulations.

[61] Mr. O’Hagan did not seem to be aware of the hot work procedures in the National Fire Code. He was aware of the CSA standard, but considered the CSA standard to be a “guideline”, not a minimum requirement. Mr. Larkin relied upon the skill of Mr. O’Hagan, whom he had hired.

[62] All the experts acknowledged that these standards were the industry standard. In my view, the appropriate standard of care to be applied for the use of the oxyacetylene torch on the southeast corner is the following:

1) Inspection and authorization in the form of a hot work permit shall be required in writing before the work commences.
2) The area around the metal base shall be free of combustible and flammable materials. If it is not, non-combustible blankets and fire resistant shields shall be used to protect the combustible and flammable materials within a 15-metre distance of the hot work.
3) Precautions must be taken to protect the roof if there is a possibility of cracks or other openings that may allow sparks to ignite combustible materials.
4) A fire watch shall be provided by another trained person during the hot work and for a period of not less than 60 minutes after its completion.
5) The person conducting the fire watch shall be equipped with fire extinguishing equipment on the roof.
6) There must be a final inspection of the hot work area conducted four hours after completion of the work.

[63] Mr. O'Hagan had the ability to perform the cutting job in question. However, he had never received any training based on the CSA and National Fire Code of Canada since he worked with North 60.

[64] I note that the CSA requirement of a 30-minute fire watch was doubled to 60 minutes in the National Fire Code. Based on the extensive evidence in this trial about

the smouldering capacity of donnaconna, the 60-minute fire watch is the most reasonable.

(d) Breach of Standard of Care

[65] The plaintiff's expert, Ronald McKeown, had over 40 years of experience in welding. He worked in the welding industry for approximately 20 years and had been a welding instructor for over 20 years. He stated:

> Mr. O'Hagan committed five serious errors that day. He did not ensure that a hot work permit had been applied for, and did not ascertain what the roof was composed of; he did not use any fire resistant shields or asbestos blanket; he did not post a fire watch for a minimum of 30 minutes, nor did he leave a fire extinguisher close to the actual work site, the roof.

[66] Defence expert, Lamar Wells, while not a certified welder, was an ironworker by trade. He had done a great deal of welding and cutting from 1976 to 1985 in Alaska and was familiar with northern conditions. He opined that snow of a depth of one to two feet would serve as an effective fire blanket, assuming that the snow was compacted, and that Mr. O'Hagan performed his work in a proper and safe manner. He qualified his opinion in cross-examination by stating that he was assuming that Messrs. O'Hagan and Larkin used a shovel to compact the snow. He also stated that they did not require a hot work permit after having been given the wording of CSA 10.7.2(f). To be fair, Mr. Wells was not familiar with the CSA standard. However, he seems to have misunderstood that Messrs. O'Hagan and Larkin were not contractors who had permission to be on the roof of Hangar C. He also had no idea whether Messrs. O'Hagan and Larkin examined the roof for hazards before cutting.

[67] I cannot give much weight to Mr. Wells' opinion about the adequacy of the snow cover based on his misunderstanding of the facts and the fact that he relied upon the credibility of Mr. Larkin and Mr. O'Hagan. I have found that I can give little weight to the evidence of Messrs. O'Hagan and Larkin. I also find that his report was edited by Dr. Eagar and thus not really his own opinion. Finally, Mr. Wells has no expertise on the issue of the adequacy of snow as a protection and was simply stating his practice as opposed to an industry custom.

[68] Defence expert, Brent Marshall, has been a welder in Alberta for approximately 30 years. He commenced his Alberta apprenticeship in 1969 and received his journeyman ticket in 1972. He has been employed as a welding instructor at the Northern Alberta Institute of Technology since 1974 and teaches both the practical and theoretical aspects of oxyacetylene cutting. Since 1985, he has been a member of the CSA Technical Committee on W117.2 Safety in Welding and Cutting. He is presently Vice-Chair.

[69] Mr. Marshall disagrees with the opinion of Mr. McKeown and concluded the following:

> Mr. McKeown incorrectly alleges 5 errors regarding the work of Mr. O'Hagan on January 18/99. Based on my analysis of 117.2, as well as extensive personal experience in the trade, Mr. O'Hagan's activities ensured the protection of Hangar C by maintaining an adequate snow cover, the presence of additional snow as a fire retardant as well as locating and maintaining fire extinguishers nearby. Mr. O'Hagan followed safety standards by not using asbestos blankets, which are no longer recommended and are a very serious health hazard. If there was a requirement of a 'fire watch', it was met by having Mr. Larkin observe the cutting process and confirm that the roof was never exposed to dangerous materials. With no roof exposed and no evidence of fire there would be no reason to maintain a further fire watch.

[70] While Mr. Marshall was sincere and passionate in his defence of Messrs. O'Hagan and Larkin, I cannot accept his opinion for the following reasons:

1. In cross-examination, he acknowledged that his opinion was based upon the use of snow as a non-combustible cover. He agreed that if the posts were unprotected, then Messrs. O'Hagan and Larkin were in breach of s. 5.2.3.2 of the National Fire Prevention Code.
2. His opinion questioned the requirement of a fire watch by stating that if there was no roof exposed and no evidence of fire, there would be no reason to maintain a further fire watch. In cross-examination, he agreed that even if steps were taken to guard and protect combustible material, a fire watch had to be maintained. He further agreed that a fire watch doesn't depend upon evidence of fire.
3. I have found as a fact that Messrs. O'Hagan and Larkin remained at the site for 5-10 minutes after the cutting was completed. Mr. Marshall acknowledged in cross-examination that this was a breach of the CSA standard. However, in his examination-in-chief he attempted to show how Messrs. O'Hagan and Larkin had really conducted a fire watch in excess of 30 minutes, in apparent disregard of their own evidence.
4. His opinion was critical of the proposed use of asbestos fire blankets, but he did not know that asbestos fire blankets were precisely what Mr. O'Hagan had in his van for the purpose of protecting against fire. He simply ignored the fact that other appropriate non-combustible material is required to be used as a blanket or guard.

5. With respect to the National Fire Prevention Code requiring a final inspection of the hot work area four hours after completion of the work, Mr. Marshall was not aware of its application in Alberta and did not teach his students about the requirement.
6. He agreed that the welder must first determine the presence of combustible materials at the site and then protect it. He seemed unaware of the fact that Messrs. O'Hagan and Larkin had no idea what the roofing material was.
7. Mr. Marshall had a bizarre interpretation of s. 10.7.2(f) of the CSA, which required a hot work permit when cutting was to be performed in a location not designated for such purposes. In the circumstances of this case, he was of the opinion that because North 60 sent Mr. O'Hagan to cut the sign on the roof of Hangar C, s. 10.7.2(f) was satisfied. In my view, the section requires a permit from the property owner.

[71] To be fair to Mr. Marshall, he advised the court before cross-examination that he was suffering from polymyalgia rheumatica, for which he was being treated with prednisone. He explained that stress might cause some delay in his responses. I have no idea whether his condition affected his mental functioning while under cross-examination. However, I can give little weight to his opinion.

[72] On the issue of negligence, and for the reasons given, I prefer the evidence of Mr. McKeown over Mr. Wells and Mr. Marshall.

[73] I find Messrs. O'Hagan and Larkin were negligent in using an oxyacetylene torch on the southeast corner roof as follows:

1. They did not obtain a hot work permit from the owner of the building before they commenced cutting. This was a breach of CSA s. 10.7.2(f), as well as the General Hangar Rules and Regulations contained in the lease.
2. They did not inspect the southeast corner roof to determine the presence of combustible or flammable materials.
3. They did not inspect the roof to determine if there were openings in the roof surface that needed protection.
4. They assumed that the snow was an appropriate protection and no non-combustible blankets or fire resistant shields were used to protect the roof, the horizontal wooden beam and the wooden posts or the drain.
5. Although Mr. Larkin provided a fire watch during the cutting process and for five to ten minutes after, there was no fire watch for the required 60 minutes after the cutting.
6. Mr. Larkin did not have access to fire extinguishing equipment on the roof during the time he provided a fire watch. This standard of care was not met by having portable fire extinguishers in the back of the North 60 van. The fact that they would have to go down two sets of ladders and up again, carrying the portable fire extinguisher, would not provide an adequate standard of fire protection.
7. There was no final inspection conducted four hours after completion of the work.

[74] I therefore find that Messrs. O'Hagan and Larkin were negligent in using the oxyacetylene torch to remove the base of the North 60 sign on June 18, 1999.

(e) Spoliation:

[75] Spoliation is the intentional destruction of evidence which permits the drawing of a negative inference by conduct of the weakness of one's case. There was very little jurisprudence on this concept in Canada until the judgments of *Dawes* v. *Jajcaj* (1995), 15 B.C.L.R. (3d) 240 (B.C.S.C.); *Endean* v. *Canadian Red Cross Society* (1997), 11 C.P.C. (4th) 368 (B.C.S.C.) and [2000] B.C.J. No. 2330 (B.C.C.A.) and *Dyk* v. *Protec Automotive Repairs* (1997), 41 B.C.L.R. (3d) 197 (B.C.S.C.).

[76] *Dawes* v. *Jajcaj*, dealt with the deliberate destruction of a motor vehicle after a defence expert concluded the plaintiff was the driver. Counsel for the plaintiff requested the preservation of the vehicle. The judge concluded that there had been no intentional, as opposed to negligent, destruction of the vehicle and did not apply the spoliation principle.

[77] In *Endean* v. *Canadian Red Cross Society*, the trial judge allowed a pleading of spoliation as a tort to stand. However, the British Columbia Court of Appeal overruled the trial judge and found that spoliation is not an independent tort but an evidentiary rule which raises a presumption as set out in paragraph 75 that may be rebutted. In that case, allegations were made that relevant documents had been destroyed.

[78] In *Dyk* v. *Protec Automotive Repairs*, the plaintiff sought to introduce an expert report on the condition of the brakes of the motor vehicle involved. The defendant objected on the grounds that the tests so altered the brakes that further tests could not be conducted. Burnyeat J. admitted the report because:

> While it is clear that the testing was of a destructive nature and that it was of an "intentional act" on behalf of the plaintiff by her agent, it is also clear that the testing had no element of "fraud" and was not done with intent to suppress the truth.

[79] I conclude from these cases that to draw a negative inference from spoliation the following is required:

i. relevant evidence has been destroyed;

ii. legal proceedings were pending;

iii. the destruction was an intentional act indicative of fraud or intent to suppress the truth.

[80] In this case, Messrs. O'Hagan and Larkin removed the metal base of a sign with an oxyacetylene torch. About five hours later, the building that they removed the base from burned to the ground. Messrs. O'Hagan and Larkin were present to see the building while it burned. While being questioned the next day by the RCMP, the two employees produced the sign itself to show that it bore no flame marks. They did not produce the metal saddle base of the sign, which they had placed in a dumpster. The metal saddle base was never produced. Messrs. O'Hagan and Larkin denied the use of an oxyacetylene torch from January 18, 1999 to February 6, 2001. They first disclosed the use of the torch to an adjuster in the fall of 2000. I find that flame marks would have been left on the metal base as a result of cutting the bolts.

[81] So, to the first factor, whether relevant evidence has been destroyed, there can be no doubt that the metal base was destroyed and that it was relevant. One can only speculate how the evidence would have assisted in establishing how the fire occurred. It may have indicated whether the welding cut was "clean" or not. It is not speculative to state that the plaintiff would have proceeded to investigate the fire from the knowledge that an oxyacetylene torch was used rather than spending time to determine whether an oxyacetylene torch was used.

[82] At the time of the destruction of the metal base of the sign, it cannot be categorically said that legal proceedings were pending. However, given the history of the fire that destroyed Hangar B, it would be reasonable to assume that legal proceedings would be commenced. I am satisfied that the second arm of the spoliation principle has been met. It was only the act of spoliation itself that put pending legal proceedings in any doubt.

[83] Thirdly, there is no doubt that the destruction of the metal base was an intentional act to suppress the truth. It is fair to say that Messrs. O'Hagan and Larkin did not wish the RCMP to know the truth about what happened on the roof of Hangar C that afternoon. They certainly did not wish the plaintiff to know the truth. The feeble excuse of Messrs. O'Hagan and Larkin that they lied because they wanted a complete investigation done cannot be taken seriously. It is not sufficient to rebut the evidence of an intention to suppress the truth.

[84] Although there is considerable other evidence on which to conclude that Messrs. O'Hagan and Larkin were negligent, I conclude that it is appropriate in these circumstances to draw an inference of negligence on the part of Messrs. O'Hagan and Larkin based upon spoliation and the suppression of the metal saddle base.

ISSUE 2: If Patrick O'Hagan and Brian Larkin were negligent, did that negligence on a balance of probabilities cause the fire that destroyed Hangar C?

(a) The Law:

[85] I have found that the plaintiffs have proved on a balance of probabilities that Messrs. O'Hagan and Larkin were negligent in their use of the oxyacetylene torch on the southeast corner roof of Hangar C on January 18, 1999. The onus of proving that the negligent use of the oxyacetylene torch caused the fire that burned Hangar C remains with the plaintiff.

[86] The plaintiffs acknowledge that they cannot establish with scientific certainty that the defendants' use of the oxyacetylene torch caused the fire. The law, however, does not require such a rigorous scientific standard to prove causation.

[87] Sopinka J. put it this way in *Snell* v. *Farrell*, [1990] 2 S.C.R. 311 at para. 33:

> The legal or ultimate burden remains with the plaintiff, but in the absence of evidence to the contrary addressed by the defendant, an inference of causation may be drawn, although positive or scientific proof of causation has not been addressed.

[88] Sopinka J. went on to say, at paragraph 34, that:

> It is not essential that medical experts provide a firm opinion supporting the plaintiff's theory of causation. Medical experts ordinarily determine causation in terms of certainties, whereas a lesser standard is demanded by the law.

[89] Perhaps the most significant and useful comment on causation was Sopinka J.'s quote from Lord Salmon in *Alphacell* v. *Woodward,* [1972] 2 All E.R. 475 (H.L.) at 490 that causation is:

> … essentially a practical question of fact which can best be answered by common sense rather than abstract metaphysical theory.

[90] It is also clear that there is no burden of proof on the defence in this analysis.

[91] These principles have been adopted in numerous fire cases involving the use of oxyacetylene torches (see *Fort St. John Aircraft Maintenance Ltd.* v. *Canadian Indemnity Co.*, [1982] B.C.J. No. 1075 (QL) (B.C.S.C.); *Canada (Attorney General)* v. *Clorey and Georgetown Shipyards Inc.* (1994), 123 Nfld. & P.E.I.R. 91 (P.E.I.S.C.) (affirmed by (1998), P.E.I.J. No. 50) and *Alberta Wheat Pool* v. *Northwest Pile Driving Ltd.*, [1998] B.C.J. No. 1425 (QL) (B.C.S.C.) and (2000) 80 B.C.L.R. (3d) 153 (B.C.C.A.)).

(b) Theories of Causation:

[92] The plaintiffs' theory of causation is that the sparks and slag generated by Mr. O'Hagan's oxyacetylene torch ignited a smouldering fire on the southeast corner roof of Hangar C, which ultimately engulfed the entire building. They allege that there is a substantial body of evidence which establishes the opportunity for such ignition, thereby justifying an inference that the ignition occurred in one of three ways:

1. the sparks and slag directly ignited combustible materials on the surface of the roof, i.e. the wooden posts or other wood comprising the base of the sign;
2. the sparks and slag penetrated the roof's surface through a crack or gap which ignited the combustible donnaconna and fir board in the roof;
3. the sparks and slag fell into the drain on the surface of the roof and ignited combustible roofing materials.

[93] The defence submits that there is not a sufficient evidentiary foundation to support the plaintiff's theory.

[94] The defence theory is that the fire was either of undetermined cause or because of the snow cover it could not have been started by the use of the oxyacetylene torch on the southeast corner roof.

[95] Alternatively, they submit the following causes of the fire:

1. arson;
2. the ignition of the highly flammable Fleet Canuck aircraft;
3. an electrical failure of the wiring in Hangar C as evidenced by four electrical anomalies:
    a) Mr. Dean smelling smoke "something like electrical";
    b) The ringing of the doorbell;
    c) The lights on the TNTA sign extinguishing before flames were seen;
    d) The phone line being dead when Mr. Tait attempted to call 9-1-1 on the telephone in the fixed wing shop.

[96] The defence has no burden to prove its theory but rather it adduces evidence to the contrary which, if accepted, defeats the inference of causation that the plaintiffs seek to establish.

[97] I will now proceed to review the evidence on causation.

c) Surveillance Video

[98] On January 18, 1999, a black and white Delco Dome camera was located on the northwest corner of the Whitehorse airport terminal building, which is located to the

south of Hangar C. It was operated by a pan/tilt and zoom mechanism that enabled the camera to rotate 360 degrees while zooming into selected areas. The camera completed a tour consisting of two rotations of the area approximately every 15 minutes. The south end of Hangar C was located 330 metres from the camera and was caught in the wider rotation. During each tour, there was an average of eight images of Hangar C. The images were recorded on a 24-hour record mode and contained a time and date stamp at the bottom of the image. The accuracy of the time was dependent upon the person maintaining the system. No evidence was brought to confirm or challenge the accuracy of the time and date stamp. However, the images confirm the correct date, and the light and darkness confirm the time of day. They also show the arrival and departure of Messrs. O'Hagan and Larkin in the early afternoon. I am satisfied that the times recorded on the images is reasonably accurate.

[99] Grant Fredericks was qualified as an expert in forensic video analysis, including photograph comparisons. Mr. Fredericks has a B.A. in Broadcast Communications and began his career as a news reporter in 1983. He became a police constable with the Vancouver Police Department in 1988. He was eventually pulled off regular duties to specialize in video analysis as an evidentiary tool. In 1998, he became the coordinator of the new forensic video unit of the Vancouver Police Department. In March 2000, he became the forensic video solutions manager of Avid Technology. He describes himself as a forensic video analyst since 1991. He has been an instructor in forensic video technology in British Columbia and with the FBI in the United States.

[100] Mr. Fredericks used an Avid Xpress Non-Linear Digital Editing System to transfer the analog video signals into digital format in a computer. He was then able to isolate

and stabilize the position of images of Hangar C. Stabilization resulted in locking Hangar C down in the centre of the image.

[101] He was able to identify the area where the North 60 sign was removed, and he testified that “flashing lights” occurred in the same area, beginning approximately 3 hours, 25 minutes and 45 seconds (approximately 5:13 p.m.) after the sign was removed (approximately 1:48 p.m.) and continuing until the fire broke out, approximately 5 hours, 25 minutes and 42 seconds (approximately 7:14 p.m.) after the sign was removed.

[102] He then attended at the Whitehorse Airport terminal to examine the entire time frame of original videotape from 12:59:48 to 19:33:03 hours on January 18, 1999 and the light sources. To do this, he conducted a “reverse projection” process to overlay the current light sources in 2002 with the light sources from January 18, 1999. He used 12 targeted light sources from January 18, 1999. He was able to identify 10 of the targeted light sources but could not identify two light sources (10 and 11). Targeted light sources 10 and 11 were unknown and not measurable due to distance. Targeted light sources 10 and 11 were immediately to the left of the flash on the southeast corner roof. Mr. Fredericks omitted light source 12 as it was unknown and too far away. It was to the immediate right of the flashes. The purpose of this exercise was to determine if the “flashing lights” could be explained by other phenomena, such as vehicle headlights from the Alaska Highway or sources that were not related to Hangar C.

[103] Mr. Fredericks opined that a significant number of images, from 17:13:57 until the fire broke out at approximately 19:14:54, show flashes of light in the exact position of the base of the North 60 sign. In his opinion, the flashes of light had nothing to do with

headlights or vehicles on the roadway behind Hangar C. He testified that the flashes of light were consistent with how the black-and-white Delco Dome camera would record images to a composite videotape of changing light levels from a fire. He testified that there were hundreds of these flashes in the 2,100 images. However, he only reproduced 32 in his report. The flashes of light were not observed by any witness. That can be partially explained by the fact that the employees of TNTA were finished for the day, with the exception of Mr. Dean and Mr. Tait, who remained in the fixed wing side of the hangar. Mr. Tait had the best opportunity to observe the flashes as he entered the southeast doors at approximately 6:30 p.m. However, he was not focused on the southeast corner roof as he entered and did not see the flashes. There were also employees in the air traffic control tower who did not see the flashes, but they also did not focus their attention on the southeast corner roof.

[104] Mr. Fredericks also testified that the flashes were very subtle and were not necessarily flames. They could have been a reflection on the smoke in the area. The flashes were also random and sometimes did not occur for several minutes. The luminescence, as well as the visibility, of the flashes varied.

[105] Mr. Fredericks' analysis shows what appears to be smoke where a flash occurs on the southeast corner roof at 19:14:54. By 19:16:24, the interior of the hangar is engulfed in fire. That indicates the rapid spread of the fire once it was visible. At 19:19:25, in Image 2082, the flames are seen in the interior, on the peak of the barrel roof and at the sign location on the southeast corner roof. The significance of the fire appearing at all three locations at the same time will be discussed below at paragraphs 115 to 117.

[106] Dr. Rudin, the defence expert, is a forensic video expert with an impressive academic background, as well as video analysis experience. He has a M.Sc. in Applied Mathematics (1976), a M.Sc. in Computer Science (1981) and a Ph.D. in Computer Science (1987). His evidence dealt with the scientific basis for the evidence of Mr. Fredericks. He testified that the black-and-white Delco Dome camera was not specifically designed as an infrared camera to record heat transfer and radiation processes. In his report, he described it as “an ill-posed problem to infer the presence of fire from the light fluctuations” described by Mr. Fredericks. He based this statement on the fact that there was no scientific study published in a peer-reviewed scientific journal to support the inference. He also stated that the flashes referred to by Mr. Fredericks could not be located by photogrammetric measurement due to the lack of at least one metric measurement. In other words, the precise location of the flashes cannot be scientifically proven.

[107] However, when Dr. Rudin was asked specifically about whether Image 1410 at 17:13:57 showed a flash of light, he agreed that he had seen a brightness change or change in luminescence. He further agreed that the change in luminescence continued intermittently until 19:14:54 in the evening. He was of the view that the flashes did not coincide with the face of the North 60 sign. However, Mr. Fredericks was saying that the flashes coincided with the base of the sign, a difference of several feet.

[108] Dr. Rudin also agreed that the three light targets 10, 11 and 12 were constantly visible from 17:18:30 until 19:08:50 when all three light targets disappeared, while lights illuminating the TNTA sign on the top of Hangar C remained illuminated. Then at

19:13:22, there was a substantial flash when the light source appeared and then went dark again.

[109] Dr. Rudin was asked about Images 2064, 2065, 2066 and 2067 taken at 19:14:54 when light sources 10, 11 and 12 were no longer visible. Dr. Rudin agreed that there was an illuminated cloud to the left of the flash. When asked if it was smoke, he said that there was no ability to analyze it. When he was asked to use his common sense, he agreed that it was possibly smoke. He also agreed that if the flash was fire, the luminescence in the cloud above it was refraction from the fire. Refraction is where the light goes into the media and propagates through it.

[110] The tension between common sense and scientific proof in the evidence of Dr. Rudin becomes clear when he was asked about whether Image 2067 at 19:14:54 shows a fire on the southeast corner of Hangar C.

> Q Would you agree with me, Dr. Rudin, that that image, 2067, in all likelihood, shows a fire on the southeast roof of Hangar C?
>
> A Again, you're asking me as an image processing expert or are you asking me as just somebody has eyes to look at?
>
> Q Well, I'm asking you as Dr. Rudin.
>
> A And it's important because in one capacity I have to use only the knowledge and methods that are verifiable by the science, and there are no methods that will do it. Even if it's obvious to human eye, in this case could be obvious to human eye, still there are no methods. So I cannot testify as an expert it is fire because who knows? It could be something else.
>
> Q Surely in video analysis, Dr. Rudin, you're not required to suspend common sense in an analysis, are you? Indeed, when —
>
> A What is —
>
> Q — when you're analyzing what you're looking at in a video you must take into consideration the context in which you see the image, don't you?

A And it has to be related, not necessarily maybe to theoretical knowledge, but to some experiments, experimental knowledge.
Q All right. But let's assume you can't do that, as you haven't here?

A And I know that there was a fire soon after that.

Q Yes.

A So it's logical to assume that this thing — in fact, one thing I could tell you just from common sense and observation, and probably could be done from the point of view analysis somehow, this behaviour at 1914:54 is very, very different from the prior behaviour.

[111] It is clear that Dr. Rudin was not prepared to rely on common sense if it could not be supported by scientific fact.

[112] However, this court is not required to find scientific proof of causation, but rather can rely on an inference of causation from the evidence.

[113] The Supreme Court of Canada, in *R.* v. *Nikolovski*, [1996] 35 S.C.R. 1197, recognized the usefulness of videotape evidence. Cory J., after discussing the frailties of independent, honest and well-meaning eye witnesses, stated at paragraph 21:

> The video camera on the other hand is never subject to stress. Through tumultuous events it continues to record accurately and dispassionately all that comes before it. Although silent, it remains a constant, unbiased witness with instant and total recall of all that is observed. The trier of fact may review the evidence of this silent witness as often as desired. The tape may be stopped and studied at a critical juncture.

[114] The videotape was useful to other experts as well. Dean Bundy was the plaintiff's expert in fire origin and cause, including fire spread. The area of origin of a fire is simply the place where the fire begins. The cause or point of ignition is found within the area of origin. It is the point that must be examined to determine the fire spread.

[115] Mr. Bundy examined Image 2082 from Mr. Fredericks' report. The image was taken at 19:19:25. It shows fire on top of the hangar, fire in the interior of the hangar and fire on the southeast corner roof.

[116] Mr. Bundy's opinion was that if the fire had started at some location other than the southeast corner roof, such as the area of the Fleet Canuck located in the interior of the hangar, the fire would go up to the roof vent or out the large doors. He testified that the southeast corner roof was the last place such a fire would go because it is lower than the peak of the roof of Hangar C. Thus, the Image 2082 confirmed his opinion that the fire origin was on the southeast corner roof and the fire spread from that location to the peak of the barrel roof. Hence, the significance of video Image 2082 showing flames at all three locations, i.e. the sign location on the southeast corner roof, the interior of Hangar C and the peak of the barrel roof.

d) Fire Witnesses Inside Hangar C

[117] William Dean is an aircraft maintenance engineer. He was employed as an apprentice by TNTA on January 18, 1999. He noted nothing unusual in Hangar C that day. At around 5:00 p.m., he left the helicopter shop and began working on his Toyota Landcruiser, which was in the fixed wing shop. The fixed wing shop also had a TNTA helicopter on a dolly and a fixed wing Cessna in the Summit Air portion.

[118] Mr. Dean was doing bodywork on his Toyota Landcruiser, but did not use heat or a cutting torch.

[119] At 6:00 p.m., Mr. Dean heard the motion sensor alarm for the helicopter shop begin to make a beeping sound. It was disarmed by another employee, who then left. Mr. Dean was alone in the hangar for approximately 10 minutes when Jamie Tait, the

owner of Summit Air, entered the fixed wing shop in his truck. There were no other personnel in Hangar C that evening.

[120] Mr. Tait is an aircraft maintenance engineer and pilot. He started his Summit Air business in 1987 and became a tenant of TNTA in the spring of 1996. He has no other business relationship with TNTA. Summit Air rents two offices on the west side of Hangar C, half of the fixed wing shop and a small parts room on the northeast side of the fixed wing shop.

[121] Mr. Tait had his supper at the Airport Chalet, which is across the Alaska Highway. Hangar C can be seen from the Airport Chalet. He left the Airport Chalet at approximately 6:30 p.m. and drove to the airport tarmac so he could enter the south doors of Hangar C and eventually enter the fixed wing shop. He had the opportunity to observe the southeast corner of Hangar C while driving down the roads to the airport tarmac. As he drove across the tarmac to the entrance of Hangar C, he did not recall looking at the south end of the building. He did not see any smoke or flame on the southeast corner roof or in the cold side of Hangar C before entering the fixed wing shop.

[122] Mr. Dean and Mr. Tait had a conversation and then each set about their tasks; Mr. Dean doing his bodywork and Mr. Tait working on his snowmobile. However, Mr. Tait made two phone calls to Atlin from the phone on the east side of the fixed wing shop. A phone bill confirmed the time at 6:44 p.m. He then proceeded to change a bearing on the front drive shaft of his snowmobile. This involved hand tools, but no application of heat.

[123] After approximately half an hour, Mr. Dean thought he smelled wood burning and then a rubber smell, which he thought might be something electrical from his Toyota. He checked the engine, but could not smell anything.

[124] A few minutes later, both Mr. Tait and Mr. Dean heard a bell ringing near the telephone on the east side of the fixed wing shop. Both were puzzled by the bell, which they had never heard before. Mr. Dean went to the helicopter shop to investigate. Everything looked all right, but he heard a noise from the cold side. He walked to the door window to look out into the cold side. He saw the Fleet Canuck on the fire, which he described as “quite a campfire”. The Fleet Canuck was completely engulfed in flames.

[125] Mr. Dean ran back to the fixed wing shop to inform Mr. Tait, who had not smelled anything. Mr. Tait then looked at the Fleet Canuck through a door window. He confirmed that it was totally engulfed in flames. There was no smoke in the fixed wing shop, but when they entered the cold side, it was completely filled with smoke, forcing them to bend over to see and breathe. They attempted to go to the Summit Air office on the west side of Hangar C, not realizing how serious the situation was. The smoke was less than five feet off the floor — so low that they realized they would not be able to get to the west side of Hangar C. They returned to the fixed wing shop, where the lights were still on, but the ceiling was beginning to fill up with smoke.

[126] The fact that the cold side of Hangar C had filled up with smoke was significant. Mr. Bundy, the plaintiffs’ fire spread expert, said that the fire was so far advanced at this point that the roof vents and the large opening at the south side of the building could not vent the smoke production.

[127] Mr. Tait attempted to use the phone on the east wall, but it was dead. He then exited the building through the helicopter shop. Bill Dean called 9-1-1 from the helicopter shop, which was logged in at 7:20 p.m. The first fire call was logged in at 7:17 p.m. from the Airport Chalet.

[128] It is significant that the first call to the fire department came from the Airport Chalet. I conclude that the fire had breached the roof of Hangar C at about the time Mr. Dean and Mr. Tait were discovering the fire from the inside. It appears that the sliding doors and insulated curtain between the fixed wing shop and the cold side prevented Mr. Dean and Mr. Tait from discovering the fire earlier. Were it not for the bell ringing on the east wall by the telephone, they might not have discovered the fire until their personal safety might have been in danger. At the time they discovered the fire, Mr. Tait was not aware that the building was on fire, but he certainly knew that the Fleet Canuck was. In his statement to the RCMP, he said:

> The building itself didn't appear to be on fire at that point, but the airplane definitely was.

[129] The smoke in the cold side limited his vision. The first time Mr. Tait saw flames on the roof was when he left the hangar and was salvaging some computers from his office on the west side.

[130] Mr. Tait also reported hearing a "boom-boom" from the cold side when the bell was ringing. At the time, he assumed it was vehicle doors closing, but now he believes it was fuel drums exploding.

[131] Mr. Tait also reported seeing a fellow walking in the vicinity of the southwest corner of the hangar. He reported this to the police.

[132] Mr. Dean made two phone calls from the phone in the helicopter shop. He then heard an explosion and saw the entire southeast side in flames. The fire was proceeding much faster than he had expected, and he made his way out of the hangar. He was surprised to see fire coming out the roof, 30 to 40 feet in the air, as he too had thought that there was just an airplane on fire.

e) Airport Chalet Fire Witnesses

[133] James Wagenfehr has been a forester with the U.S. Forest Service for 35 years. He held the position of Director of Fire Suppression and Operations from 1985 to 1995. On retirement in 1998, he started his own wild land fire suppression service. His background permits me to give added weight to his evidence.

[134] He was sitting in the bar at the Airport Chalet facing a window which gave him a clear view of Hangar C. The bar is in the same building as the Airport Chalet restaurant, but to the north of the restaurant, and thus a bit closer to Hangar C.

[135] At about 7:15 p.m., he first noticed an emission of steam or condensation from the southernmost ventilators in the roof of Hangar C. He watched it for a few minutes, and then saw a flame within the column of that emission. He alerted his companion, who called the waitress and asked her to call 9-1-1.

[136] Mr. Wagenfehr then observed a glow in the windows at the south end of Hangar C above the doors. He then saw flames rolling out the front door area, although he could not see the entire base of Hangar C.

[137] He was very clear that he did not see flames at the south doors when he first saw the fire on the roof.

[138] Luc Paquet was seated some distance from the restaurant window when a waitress informed him that Hangar C was on fire. He first saw the flame come out underneath the TNTA sign on the top of the roof of Hangar C, while the lights for the TNTA sign were still on. Then after awhile, the flame or glow of flame moved to the upper vents on the south side of Hangar C and then to the ground and second storey levels of the southwest corner. This was followed by the whole inside of the south hangar doors becoming full of flame.

[139] Hans Lammers was dining at the Airport Chalet restaurant with his brother and his brother's family. He was formerly employed by TNTA, but now works for Air Canada regional airlines. He was familiar with Hangar C and the fact that the south doors were in a permanently open position. He identified Hangar C and the open doors at the south end from a photograph taken from the verandah of the Airport Chalet next to the restaurant.

[140] He could not see Hangar C from his table and moved to the window area when the fire was noticed by others. He confirmed that he first saw flames coming from the roof of Hangar C by the TNTA sign at the most southerly vent supporting the sign. He said that the south doors area was black at the time, meaning that he did not see fire in the location of the doors when he first saw fire at the TNTA sign on the roof.

[141] Matthew Cornish was an air traffic controller on duty the evening of the fire. The air traffic control tower is located to the south of the airport terminal, which is to the south of Hangar C. It has a view of Hangar C because the highest part of the tower, called the cab, is higher than the airport terminal.

[142] He was having supper on the floor below the cab from 6:00-7:00 p.m., which would explain why he did not see the light flashes on the southeast corner of Hangar C. He may have viewed Hangar C briefly on his return to the cab, but nothing caught his eye. He worked at his computer, which faced the opposite direction to Hangar C.

[143] His vision was directed to Hangar C when he heard explosions and turned to see Hangar C fully ablaze. He phoned 9-1-1 and the log journal confirms his call at 19:35:15, well after the first call at 7:17 p.m. As a matter of fact, when he called 9-1-1, he heard fire trucks arriving on the scene. The fire he saw was inside the hangar and on the roof. He could not say that he saw fire on the southeast corner roof.

[144] Anne Marie Losier was a janitorial supervisor at the Whitehorse airport terminal. She was not sure of her time of arrival, but she had to be at work around 7:00 p.m. As she drove up to the northern entrance to the terminal, she noticed fire on the roof of Hangar C, but not on the inside of the south doors.

[145] She called 9-1-1 on her arrival at the terminal, and it was logged at 19:20:10. She then observed the fire in the body of the hangar behind the right-hand doors, which was followed by most of the south end of the building being on fire. It should be noted that Ms. Losier was closest to the fire of all the eye witnesses and she had a ground-level view.

f) Presence of Combustible Material on the Roof

[146] I have found that Messrs. O'Hagan and Larkin were negligent in not inspecting the southeast corner roof to determine the presence of combustible or flammable materials. I will now turn to the issue of the presence of such materials.

[147] A great deal of evidence was presented on the composition of the roof itself. I find as a fact that the roof was composed of the following:

a) a base of $^{3}/_{4}$-inch tongue and groove fir planks;

b) one layer of $^{1}/_{2}$-inch donnaconna board;

c) a layer of tar-based adhesive;

d) a layer of rolled roofing approximately 2-2½ mm thick;

e) a further layer of tar-based adhesive;

f) a further layer of rolled roofing approximately 2-2½ mm thick;

g) one coat of aluminized paint on the surface.

[148] The above roof of the southeast corner was repaired by Robin Wheeler in 1994, when he applied items (c) through (g). There is no dispute that these materials are combustible, although items (a) and (b) would be the most combustible from over 50 years of drying out. Items (c) through (g) were applied with a “cold process” so as not to start the roof on fire, as happened previously on Hangar B. The purpose of applying items (c) to (g) was to prevent water leaks in the roof of Hangar C.

[149] One question to be determined is whether the roof would be susceptible to cracks, which would cause water leaks. There is evidence, and I find as a fact, that the old roof of Hangar C cracked or blistered upon movement in the roof arising from changes in temperature and humidity.

[150] Mr. Wheeler was very confident that the new roof application on the southeast corner had not cracked or blistered in 1995 or 1996 when he returned to check the roof, which was his standard practice based upon his two-year warranty of workmanship. However, he did acknowledge that the roof application would have potential for cracking

in future years, although he thought it unlikely. The specifications for the Swepco Aluminum Roof Coating indicated that “performance of Swepco products cannot be guaranteed in any area of the roof subject to standing water.” No evidence was presented on whether there was standing water on the flat southeast corner roof.

[151] Mr. Wheeler testified as to his practice when protrusions from the roof surface were encountered during his cold process application. Referring specifically to the 6-inch by 6-inch posts for the North 60 sign, he indicated his practice was to place a triangular piece of wood, called a “cant strip”, around the bottom of each leg. This would allow the roofing membrane to go up the posts in a more gradual fashion to avoid the stressful 90-degree bend. Then a portion of the roofing material would be run up over the cant strip, followed by a piece of roofing material nailed at the top, down over the cant strip. He acknowledged that over time, the top part of the flashing would pull away due to the action of water and ice during the winter, which was why the nails were applied.

[152] Part of the plaintiffs’ theory of causation is that the interface between the posts of the base of the North 60 sign and the roof membrane provided a prime location for the sparks and slag to ignite the roofing material or the wooden base of the sign. This was based upon the plaintiffs’ expert, Dean Bundy, who testified:

> … the colder it gets the drier it is — the moisture is sucked out of the wood — the — the greater potential for ignition of that wood occurs, and besides that the – the shrinkage of the wood, the movement of the building as a result of that cold air and shrinkage provides what ended up being a recipe here for cracks around vertical penetrations into a roof surface.
>
> In the roof construction, in order to keep the roof from leaking they have to tar around those cracks, there in the – in these vertical penetrations, and as the summer sets on and the – and the tar that’s – gets dried out,

> then you get on to winter then the shrinking occurs, it'll actually pull back and pull away from the – penetrations that go through the roof.

[153] Mr. Wheeler agreed with the view that it was a problem in roofing wooden buildings when the wood swells in the summer and shrinks in the winter. The result is that problems can be expected from protrusions through the roof membrane. The expanding and contracting of the posts and roofing material can cause the roofing material to peel back or split.

[154] Charles Hoeller, the director of maintenance for TNTA aircraft, testified that in the summer of 1998, he observed the roofing material starting to curl away from the posts between $^{1}/_{2}$-inch and $^{1}/_{4}$-inch. Mr. Wheeler acknowledged that it would be the kind of problem that he might expect after four years.

[155] The plaintiffs' theory is also that the wood base of the North 60 sign itself would be a source of combustion for the sparks and slag. The base consisted of two vertical 6-inch by 6-inch posts, penetrating through the roof membrane, supporting a wooden cross-beam approximately 18 inches above the roof. The posts had virtually no protection from the flame of the cutting torch and all the cutting demonstrations by the plaintiffs' expert, McKeown and defence expert Eagar demonstrated the charring effect upon the wooden cross-beam. McKeown also held the view that sparks could have lodged in the wooden posts.

[156] Based upon the fact that I have already found that the failure to cover the cross-beam and posts is negligence, I am of the view that the sparks and slag could very well have ignited the posts or cross-beam, which had no snow cover. There is also the undisputed fact that an electrical junction box was located on the west side of the most

northerly post, which was less than 18 inches from the tip of the cutting torch. This too could provide a location for catching the sparks and slag and igniting the post.

[157] Finally, there was a drain in the roof of the southeast corner, described by Sylvio Ferro, the TNTA maintenance man. The drain was located near the posts, although he was uncertain of the exact location. He described it as made of galvanized tin, 6 to 8 inches wide and 14 inches long, leading to a galvanized pipe drain in a 3½- to 4-inch hole. This too could have been an area to catch sparks and slag from the oxyacetylene torch. Mr. Wheeler had no memory of such a drain, so it was unlikely to have been specially treated in the roofing process.

g) Combustion of Donnaconna

[158] Donnaconna board can generally be described as a wood material that is very fibrous. It was commonly used for insulation in walks and rooves. Dean Bundy described it this way:

> But from a fire perspective, it's a very loose fit. It allows for easy ignition because there's a lot of loose cardboard type fibrous wood pieces on the surface of it and it's — you can literally ignite it with a match. As I think everyone has seen in this case, you can also ignite it with a spark from a piece of steel. You can ignite it with a cigarette. We had a case like that in Washington where that occurred on the roof at a Catholic church and it's — once it gets ignited it's very difficult to extinguish. Firemen hate it because it gets going in the walls and such and they have to literally rip it all out of the walls before they leave or they'll be back for overhaul again, for a secondary ignition within the walls, roof assemblies of buildings.

[159] City of Whitehorse Fire Chief Clive Sparks confirmed this opinion:

> A Donna conna will burn. Quite often it does not burn quickly, it — it burns in a smoldering manner, and is one of the products that, after a fire, if you have donna conna in the area where the fire was, it is something that can remain smoldering for a long time, and creates a certain concern for us when we're doing overhauls to make sure that we've got it all out.

Q And why is it that you've got the concern?

A Because it can smolder for a number of hours, and, then, when it reaches either — gets enough oxygen, basically, it can start to burn again, or if it gets near something that is easily burnt, it can ignite it.

[160] James White is the owner and senior scientist in his own company called Western Fire Center, Inc. He is a former associate of Dean Bundy and the two collaborated on an experiment to determine the smoulder propensity of donnaconna board. The experiments conducted did not attempt to recreate the weather and snow conditions of January 18, 1999, nor did they recreate the roof composition of the southeast corner roof of Hangar C. In none of the tests did the donnaconna board involved break out into flame. However, that may be explained by the fact that the donnaconna used was new and consequently not as dry as the donnaconna in the roof of the southeast corner, which was over 50 years old.

[161] On the basis of the evidence of Dean Bundy, Fire Chief Clive Sparks and Mr. White, I find the following facts:

1. Donnaconna is easily ignited by the sparks and slag from an oxyacetylene torch;
2. Donnaconna will smoulder for extended periods of time;
3. Donnaconna will burn downwards, as well as outwards, depending upon ventilation;
4. Smouldering donnaconna will ignite combustible material adjacent to it.

h) Welding Experts

[162] A great deal of the trial was consumed by welding experts attempting to establish that the slag and sparks from an oxyacetylene torch could or could not have started the fire because of the snow accumulation on the southeast corner roof at the base of the sign. All of the evidence of these experts had various strengths and weaknesses. I will set out their evidence and experiments separately. However, a weakness of evidence that was common to all the welding experts was their inability to recreate the same weather and snow conditions. They were also unable to recreate the roof surface that may have had cracks in which the sparks or slag could lodge. All the experiments depend upon the skill of the operator in a general sense and specifically on that day. It is also significant that, with the exception of the Western Fire Center tests, none of these experts waited the required four hours to conduct a final inspection. In addition, none of the experts had the same age of roof material (fir board and donnaconna) or the exact configuration of the sign base on January 18, 1999. I also wish to be fair to all the experts who gave evidence. None of them had the opportunity that I had to listen to almost three months of evidence about Hangar C and the fire that engulfed it. In particular, I heard extensive evidence on the roof composition and state of repair which was not available to them.

[163] I will repeat the plaintiffs' theory of causation. It is the plaintiffs' submission that the slag and sparks generated by Mr. O'Hagan's oxyacetylene torch ignited a smouldering fire in the roof of the southeast corner of Hangar C, which ultimately engulfed the entire building. They concede that there is no direct evidence of the manner in which the sparks and slag ignited the roof. Rather, they submit that the

evidence establishes the opportunity for such ignition and justifies an inference that the ignition occurred in one of three ways:

1. the sparks and slag directly ignited combustible materials on the surface of the roof, i.e. the wooden posts or other wood comprising the base of the sign;
2. the sparks and slag penetrated the roof's surface through a crack or gap which ignited the donnaconna and fir board;
3. the sparks and slag fell into the drain on the surface of the roof from which it ignited the roofing material.

[164] There is one aspect of using an oxyacetylene torch that all experts agree, or should agree upon. It is an inherently dangerous activity when not performed in an area designed for its use.

[165] Defence expert, Brent Marshall, provided the following technical explanation of the cutting process:

> The cutting process requires lighting the acetylene gas at the tip of the torch and adding oxygen to set a neutral flame at the tip (approximately 1-1 (*sic*) ratio of acetylene to oxygen). The visible flame is made up of two parts:
>
> a. The primary combustion of cylinder oxygen and acetylene, which takes place at the face of the cutting tip. It is visible as small bright blue flames that look like small cones. The number of cones, are determined by the number of preheat orifice or ports in the face of the cutting tip.
> b. The secondary combustion is the burning of gases that are by products (sic) of the primary combustion combined with oxygen from the air and this is visible as the large flame coming off the face or end of the tip.
>
> The cutting tip is then positioned to place the inner cone tips approximately $^{1}/_{8}$" away from the surface of the metal to preheat the metal to kindling temperature. When the metal surface has turned color to a cherry red, a jet of pure oxygen under high pressure is projected on to the surface and the cutting action begins as the exposed surface

> begins to melt and burn. This burning liquid metal preheats the metal underneath and is then ejected or purged away by the high-speed pure oxygen jet. This action then exposed the preheated metal from underneath the molten layer and allows the process to begin again until the cut is finished.
> The expelled metal will be in the form of small droplets of molten metal. The combustion of the metal will cease when nitrogen from the air displaces the pure oxygen. The result is the production of many small hot droplets and depending on the skill of the operator, the base metal form, base metal metallurgy and the position of the required cut, there may be larger droplets and hot pieces produced by the cutting process, ex. Ends of bolts or nuts in this case.

[166] Brent Marshall indicated that the kindling temperature is 1400-1600° F. Mr. McKeown testified that the kindling point would be between 1500-1600° F. Mr. McKeown stated that a neutral flame is approximately 6300° F. and the molten metal is approximately 2900° F. He said that acetylene is the hottest gas known to mankind. According to Mr. McKeown, the slag is created from the molten metal that is removed during the cutting operation.

[167] Mr. McKeown was the first expert to conduct tests to determine whether the roof could be set on fire by the use of an oxyacetylene torch. Mr. McKeown is a professional welder with over 30 years experience. His first two demonstrations were designed to show the quantity of sparks and slag that are generated in the cutting process. These tests were conducted indoors and would undoubtedly have a different result in snow and -15° C. conditions. However, these cutting demonstrations show a significant amount of sparks and slag as opposed to the statement of Mr. Larkin that there was “very, very little” slag in the cutting operation. Significantly, Mr. Larkin at first stated that the slag dropped into the snow, but he corrected himself by saying, “Well, I’m not sure on that, where it went.” Mr. Larkin also saw sparks from the oxyacetylene torch, but

stated “very little sparks there was.” I prefer the evidence of Mr. McKeown and do not find Mr. Larkin’s evidence credible on this point.

[168] Mr. O’Hagan described his cuts as “clean” and that he could “snip it off like butter.” He said the cutting operation took 10 seconds from pre-heating to the finished cut. Mr. O’Hagan’s evidence is not consistent with Mr. McKeown’s experience, and I accept the evidence of Mr. McKeown that demonstrated a 10-second cut and preheat time was unlikely.

[169] Mr. McKeown also produced videos of various welding instructors cutting $^{7}/_{8}$-inch nuts, bolts and washers with actual cutting times (not including pre-heat), ranging from 20 seconds to a high of 73 seconds. Two of these cuts were performed outdoors with a temperature of -5° C. and approximately 10 inches of snow.

[170] Mr. McKeown’s tests did not include a mock-up of the roof surface or the type of snow and temperature that prevailed on January 18, 1999. I have also found the nuts and bolts were $^{5}/_{8}$-inch, which would produce less sparks and slag than in Mr. McKeown’s tests. However, they clearly demonstrate that considerable sparks and slag are the inevitable byproduct of a cutting operation using an oxyacetylene torch.

[171] Defence expert, Dr. Thomas Eagar, holds a Chair in Materials Engineering at the Massachusetts Institute of Technology. He has been a faculty member for over 25 years, with a research specialty of welding and joining metals, including oxyacetylene cutting. He has published over 150 papers on welding and manufacturing. In 1977, he was elected one of the youngest members of the U.S. National Academy of Engineering. His professional experience is primarily academic, although he has welding experience.

[172] His report dated February 27, 2002 concluded:

> Based upon my investigation, I conclude that it is scientifically impossible for the cutting of the two bolts to have caused a fire to ignite Hangar C hours after the cutting procedure was completed.

[173] Unfortunately for Dr. Eagar, the February 27, 2002 report was completed before he had an opportunity to conduct any experiments. He then followed up with a report dated March 30, 2002, which followed the four tests conducted by Mr. Galler and Dr. Larson on instruction from Dr. Eagar.

[174] He again relied on his knowledge of the scientific method in his introduction to the March 30, 2002 report:

> This rebuttal report contains my rebuttal to the plaintiff's reports, as well as a description of my own tests. It should be noted that my expertise for this reply is expanded somewhat beyond that provided in my previous reports. Specifically, many of my responses are based upon my knowledge of the scientific method (i.e. collect data, develop an hypothesis, test the hypothesis, draw conclusions) and of logical inference. My qualifications consist of practicing as a scientific researcher for more than 30 years and teaching the scientific method and logical analysis for the past 25 years.

[175] I ruled that I would not hear evidence from Dr. Eagar that was contained in paragraphs 16 and 17 of the report as it went far beyond his qualifications as an expert.

[176] Fundamental to Dr. Eagar's opinion as to "scientific impossibility" was the quenching concept of snow, i.e. its ability to quench the ignition of fire. His experiments were conducted in Boston, Massachusetts in March 2002 when there was no available snow. Not to be deterred from completing their tests, Mr. Galler was instructed to obtain "snow" from the Zamboni machine at a local indoor artificial ice rink after it had cleaned the ice. Although it may be more accurately described as "ice shavings," I will refer to it

as snow, as that is the word used in Dr. Eagar's report and his evidence. To his credit, Dr. Larson acknowledged his concern that it might not be an appropriate substitute, but Dr. Eagar instructed him to obtain the best thing they could.

[177] The four experiments were conducted on March 15 (two tests), March 22 and March 29, 2002. The snow was obtained from the Zamboni machine on March 14 by shoveling the snow from the machine into two plastic barrels. It was kept overnight in a walk-in freezer and used for the test the next day. Dr. Larson claimed that the snow had a density of approximately 30 percent, which he calculated not be weighing it, but rather by feeling the weight of a shovel full of snow.

[178] Dr. Eagar came to a different conclusion. He said it had a density of 30 to 50 percent based on his version of a compaction test, which he described as the scientific method of compacting the snow. He took some of the snow and squeezed it in his hand. Dr. Eagar then went on to explain the relevance of the snow he used for testing to this case:

> I believe that if I were to compare that snow to a less dense snow, such as a dry powder which could be as low as maybe fifteen percent dense, then clearly it would take twice as much of the less dense snow to catch this bolt type of thing. So, instead of going four inches deep maybe you go eight inches deep, perhaps. However, in terms of the crusty snow, I would say that the snow that I used was essentially equivalent or even less dense than the crusty snow. The crusty snow goes go [*sic*] the centering [*sic*] operation that I talked about yesterday on its way to essentially becoming a hundred percent dense. It's not necessarily all the way there as a crust, but it — crusty was typically fifty to — well — it's — in order to be crusty and have enough strength to feel crusty it has to be fifty to seventy to eighty percent dense.

At this point, all I can say is that Drs. Eagar and Larson strayed a long way from the scientific method in their compaction "tests". Dr. Eagar was trying to respond to the

suggestion that snow in the Whitehorse area at -15^0 C. is often a dry snow, as opposed to a wet snow that might be found in Boston at a higher temperature.

[179] There were other problems with the report of Dr. Eagar and colleagues. I will enumerate some of them:

1. Mr. Galler admitted that the fourth test was conducted on March 29, 2002 based on 6 inches of Zamboni snow. Nevertheless, on March 28, 2002, Mr. Galler and Dr. Larson reported the results of the fourth test based on using 3 inches of snow. Dr. Eagar explained how this could be done using the scientific method:

> It was well known from our prior tests that test four was — we did not expect, based on our fire tests, that we would ever even get the bolt to hit the roof. And so, it was — it's — virtually — based on the other tests, virtually a scientific certainty, it's known from — that's what science gives you is the predictive capability. So, Mr. Galler knew that when we couldn't ignite donna conna in the most severe test that a less severe test was not going to do it either.

   At the very least, Dr. Eagar gave a new meaning to scientific certainty.

2. To his credit, Dr. Eagar did acknowledge that if donnaconna were exposed to flame-cutting without a snow blanket, smouldering fire would probably occur.

3. Dr. Eagar opined that the slag expelled from the oxyacetylene torch would be heated to somewhere between 2500-3000° C. He further stated that these slag particles would travel at a speed of 50 metres/second, or 180 kilometres/hour. He further theorized that, without testing, he could say that $^1/_{16}$-inch of 30-percent dense snow would be a sufficient snow cover. However, he qualified this by saying

that for a welder in this situation, he would have to test the snow to be sure it wouldn't blow away in a light breeze. He acknowledged that adherence of the snow to the roof is a factor and if the snow were displaced in the cutting process, it would not be an effective protection.

4. Under further cross-examination Dr. Eagar acknowledged that he could not simply rely on the quenching quality of a quantity of snow, but in fact must consider the roof substances, the velocity of the gases and the slag particles. However, he never tested his theory of one-sixteenth of an inch of snow being an adequate protection.
5. The roof products used by Dr. Eagar were different from those of the roof of the southeast corner of Hangar C, despite having been given the roof structure and Swepco product information by legal counsel.
6. Dr. Eagar stated that it was his professional opinion that Whitehorse snow is substantially similar in its water content to other snow, without having conducted an evaluation of the density of Whitehorse snow. He acknowledged that he did not know the quality of the snow on the roof of Hangar C on January 18, 1999.
7. Without going into great detail, I have no confidence in Dr. Eagar's assessment of pre-heating and cutting times for the oxyacetylene torch.
8. In his February 27, 2002 report, Dr. Eagar described the hot oxide from the cutting torch as being "particles the size of coarse sand up to one to two millimeters in diameter." In his March 30, 2002 report, he

learned that some of the slag was the size of a pea bean or small peas.

9. He admitted to using a size 1 tip for the oxyacetylene torch when he had the choice of using a 1 or 2 tip size. He agreed that a number 2 size tip generates more hot oxide or slag, but he claimed he didn't know that Mr. O'Hagan had used a size 2 tip on January 18, 1999. He stated that the slag produced in his tests would be one-third less than the slag produced by Mr. O'Hagan.

[180] To conclude, I cannot give much weight to the conclusions of Dr. Eagar.

[181] The final expert to testify on the issue of the effect of a snow cover was Brent Marshall. As discussed earlier, a large part of Mr. Marshall's evidence dealt with whether the use of the oxyacetylene torch was negligent. He was qualified to give an expert opinion on that subject. However, his report went further, based on cutting with an oxyacetylene torch in a mock-up roof panel that generally matched the roof composition that I have found existed on the southeast corner of Hangar C on January 18, 1999. Once again, no provision was made for cracks or gaps. He also used a number 2 tip and a variety of snow depths and compaction. He observed the following results, among others:

1. Without any snow cover and very hot metal, I was unable to cause a sustainable fire on this type of roof material after the cut end was removed; and
2. With snow, there was no evidence of any molten metal droplets reaching the roof surface in tests 2, 3 and 4.

[182] From these test conclusions, Mr. Marshall then gives the opinion that:

> If conditions re *Trans North Turbo Air Limited* v. *North 60 Petro Ltd., et al.* were at all similar to the tests performed, as documented above, it is impossible for the cutting activities described to cause the fire or for any matter droplets to penetrate the snow cover and ignite the roof material including the donna conna.

[183] I have great difficulty with Mr. Marshall making the leap from concluding that he was unable to cause a sustainable fire to it being impossible for the cutting activities on the roof of the southeast corner of Hangar C on January 18, 1999. He did qualify his opinion with the condition that the roof conditions on January 18, 1999 had to be similar to his test conditions. However, his conditions were not similar in that he had no exposed post and wood surfaces, nor did he incorporate the existence of a gap, such as that described by Charles Hoeller. In short, I find it would be difficult for anyone to recreate the snow condition and depth, age of the posts, wood and donnaconna, potential gaps in the roof surface and the amount of slag and sparks that would have been generated from the particular cuts done by Mr. O'Hagan that day on nuts that were rusted onto bolts.

[184] Mr. Marshall also based his opinion on the assumption that there was no slag emanating from Mr. O'Hagan's oxyacetylene torch that day. His subjective view of the evidence given by Mr. O'Hagan was the following:

> Well, the first thing — one of the first things that struck me was he said, "A clean cut and small droplets," or sparks, as you might call them, but they're droplets of metal. That meant he knew. And he talked about a clean cut, which in our field is plain to us. Obviously it wasn't plain to you gentlemen, but a clean cut meant that there was no slag. In other words, it was an acceptable cut. It's sharp edges on the top and sharp edges on the bottom.

Mr. Marshall appeared to be unaware of the fact that Mr. Larkin recalled that slag, albeit “very little,” came from the two bolts and nuts as they were cut.

[185] Based on all of my comments, I can give little weight to Mr. Marshall’s conclusion that a fire was impossible from the use of an oxyacetylene torch on January 18, 1999.

[186] I have concluded that Mr. O’Hagan’s evidence is unreliable on this point. Most of the experts acknowledge, and the experiments conducted show, that some slag or molten metal is an inevitable by-product of the oxyacetylene cutting process.

[187] Having heard all the evidence from welders and academics, I prefer the opinion of Mr. R.W. Milne, P.Eng., who said:

> The ability of snow to provide adequate fire protection depends on the density and water content of the snow at the point of contact with the heat source. It is my opinion that a blanket of loosely compacted snow would not provide adequate fire protection against a continuous stream of molten and semi-molten slag particles generated during oxyacetylene torch cutting. In particular, larger particles that may fall from the work piece near the end of a cut could deliver sufficient heat to ignite a smoldering fire in roofing materials, even if a snow blanket “8 inches to 12 inches” deep was present.

[188] I am also of the view that the donnaconna and fir board of the southeast corner roof could be ignited by the sparks and slag from the oxyacetylene torch, either directly through cracks or gaps in the surface material, or in the drain, or by way of exposed wood on the posts and cross-beam.

(i) Origin, Cause and Fire Development Experts

[189] The plaintiffs’ theory of causation is that the sparks and slag generated by Mr. O’Hagan’s oxyacetylene cutting torch ignited a smouldering fire in the roof of the southeast corner of Hangar C that ultimately engulfed the entire building. The question

then is: how did the fire ultimately engulf the entire building? The evidence of the plaintiffs' expert Dean Bundy will be contrasted with defence expert Patrick McGinley

[190] Dean Bundy began his career in fire investigations with the Oregon State Police from 1976–1988. He conducted investigations from the fire to the courtroom. He became involved in the business of fire investigation in 1988 and has conducted 2,500 separate on-site fire investigations. He is a certified Fire and Explosion Investigator and a Certified Fire Investigation Instructor with the US National Association of Fire Investigators. At the Western Fire Center Inc., he has been involved in reconstruction and product development, as well as computer fire modeling.

[191] He describes the fire of January 18, 1999 as a ventilation-controlled fire, in which the heat release or growth of the fire is controlled by the amount of air available to the fire. He testified:

> So in the beginning you just see a little bit of smoke wafting out here and there as it breathes, kind of like a bellows, in that space. Then you start adding a little bit of oxygen and occasionally you'll get a little flash and then it will come back down and you'll get a little bit more, it'll come back down and then intermittently it will grow and the reason it's doing that is because the – the smoke that's being created, the unburned combustion by-products of this process are choking off the ability of the process to vent and burn the fire gases.

[192] However, Mr. Bundy testified that at a certain point a hole burns through the fir boards and the fire has access to more air and combustible material. The fire quickly spreads across the ceiling as it grows. In Mr. Bundy's words:

> When that starts to happen, things go pretty quickly. It will start spreading across the wood, it will then be looking - - because it's buoyant, the heat is buoyant, it wants to go up, the smoke and fire gasses [*sic*] that are coming out of that process are heating the wood ahead of it. It's igniting the wood behind it; it's then going on up to the highest point in the ceiling, and the first thing a witness would have seen in this particular

> case should have been smoke coming out the very top of the building. If they would have been looking, they would have seen the wafting of smoke coming out the flat roof and flashes of light coming out around that area and then smoke coming out the very top of the building in what turns out to be vents. As I think Mr. Wagenfehr described it as a cupola, which the sign sits on or sits near there on this model you have in the courtroom.

[193] Defence expert Patrick McGinley was employed in the Philadelphia Fire Department from 1964–1984. He was promoted through the ranks from fire fighter to Fire Marshall for the City of Philadelphia. Since 1984, he has been president of his own fire investigation company. He has given lectures and is a Certified Fire Investigator and a Certified Fire Investigation Instructor since 1987.

[194] His theory is that the fire started inside Hangar C in the area where the Fleet Canuck aircraft was stored. He says this is supported by the eyewitness evidence of Mr. Dean and Mr. Tait and the videotape showing the fire on the inside of the hangar to the right. He denies that the videotape indicates a fire in the vicinity of the southeast corner prior to the presence of fire inside the hangar. He says that the witnesses who first saw the fire at the roof level is consistent with the fire starting at the Fleet Canuck and spreading upwards.

[195] However, Mr. McGinley accepted the evidence of Fire Chief Monaghan that there was no evidence that the fire was caused by the Fleet Canuck. He then concluded that the cause of the fire should be classified as undetermined based on an inadequate fire investigation and the inability to properly examine all potential ignition scenarios.

[196] Mr. McGinley takes issue with Mr. Bundy’s evidence that the fire burned down through the donnaconna and fir board. He stated:

> … all fires burn upward and outward in a plume fashion, seeking the path of least resistance – contrary to fire behaviour, of this fire, instead of burning upward through two layers of petroleum based product, a quarter of an inch thick, this fire burns downward through five-eighths of an inch of solid wood. That is contradictory to normal fire behaviour.
> Fires don't burn down, fires burn up. There are circumstances which will drive a fire down but they weren't present in the two-inch roof deck.

[197] I point out that the plaintiffs did not suggest that the sparks and slag of the oxyacetylene torch burned down through the layers of petroleum-based product. They did submit that sparks and lag lodged in cracks and gaps or burned through exposed wood to reach the fir board and donnaconna, which then smouldered and burned downwards. The plaintiffs' theory is that it then burned on the underside of the fir board very quickly to the barrel roof and the air vents.

[198] Further, Mr. McGinley made the following statement in his evidence in chief:

> There has never been a fire in the history of this planet that shows up every 15 minutes or so and it just periodically makes an appearance over a period of a number of hours; it just doesn't work that way unless there was some source turning it on and off and there is nothing here to account for that.

[199] I have difficulty with the absolute nature of Mr. McGinley's evidence. He simply accepts some evidence and completely rejects other evidence. Although he professes no expertise in analyzing videos, he concludes that the video does not support the theory that the southeast corner of the roof was the origin of the fire. However, he does rely on the evidence of Messrs. Dean and Tait to support his theory that the origin is in the area of the Fleet Canuck. They did not so testify. The Fleet Canuck was all that they observed in flames given that the cold side was filled with smoke.

[200] When asked if there could have been a fire in the roof without Messrs. Dean and Tait seeing it, Mr. McGinley replied:

> No, sir. There could not have been fire in the roof without them seeing it when they're standing there looking at the Canuck.

[201] In my view, it is one thing for an expert to rely on what a witness said. However, when the expert draws conclusions of fact relying upon one witness whose evidence conflicts with another witness, he is entering into the role of the judge in interpreting evidence which he has not heard. I find that Messrs. Dean and Tait could very easily not see the fire on the roof, probably because the dense smoke blocked it out.

[202] Mr. Wagenfehr, a fire expert in his own right, testified that he first saw smoke coming from the southernmost vent while the interior of the hangar was dark with no fire there at that time. Mr. McGinley cannot explain this evidence as it is inconsistent with his theory. Mr. McGinley stated that this was completely inconsistent with the physics and the nature of fire. He would simply not accept the reasonable explanation that the fire had burned high in the rafters of Hangar C and showing at the southernmost vent before dropping down to ignite the Fleet Canuck. Despite the fact that Mr. Wagenfehr did not see flames inside the hangar before he saw flames emanating from the southernmost vent on the roof, Mr. McGinley persisted in his opinion that the Fleet Canuck was burning before Mr. Wagenfehr saw smoke or flame from the vents. He concluded that Mr. Wagenfehr was mistaken in that particular statement and that it was contrary to nature and could not happen.

[203] Further, when Mr. McGinley was questioned about the fact that all the Airport Chalet witnesses saw fire in the roof vents while the interior of the hangar was dark, he replied:

> No, I'm saying that their testimony about observing the fire coming out of the vents is accurate, but their correlation to fire coming out of the vent and the dark interior of the hangar is absolutely wrong.

[204] Unfortunately, Mr. McGinley erred in another crucial area of evidence. He stated in no uncertain terms that there was no evidence that a gap or crevice in the roofing material existed. What he should have said was that he was not aware of such evidence. However, he went on to say that if such a gap existed, it would have been filled with tar, ice or snow. At this point, Mr. McGinley was creating evidence.

[205] It is most unfortunate when experts begin to interpret or ignore evidence of witnesses — or worse, to create evidence to fit their theory of fire development. The result is that I cannot give Mr. McGinley's evidence much weight.

[206] To conclude, I prefer the account of cause, origin and fire spread presented by Mr. Bundy. I also rely upon his analysis of the video surveillance camera set out in paragraphs 116 and 117 above.

(j) Alternative Causes

[207] The defendants have presented evidence to show alternative causes for the fire of June 18, 1999. The alternative causes are: arson, the Fleet Canuck, electrical fault and finally, undetermined cause. As I have stated previously, there is no onus upon the defendants to establish these as causes to defeat the plaintiffs' claims.

(i) Arson:

[208] The RCMP investigated the fire to determine if there was any evidence of arson. In fact, the practice in Whitehorse is to have the RCMP very involved in the entire investigation because of their photographic expertise and laboratory access to assist the Yukon fire authorities.

[209] Fire Chief Clive Sparks (formerly Fire Chief Monaghan's Deputy) was clear in his evidence that the Whitehorse fire department found no evidence of arson. However, there was some evidence from Messrs. Dean and Tait that a stranger was found in the vicinity of the southwest corner of the hangar when they were leaving the premises to escape the fire. The stranger was identified, but found to be a bystander who had come from the Airport Chalet, the location of many other witnesses to the fire.

[210] The RCMP were also aware of a youth admitting in a letter to his father that he had set the fire. An interview was conducted and a polygraph taken. The RCMP were satisfied that this individual did not set the fire. Corporal Campbell, who conducted the arson investigation, indicated that the RCMP file remained open, but no tips or leads were actively being pursued. The defence did not present any evidence from the youth in question.

[211] Some defence witnesses seized upon the fact that the RCMP file remained open and that the possibility of arson could not be ruled out. However, I am satisfied that there is no evidence of arson.

(ii) Fleet Canuck:

[212] The Fleet Canuck is a highly flammable aircraft. The fabric or skin covering it is impregnated with aircraft dope, which is a flammable substance. The only evidence to

support the proposition that the fire started at the Fleet Canuck is that of Messrs. Dean and Tait. They testified that it was the only object they saw in flames when they entered the cold side. However, the smoke level in the cold side was less than five feet off the ground, limiting their visibility considerably. Significantly, the Airport Chalet witnesses observed the flames on the roof of the hangar before observing flames inside the hangar. The fire investigators did not identify the Fleet Canuck as a source of ignition. The probable cause for the Fleet Canuck fire, as described by Mr. Bundy, was “drop down” fire from the fire that moved across and up the barrel roof from the southeast corner roof.

(iii) Electrical:

[213] The electrical causation theory was put forward by defence expert, Dr. T.C. Cheng. Dr. Cheng is an electrical engineer from the University of Southern California. He was qualified as an expert in electrical fire causation, electrical degradation and insulation breakdown phenomena.

[214] Dr. Cheng testified that, from the beginning, the fire was not adequately investigated from an electrical perspective. This was also the concern of Brian Monaghan, the Fire Chief, who conducted the investigation for the City of Whitehorse. The reason is simple. The City of Whitehorse has no funding to conduct fire investigations. In this case, the investigation was paid for by the insurer of Hangar C. Because there was no scientific investigation into electrical causation, Dr. Cheng considered electrical causation a potential cause.

[215] There were four electrical anomalies identified:

1. Mr. Dean smelled “something like electrical” just before he discovered the Fleet Canuck in flames. He also smelled a rubber smell.
2. Messrs. Dean and Tait heard a doorbell ringing near the east side of the fixed wing shop.
3. The light in the Trans North sign on top of Hangar C went out before flames were seen.
4. When Mr. Tait used the phone in the fixed wing shop to call 9-1-1, the phone line was dead.

[216] The plaintiffs’ position is that the fire burned through the electrical and telephone lines. In other words, the wires were the victims, not the cause, of the fire. However, Dr. Cheng considers the smell of burning rubber to be indicative of the failure of electrical insulation. He was also very critical of the inadequate investigation of the tripping of the electrical breakers at the scene. He also observed photographic evidence of potential arcing, although he was of the opinion that it is very difficult to start a fire by arcing.

[217] Dr. Cheng stated that most electrical fires are caused by resistant heating. He theorized that the wiring in Hangar C would be subject to extreme temperatures causing insulation around the wire to freeze and crack. This would allow moisture penetration and ultimately insulation degradation. He reported that:

> Eventually, the insulation for the supply wire to the doorbell would be compromised and shorted to another live conductor causing the doorbell to ring continuously. Since the door push-button was located on the west side of the hangar and the fire was discovered at the Fleet Canuck, the above scenario would be a reasonable explanation for the ringing of the doorbell.

[218] There are two problems with Dr. Cheng's evidence. Firstly, I have found that the fire was first discovered at the southeast corner roof and not the Fleet Canuck. Secondly, this explanation is a theory only, and I do not find as a fact any electrical wire degradation to support it.

[219] I am of the view that both the smell of electrical fire or rubber burning, and the ringing of the bell, resulted from the fire, rather than causing it. At the end of the day, Dr. Cheng's evidence can do no more than establish electrical causation as a potential theoretical cause.

(iv) Undetermined Cause:

[220] The final alternative cause put forward by the defendants is that of undetermined cause. This defence position is based upon the argument that the fire investigation was either biased or inadequate.

[221] The bias argument is that the fire investigation was really directed by Earl Moker, the insurance representative. It was suggested that his presence on the fire investigation team led to a biased investigation.

[222] However, given that there is no independent funding for fire investigators by the City of Whitehorse, the custom or practice is to invite the insurance representative to be part of the investigation team. This has a two-fold purpose. It ensures that the insurers are kept informed, and it provides a source of funding if money is necessary to complete the fire investigation. It was also recognized that Mr. Moker had an expertise to bring from previous investigations.

[223] In this case, Mr. Monaghan, Fire Chief for the City of Whitehorse directed the fire investigation. A fire investigation team, including the territorial fire marshall's office and

the RCMP, was assembled. At the initial meeting, before Mr. Moker joined the team, it was determined that the focus of the investigation would be the southeast corner. This was a decision made between Yukon Fire Marshall John Holesworth and Fire Chief Brian Monaghan based on information from the RCMP. It was the logical place to start the fire investigation.

[224] The fire investigation team directed that a plywood hoarding be constructed around the southeast corner to permit the heating of the scene, which was covered with ice. This hoarding was constructed under the direction of Fire Chief Monaghan with funds provided by the insurer. The fire investigation included a video of the entire hangar by Corporal Campbell, site security, site photographs, preparation and review of witness statements, scene hoarding, lighting and heating. The investigation took place in February, when the scene was hoarded, as well as April, when the entire site had thawed, permitting further investigation.

[225] Under Fire Chief Monaghan's direction, the investigation covered the southeast corner, the oil drums at the south end of the hangar, the Fleet Canuck and other vehicles, the other aircraft frames and the west side of the hangar. Mr. Monaghan was not convinced that as thorough an investigation of the site was completed compared to the detailed investigation of the southeast corner. Dr. Cheng and Mr. McGinley were not satisfied that an adequate fire investigation was completed. However, I am satisfied that Fire Chief Monaghan conducted a satisfactory fire investigation, given the financial and weather constraints.

[226] However, the Whitehorse Fire Department concluded their investigation by indicating that the fire was of undetermined cause. Fire Chief Monaghan was in

agreement with this conclusion, even after Messrs. O'Hagan and Larkin indicated that an oxyacetylene torch had been used on the southeast corner roof that day. Defence expert, Patrick McGinley, in reliance upon Fire Chief Monaghan, concluded that the cause was undetermined. It is my view that Fire Chief Monaghan was seeking a scientific certainty, which is not the test relied upon by this court. Fire Chief Monaghan did not have the evidence of Messrs. O'Hagan and Larkin or the surveillance video when his department concluded undetermined cause. Mr. McGinley, on the other hand, was hampered by his understanding of scientific method, which would not allow a conclusion to be reached while the RCMP arson file remained open.

[227] I do not find that the cause of this fire is undetermined.

(k) Summary

[228] The cause of the fire at Hangar C on January 18, 1999 can never be proven with scientific certainty. The law, however, does not require scientific proof, but rather, proof on the balance of probabilities. The application of common sense and drawing appropriate inferences from the evidence can establish causation in the civil law context.

[229] I am satisfied that on January 18, 1999 there is evidence of only one significant event outside the ordinary events that occurred at Hangar C that day. That event was the negligent use of an oxyacetylene torch on the southeast corner roof of Hangar C to remove the base of the North 60 sign.

[230] While the exact explanation of how this fire occurred cannot be demonstrated to satisfy the scientific method, I am satisfied that it is appropriate to draw an inference

that the fire occurred because of the negligent use of the oxyacetylene torch. This inference arises from the following findings of fact:

1. The roof of the southeast corner was made of donnaconna and fir board, both of which are combustible. Donnaconna, in particular, is a combustible material that can smoulder for long periods of time.
2. There was opportunity for the sparks or slag from the oxyacetylene torch to come into contact with and ignite the donnaconna and fir board of the southeast corner roof through gaps or cracks in the petroleum-based cover.
3. The snow was not an adequate cover of the combustible materials and indeed, certain areas, like the posts or the uncovered part of the wooden beam, were completely uncovered and exposed to the hot sparks and molten slag.
4. The video surveillance camera was the silent witness to the smouldering and flashes that preceded the ultimate ignition that was first visible near the North 60 sign on the southeast corner roof.
5. The video surveillance camera tracked the progress of the fire from the southeast corner to the roof of Hangar C at the TNTA sign over the vents. I find that the fire followed the roof of the southeast corner and followed the barrel roof to the southern vent.
6. Both the surveillance camera and the Airport Chalet witnesses indicate the fire within the cold side of the hangar did not erupt until after they had seen it at the vents on top of the barrel roof. The ignition of the Fleet Canuck occurred from drop-down embers from the fire along the ceiling.

7. The alternative causes put forward by the defendants lack a sufficient evidentiary basis and do not amount to more than speculation.

ISSUE 3: Was North 60 directly liable for the fire as a result of its own negligent training and supervision of Messrs. O'Hagan and Larkin?

[231] North 60 has admitted that it is vicariously liable for the negligent acts of its employees, Mr. O'Hagan and Mr. Larkin. I must now determine whether North 60 is directly liable for the TNTA fire on January 18, 1999 as a result of negligence in training and supervising Messrs. O'Hagan and Larkin.

[232] I have found that the standard of care for welding in the Yukon Territory is found in the *National Fire Code of Canada* (1995) revised to June 30, 1997 and the CSA W117.2-94, *Safety in Welding, Cutting and Allied Processes*.

[233] *The National Fire Code of Canada* provides for training employees in s. 5.2.1.2 as follows:

> 1) Hot works shall be performed only by personnel trained in the safe use of equipment in conformance with this section.

[234] When asked about the provisions of the hot works procedures contained in the *National Fire Code*, Mr. O'Hagan replied that he did not know what the lawyer was talking about. North 60, on the other hand, assumed that the professional certification carried by Mr. O'Hagan indicated that his training in the use of that equipment. North 60 provided no other training to Mr. O'Hagan in the use of welding equipment and, specifically, did not train him in conformance with the Hot Works Equipment section of the *National Fire Code*. Thus, I find that North 60 is directly liable for the fire as a result of its failure to train Mr. O'Hagan at all.

[235] Mr. Robert Cox appeared as an officer of North 60. I note in passing that he testified that North 60 learned from Mr. Martin in January 2001 that Messrs. O'Hagan

and Larkin lied to the RCMP. North 60 directed them to make revised statements to the RCMP.

[236] Both Messrs. O'Hagan and Larkin were reprimanded by North 60. Mr. O'Hagan received a one-week suspension without pay. Mr. Larkin received a two-week suspension without pay. The suspensions were intended to be served in 2001, but they were not served until some time in 2002, prior to the commencement of this trial.

[237] The lease agreement between TNTA and North 60 was clear in its requirement that no welding was to be carried out on or near Hangar C without the written consent of TNTA. North 60 failed to advise either Mr. O'Hagan or Mr. Larkin of that requirement. The evidence of TNTA was that no such consent would have been granted, especially after the devastating fire of 1993 that burned down Hangar B owned by TNTA. That fire was caused by a propane torch being directly applied to the roof of Hangar B. Hangar C and Hangar B were of similar wood construction.

[238] North 60 was negligent in failing to properly train Mr. O'Hagan and for failing to obtain the required consent from TNTA. Therefore, I find North 60 directly liable for the fire of January 18, 1999.

ISSUE 4: In the alternative, did the acts of the defendants amount to a trespass requiring the defendants to establish the absence of intention and negligence?

[239] The plaintiffs have pleaded negligence and trespass as separate causes of action. The reason for this is that, in Canadian law of trespass, where a plaintiff is injured by force applied directly to him by the defendant, the plaintiffs' case is made by proving this fact and the defendant has the onus to establish the absence of intention and negligence (see *Cook* v. *Lewis*, [1952] 1 D.L.R. 1 (S.C.C.)).

[240] While American and English law have changed from the old distinction between direct (trespass) and indirect interference (negligence) to one of intentionally and negligently inflicted damage, Canadian law, at least as far as trespass to the person is concerned, maintains the distinction between trespass and negligence (see *Non-Marine Underwriters, Lloyd's of London* v. *Scalera*, [2000] 1 SCR 551 (SCC)). In the *Scalera* case, McLachlin J. delivered the judgment for the majority and referred with general approval to the article by Ruth Sullivan, "*Trespass to the Person in Canada: A Defence of the Traditional Approach*" (1987), 19 Ottawa L. Rev. 533. McLachlin J. found that the law of battery is based on protecting an individual's right to personal autonomy, and hence that individual need only prove a direct interference, at which point the onus shifts to the person who violated the right to justify the intrusion, excuse it or raise some defence.

[241] McLachlin J. relied upon *Bell Canada* v. *COPE (Sarnia) Ltd.* (1980), 11 C.C.L.T. 170 (Ont. H.C.), aff'd (1980), 31 O.R. (2d) 571 (Ont. C.A.), which was a property trespass case. She quoted the trial judge, Linden J., for support in shifting the onus of

proof. She found that in cases of direct interference, the defendant is likely to know how and why the interference occurred. In that case, COPE (Sarnia) Ltd. caused Bell Canada's service cable to be cut during some excavation work.

[242] In summary, it is clear law that in a trespass action in Canada, where direct damage is done to either person or property, the defendant bears the burden of proving that the damage did not occur as the result of intentional and negligent conduct.

[243] The question to be determined in this case is whether TNTA has demonstrated a sufficiently direct connection between the actions of Messrs. O'Hagan and Larkin and the damage to warrant treatment as a trespass. There is no doubt that Messrs. O'Hagan and Larkin committed a simple trespass. They were on the roof of Hangar C, using an oxyacetylene welding torch without the required written consent of TNTA, who had no knowledge of their presence.

[244] However, the connection between the use of the oxyacetylene welding torch and the subsequent fire which broke out over five hours later is much less direct. The decision of Messrs. O'Hagan and Larkin to use the welding torch and the subsequent fire is neither simple nor clear and thus obscures the role and responsibility of Messrs. O'Hagan and Larkin. Simply put, the fire was not an immediate consequence of the act of Messrs. O'Hagan and Larkin.

[245] However, the delay in the damage occurring does not mean that the interference by Messrs. O'Hagan and Larkin was any less direct. The use of the words "direct" and "indirect", in this context, distinguishes between damage that is caused by a direct act to a person's property, as opposed to an act that was done outside a person's property which, nevertheless, caused damage to that person's property.

[246] Trespass to land or, in this case, a building, consists of entering upon the building without lawful justification or legal right to do so. Can it be said that Messrs. O'Hagan and Larkin did not commit a trespass because they were removing the property of their employer? Arguably, if the sign had been removed without incident, it could be said that the trespass was minimal and there would be no action in trespass. That is not the case before me, as I have found a causal connection between the act of trespass and the devastating damage that followed.

[247] In my view, in the alternative, this is an appropriate case to apply the law of trespass to property. It is clear that although the acts of Messrs. O'Hagan and Larkin ultimately resulted in a trespass, those acts were not intended to have the devastating result that followed, nor to cause any damage to the plaintiffs at all. Hence, before liability can be found against the defendants, they have the opportunity and the onus to disprove intention and negligence. While it is fair to say that Messrs. O'Hagan and Larkin never intended to set fire to Hangar C, I have previously concluded that their actions on January 18, 1999 were negligent. Thus, Messrs. O'Hagan and Larkin and North 60 are liable under the law of trespass for the damage caused to Hangar C and TNTA's business.

ISSUE 5: Was Trans North Turbo Air contributorily negligent and thus responsible for some or all of the damage?

(a) The Law

[248] The defendants claim that the plaintiff TNTA should be found contributorily negligent and the damages apportioned in accordance with the degree of fault of each party. Authority for this claim is found in the *Contributory Negligence Act*, R.S.Y. 1986, c. 32, which provides:

> **Apportionment of damage or loss**
> **1.**(1) Subject to subsections (2) and (3), where by the fault of two or more persons damage or loss is caused to one or more of them, the liability to make good the damage or loss is in proportion to the degree in which each person was at fault.
> (2) Where, having regard to all the circumstances of the case, it is not possible to establish different degrees of fault, the liability shall be apportioned equally.
> (3) Nothing in this section renders a person liable for damage or loss to which his fault has not contributed.
>
> **Degree of fault**
> **2.** Where damage or loss has been caused by the fault of two or more persons, a judge or a jury, as the case may be, shall determine the degree in which each was at fault, and where two or more persons are found at fault, they are jointly and severally liable to the person suffering damage or loss, but as between themselves, in the absence of any contract express or implied, they are liable to make contribution to and to indemnify each other in the degree in which they are respectively found to have been at fault.

[249] The burden of proof rests on the defendants to show contributory negligence of the plaintiff on a balance of probabilities in the same way that the plaintiffs have been required to prove the negligence of the defendants. The defendants must establish the following:

1. A duty of care;

2. A breach of the duty of care;

3. Damages that are causally connected to the breach of the duty of care; and
4. Apportionment of damages based upon the degree in which each person was at fault.

b) The Duty and Standard of Care

[250] There is no dispute that TNTA has a duty of care that a reasonable person would have for the safety or protection of their own property as set out in *Nance* v. *British Columbia Electric Railway*, [1951] A.C. 601.

[251] Hangar C was equipped with at least 23 hand-held portable fire extinguishers and 2 wheeled units with hoses.

[252] The fixed wing and helicopter shops had heat detectors. There was conflicting evidence about whether the heat detection system was tied into the motion detector system. If it was tied in, it would only activate when all personnel had left the building. On the night in question, it would not have been activated because of the presence of Messrs. Dean and Tait in Hangar C.

[253] However, I am satisfied by the evidence of Mr. Cameron and Mr. Ferro that the heat detection system was separately wired and would have activated if the smoke had penetrated the fixed wing or helicopter shop.

[254] In addition, TNTA did not allow smoking or burning on the premises (except as required by their own staff or tenant) to repair aircraft. It expressly prohibited painting, doping or welding on or near Hangar C without the written consent of TNTA.

[255] I am satisfied from the evidence of Randall Kovacs that the fuel load in Hangar C was reasonable for a wood construction hangar and that the fire suppression equipment in place was appropriate for the fuel load and their own hazards.

[256] The question to be determined is whether the standard of care required the plaintiff to do more and to install a sprinkler system or a smoke alarm system in Hangar C.

[257] It must be determined what, if any, statutory regime applied to Hangar C between its purchase by TNTA in 1970 and the fire on January 18, 1999. In 1970, the helicopter shop was renovated by TNTA. Again in 1972, the office space on the east side was renovated. In 1973, a sliding door was installed between the fixed wing shop and the cold side.

[258] I find that the following propositions apply to Hangar C:

1. Hangar C and the Whitehorse Airport fall exclusively under the authority of the federal government (see *Johannesson* v. *Rural Municipality of West St. Paul*, [1951] 4 D.L.R. 609 (S.C.C.) and *Re: Orangeville Airport Ltd.* v. *Town of Caledon* (1976), 11 O.R. (2d) 546 (Ont. C.A.)).
2. On April 12, 1972, the federal government enacted the Canada Building Safety Regulations pursuant to the Canada Labour Code. Section 5 of the regulations required the design and construction of any building to comply with the National Building Code of Canada, 1970. These regulations did not take effect until six months after April 12, 1972, i.e. September 12, 1972. Thus, the regulations did not apply to the renovations in 1970 and 1972. There is no evidence that the 1973 installation of a sliding door on the fixed wing shop met the definition of a “major alteration” requiring approval by the building authority.

3. It should also be noted that the Canada Labour Code of 1970 did not apply to businesses of a local or private nature, nor to employment upon or connection with the operation of aircraft (s. 80). An amendment of s. 80 in 1984 may have resulted in the application of the Canada Labour Code to Hangar C, in that it deleted the reference to aircraft.
4. It is clear that in 1976, the Yukon Fire Safety Regulations deemed that the National Building Code, 1975 applied as an acceptable minimum standard.
5. It should also be noted that the Associate Committee on the National Building Code produced the 1968 Building Code for the North (BCN). The BCN was developed to cover “the somewhat unusual requirements for building in northern regions,” which included fire provisions. Although there is no evidence that it was legally adopted in the Yukon, it reflects a reasonable standard for construction in the Yukon in the 1970s. The BCN did not require any part of the hangar to be sprinklered.

(i) Sprinkler System

[259] I must say that an attempt to determine the applicability of building codes 30 years ago is not without shortcomings, as no experts from that time frame were called. The result of this analysis is that there may not have been a legal requirement for a sprinkler system in Hangar C as a result of the renovations carried out by TNTA in 1970, 1972 and 1973. There is certainly no evidence that any authority was suggesting or directing that a sprinkler system was required. Furthermore, a survey of other similarly constructed hangars in British Columbia did not indicate that sprinkler systems were required to be installed, except for one hangar that was built in 1993.

[260] This statutory analysis does not absolve TNTA from taking appropriate protective measures; it simply indicates there was no legal requirement for a sprinkler system.

[261] It is significant to note that even the plaintiff's own expert, Randall Kovacs, who has considerable expertise in the application of building codes, concluded with respect to clause 1.4.5 of the National Building Code, 1970, that:

> This clause implies that it would be reasonable for Trans North to provide automatic sprinkler protection to the portions that were renovated in 1970, including the helicopter shop and the offices on the west side of the building. It does not imply that sprinkler protection would have been required to be retrofitted into the cold side of the hangar which was not renovated.

[262] Mr. Kovacs reached the same conclusion for the fixed wing shop renovation in 1972. I note that Mr. Kovacs did not address the application of the National Building Code, 1970 to Hangar C, but explicitly assumed it did not apply in 1942, 1970 and 1972.

[263] There are two kinds of sprinkler systems. A water sprinkler system would be the most economical to install, but it would be inappropriate for Hangar C because of the freezing winter temperatures on the cold side. A water sprinkler system could only be installed on the warm side of the building. There was also the suggestion that a lack of water pressure had hampered the fire department response to the fire, and thus the water pressure may not have been adequate for a sprinkler system.

[264] A foam sprinkler system would be the most appropriate for Hangar C because it housed fueled aircraft, and a water sprinkler system is not adequate fire suppression in that case. A foam sprinkler system also has the benefit of being utilized on the cold side of Hangar C as well.

[265] Mr. Kapty gave consideration to a sprinkler system in Hangar C after the devastating loss of Hangar B by fire in 1993. Mr. Kapty's inquiry into a sprinkler system indicated a cost in excess of $250,000, without any reduction in fire insurance premiums. All parties agree that the fair market value of Hangar C at the time of the fire was $810,000. TNTA was hopeful that historic sites financial support would be forthcoming to assist. Failing that support, TNTA took the position that it was not practical to install a sprinkler system and relied upon its maintenance and safety practices, as well as its regulations, which did not permit hazardous operations, such as painting, doping or welding, to take place on or near the hangar without its written consent.

[266] The issue of commercial practicability also arises when considering the standard of care. In the case of *British Columbia* v. *Canadian Forest Products Ltd.*, [1999] B.C.J. No. 1947 (Q.L.) (B.C.S.C.), a fire occurred on the defendant's timber licence, and the plaintiff British Columbia government was suing for the expense of suppressing the fire and restoring the site. On the issue of contributory negligence, the plaintiff was found liable for 30 percent and the defendant was found liable for 70 percent. It was found that the defendant was well aware of the issue of holdover fires, but had refrained from taking preventive measures. The court cited, with approval, a principle from *Tahsis Company Ltd.* v. *Canadian Forest Products Ltd.* (1968), 65 W.W.R. 641 (B.C.S.C.):

> I would go so far as to say that in a case of the present class no precaution which was commercially practicable ought to have been omitted, and any omission of a practicable precaution would constitute a failure of duty.

In the *British Columbia* v. *Canadian Forest Products Ltd.* case, the commercially practicable utilization of infrared scanning was available.

[267] I conclude that TNTA was not required to install a sprinkler system for the following reasons:

1. There was no legal requirement to have a sprinkler system.
2. Similarly constructed hangars in British Columbia did not have sprinkler systems.
3. It was not commercially practicable to install a sprinkler system.

(ii) Smoke Alarm

[268] The case for requiring a smoke alarm system was put by Thomas Klem, who was qualified to give expert evidence on, among other areas, fire protection systems and their performance. He testified that a smoke alarm system should have been located in the cold side of the hangar. He incorrectly assumed that there were smoke alarms in the helicopter and fixed wing shops. In fact, they were heat detectors.

[269] However, it is important to note that smoke alarm systems, unlike sprinkler systems, do not suppress fires. Their function is to warn or notify that there may be a fire, and Mr. Klem suggested it would directly notify the fire department. He assumed this would lead to an earlier intervention by the fire department. However, Mr. Klem did not discuss the idea of a smoke alarm system with the Whitehorse fire department, the Whitehorse Airport fire department or the Yukon government to establish the possibility of direct notification. I am unable to find on the evidence that a smoke alarm system should be a requirement of the standard of care for TNTA.

c) Breach of Standard of Care

[270] As I have found the standard of care did not include a requirement for a sprinkler or smoke alarm system, there is no breach of the standard of care.

d) Causation

(i) Sprinkler System

[271] In the event that I am incorrect in finding no requirement for a foam sprinkler system, it must be determined whether a sprinkler system would have reduced the impact or damage of the fire caused by the defendants.

[272] I have found that the fire started on January 18, 1999 and commenced in the area of the base of the North 60 sign on the southeast corner roof of Hangar C. It then proceeded along that roof until it reached the intersection between the flat southeast corner roof and the sloping barrel roof. The fire proceeded along and up the barrel roof until it broke through the roof vents at the North 60 sign.

[273] I accept the evidence of Randall Kovacs generally with respect to the operation of sprinkler systems. He stated that sprinklers would have been designed to provide adequate coverage to fires resulting from hazards on the floor of Hangar C. They would not have been designed to suppress fires above the lines of sprinklers installed within 12 inches of the ceiling or roof of the hangar. If a sprinkler were activated, the foam would flow downwards and would not have stopped the growth of the fire along the ceiling above the line of sprinklers. Randall Kovacs concludes, and I find that an automatic sprinkler system in Hangar C would not have controlled or suppressed a fire on the roof deck of Hangar C to the extent that the outcome of the fire loss would have changed. This position was generally supported by the defence expert, Thomas Klem,

although he was of the view that the sprinkler system might have resulted in earlier detection and fire department intervention. However, he said there was no way of knowing what effect earlier detection would have had on a fast-moving ceiling fire. The plaintiff's expert, Mr. Bundy, was also of the opinion that a sprinkler system would not have prevented the fire that he described as "hugging itself along the ceiling."

[274] I conclude that a sprinkler system would not have resulted in any suppression of this fire.

(ii) Smoke Alarm

[275] In the event that I am incorrect in finding that a smoke alarm system is not part of the standard of care for TNTA, I will discuss the effect of such a system on the suppression of this fire. As stated previously, a smoke alarm system is not a fire suppression system. Arguably, it might have brought the fire department to the scene earlier. However, that is not the end of the analysis. It would still have to be determined if that would have made a difference. Mr. Klem admitted there was no way of knowing for sure, and he acknowledged that a fire along the roof would be difficult to suppress. I am also mindful of the fact that the spread of the fire from the southeast corner roof to the vents on the barrel roof was very fast. I find insufficient evidence to support the opinion that a smoke alarm system would have affected the outcome of this fire.

e) Summary

[276] I have found that the standard of care for Hangar C does not require the installation of either a sprinkler system or a smoke alarm system. I have also found that such installations would not, in any event, have resulted in suppression of this particular fire because of the way it followed the barrel roof of Hangar C.

ISSUE 6: What are the damages that flowed from the fire?

(a) Introduction

[277] The agreed upon damages for TNTA are as follows:

a)	Helicopters	$4,037,116
b)	Fixed-Wing Aircraft	$ 506,231
c)	Equipment and Tools	$ 414,872
d)	Hangar Supplies	$ 15,909
e)	Office Contents	$ 82,158
f)	Office Supplies	$ 5,760
g)	Vehicles	$ 56,064
h)	Third Party Losses	$ 206,011
i)	Fire Investigation Costs	$ 38,079
j)	Extra Fire-Related Costs	$ 222,700
	TOTAL:	**$5,585,400**

[278] The damages claimed by TNTA not agreed upon are as follows:

a)	Loss of Hangar C	$2,788,100
b)	Hangar C Parts and Accessories	$1,959,100
c)	Business Interruption Loss	$2,385,400
	TOTAL:	**$7,132,600**

[279] The following damages were also agreed upon:

a)	Summit Air Charters Ltd.	$1,102,000
b)	Almon Landair Ltd.	$ 675,000 (U.S.)
c)	Robert Cameron	$ 58,500

I understand that Mr. Cameron's claim for the Beaver aircraft is contained in TNTA's fixed wing aircraft claim.

(b) The Loss of Hangar C

[280] There are four legal principles that can be applied to evaluating damages in negligence actions (see *Nan* v. *Black Pine Manufacturing Ltd.* (1991), 80 D.L.R. (4th) 153 (B.C.C.A.)). They are:

1. The plaintiff shall be put in the same position financially, so far as possible, as if the tort had not occurred.
2. Damages awarded must be reasonable, both to the plaintiff and the defendant.
3. Replacement cost will be the starting point for the assessment of damages, subject to a deduction for depreciation or betterment, depending on the circumstances. For example, a car may be subject to depreciation since there is a market in used vehicles which could allow the plaintiff to purchase a similar vehicle. A house or commercial building replaced on a replacement cost could result in some betterment to the plaintiff, which may or may not be adjusted. Whether a commercial building is used for commercial purposes, as opposed to investment purposes, may be taken into consideration.

[281] The facts in the *Nan* case are that the Nan family home was destroyed by fire. The Nan family had purchased the home in December 1985 for $44,000. A disputed appraisal indicated a value of $47,000 at the time of the fire. The cost of rebuilding the Nan house was $69,809. The defendant argued that the plaintiff was receiving a brand

new home for the well-worn building at the time of the fire. The defendant argued that the actual value was $37,500.

[282] Wood J. found that the only way the Nan family could be compensated was to restore their property to the condition it was before the defendants destroyed it, without deduction for depreciation or betterment. As long as the plaintiff had acted reasonably, the defendant was not entitled to a deduction on the basis that the plaintiff received new for old.

[283] The facts of this case are that TNTA owned a hangar worth $810,000. Hangar C was on leased land that did not expire until 2016. When the hangar burned down on January 18, 1999, TNTA had to find replacement premises immediately to continue its business. They had five remaining helicopters (having lost seven, plus their fixed-wing aircraft), which required constant maintenance and repairs.

[284] Hangar C met all of TNTA's needs. It had 44,000 square feet for office space for administration and sales, hangar space, a helicopter repair shop and fixed-wing repair shop. It also had room for major components, spare parts, equipment and tools. It was available for use until the expiry of the land lease in 2016.

[285] Immediately after the fire of January 18, 1999, Mr. Kapty set up temporary headquarters in his kitchen at home. He placed an advertisement in the *Whitehorse Star* stating that TNTA would stay in business. Within days of the fire, TNTA was using temporary space from Heli Dynamics Ltd. that was small enough to have fit within the old helicopter shop. There were only two offices and space for one helicopter. The Heli Dynamics space was near the airport and available for rent.

[286] By March 1999, TNTA moved to a larger space in the Big Salmon Air hangar, also near the airport. It was still less than the original Hangar C space, but an improvement from the temporary Heli Dynamics Ltd. space.

[287] However, Mr. Kapty continued to seek a suitable permanent home for the business. He reviewed a number of other sites in Whitehorse. He had determined it was not worthwhile to build replacement premises on the Hangar C property, as the Yukon government indicated it had other development plans for the site in 2016. It was also learned that the City of Whitehorse would require a water trunkline to be built from Two Mile Hill to the Whitehorse airport. TNTA would have to cover a significant portion of that cost.

[288] There were three different proposals to replace Hangar C on the original airport site:

a)	Original wood frame construction	$3,585,000
b)	Modern structural steel construction	$4,142,000
c)	The lowest price from Steve Butler Construction	$2,103,800

[289] The preferable replacement from a fire safety perspective would be the steel construction. However, building a replacement structure was not practical, given the requirement to move in 2016.

[290] Mr. Kapty continued to search for new premises and located a 15-acre property owned by NorthwesTel, the local telephone company. It was located close to the Whitehorse airport, although not as close as the Heli Dynamics and Big Salmon Air hangars. There would still be water trunkline costs, although less than on the old Hangar C property. There were numerous renovations to make to the three buildings on

the NorthwesTel property suitable for a helicopter business. TNTA purchased the property for $1,900,000 in May 2000. Renovations could not begin until November 2000, and occupancy commenced January 15, 2001 while renovations continued. These buildings had 15,000 square feet of space, as compared to the 20,000 square feet (of the 44,000 square feet) used by TNTA in Hangar C. The total cost of the new premises, including renovations and water trunkline costs, was $2,788,100, which is a net figure after reduction of a betterment value of $380,900.

[291] TNTA submits that the replacement cost for Hangar C is between a low of $2.5 million for the Butler Construction estimate and a high of over $4 million for a full structural steel construction. North 60 submits that the range should be based upon the fair market value of Hangar C of $810,000, which would result in a range of loss of between $1,144,300 to $1,310,400. North 60 raises the following betterment factors for TNTA:

a. Immediate increase in value of TNTA shares.
b. TNTA owns 15 acres, compared to previously owned leased land.
c. The buildings are newer, with reduced maintenance and structural expenses.
d. The building is renovated to TNTA’s preferences.
e. TNTA benefits from higher tax deductions.

[292] TNTA submits it has a new permanent building, but it is a smaller space than Hangar C, without the runway access.

[293] It was not possible to put TNTA into the same position as before the fire because the lease of the site expired in 2016. Thus, the actual replacement cost on the site of Hangar C was not a fair value to calculate.

[294] The major concern is whether TNTA has benefited unreasonably from the fact that it has ownership of 15 acres, as opposed to a lease that expired in 2016. Inevitably, comparisons between the two positions vary considerably, depending upon discount rates assumed. However, in my view, a new location was required as a result of the fire and it was fortunate that a suitable site was arranged within two years of the fire. It is highly speculative to consider whether TNTA will be “better” as a result of its new location. But it has put TNTA into as close a position as possible to its pre-fire position without being unreasonable to the defendants. The final cost to TNTA is well within the potential range of costs, and I have concluded that the amount of $2,788,100 is a reasonable replacement cost in the commercial context of Whitehorse.

(c) Hangar C Parts and Accessories

[295] The specific parts that are disputed by the defendants are aircraft accessories, aircraft engines, aircraft used parts, aircraft radios, aircraft rotables, and aircraft new parts. It must be remembered that all the parts and accessories were destroyed in the fire, as well as the supporting paperwork. “Rotables” are those parts which have a serial number and time before overhaul (TBO). When the rotables reach their time limit for use, they are sent out for overhaul and renewed to zero time and placed in inventory for future use. TNTA also had a category of “time life” parts, which had reached their time limit but were kept in the event that the manufacturer extended the life of the part.

[296] Mr. Howell was the parts manager for TNTA on January 18, 1999. The fire had a major impact on his work, as he had to recreate the paperwork on each aircraft and part. It involved contacting suppliers and overhaul service centers to obtain their customer records on TNTA. In addition, Mr. Howell had to provide the parts for the five

remaining aircraft that were still operating. In general, there was a 50-percent reduction for depreciation of new parts and a 50-percent deduction for zero-timed rotables. At the same time, I am satisfied that Mr. Howell was as accurate as he could be in recreating the parts and accessories and assigning values.

[297] Mr. Hoeller, the TNTA director of maintenance, was closely associated with the replacement of parts and accessories. Initially, they ordered the parts required for immediate maintenance and slowly purchased the tools required for maintenance. At the date of trial, over three years after the fire, TNTA was still lacking some instrumentation and testing equipment.

[298] Mr. Siebert, a chartered business valuator, testified for the defendants. He was hampered in his analysis, as he had no back-up documentation to check parts and values. The main thrust of Mr. Siebert's evidence was that the evaluation of parts and accessories exceeded the net book value on the financial statements by five times. Specifically, he challenged the claim for engine values, but brought no evidence to support his opinion.

[299] I am satisfied that the value of $1,959,100 is appropriate and reasonable for the parts and accessories claim.

(d) Business Interruption Loss

[300] TNTA's damage claim for business interruption is $2,385,400. The defendants claim that the maximum claim for business interruption should be $394,200. The difference is explained by the different assumptions of economic activity and the impact on anticipated helicopter flying hours. The defendants assume that the general downturn in the Yukon economy, and in mining exploration in particular, would

negatively impact on TNTA's revenues. TNTA acknowledges that there was a downturn in the Yukon economy, but rejects it as having a serious impact on TNTA's revenues.

[301] The law may be summarized as follows:

1. Damages for lost profits must be proven on a balance of probabilities.
2. Damages may arise from the loss of a specific contract or the loss of opportunity to obtain business since the fire.
3. Where the loss of profits cannot be established with certainty, the award must consider that not all of such business would be obtained.
4. The losses must be foreseeable or reasonably contemplated at the time of the fire.

See *Houweling Nurseries Ltd.* v. *Fisons Western Corp.* (1988), 49 D.L.R. (4th) 205 (B.C.C.A.).

[302] At the time of the fire on January 18, 1999, TNTA was a helicopter company with a fleet of 12 helicopters. It had bases throughout the Yukon, as well as Smithers and Port Alberni, B.C. The essence of a helicopter business is the ability to move helicopters to the business, rather than vice versa. Although Whitehorse was the main centre of operations, aircraft were ferried all over the Yukon and into British Columbia and the Northwest Territories if the work was there.

[303] Mr. Kapty was responsible for marketing and spent a great deal of time in his Vancouver office meeting with existing and potential clients. The company relied heavily on mining exploration in the 1990s but was moving to the oil and gas activity at the time of the fire. To be competitive in oil and gas exploration, it was necessary to develop joint

venture agreements with Yukon First Nations in their respective land areas, known as traditional territory. TNTA had spent considerable time in developing such agreements.

[304] The fire was a huge disruption to the helicopter business. Mr. Kapty could not follow up on his usual marketing activity. Every employee was involved in setting up new premises, both temporary and permanent. Its new permanent premises were not occupied until January 15, 2001. Mr. Hoeller described the business as bedlam, between resurrecting maintenance manuals, aircraft records, ordering shop equipment, maintaining existing helicopters and bringing new helicopters up to standard.

[305] The replacement of helicopters was substantially completed by June 1, 1999, within five months of the fire. By that time, five of the seven destroyed helicopters were replaced. Each replacement helicopter was located in various parts of western Canada and inspected by two employees, purchased and then ferried to Whitehorse and readied for operations according to TNTA standards.

[306] Mr. Kapty maintains that it was not until December 2000 that they were able to purchase an A-Star helicopter, which was specially designed for the heavy lifting in oil and gas exploration. He testified that TNTA would have purchased the A-Star in December 1999 but for the fire and the business disruption that resulted.

[307] TNTA had initially ordered a Bell 407 for the oil and gas exploration work, but the TNTA position in the production line had been sold in 1998 in order to purchase an A-Star. Mr. Hoeller confirmed Mr. Kapty's evidence that the January 18, 1999 fire set the company back a year in the A-Star purchase. I find the purchase of the A-Star was delayed a year until December 2000. However, I do not find it appropriate to calculate losses into the 2001 year, except for the purpose of establishing the expected A-Star

loss for the year 2000. I also find that there was A-Star business for the year 2000 and that the work available for it in 2001 is the appropriate calculation. Thus, the lost contribution margin (revenue less variable costs) for 1999 and 2000 is a total of $1,147,884, as opposed to the $1,705,909 claimed by TNTA.

[308] I do not accept the claim in the Clark report for the defendants that would result in a lost contribution margin based on the downturn in the Yukon economy. The Clark report also based its calculation on a business interruption period from January 19, 1999 to June 10, 1999. I find this to be an unreasonably short period of disruption in the TNTA circumstance, where new aircraft parts and premises had to be arranged at the same time as maintaining the remaining helicopters.

[309] I accept the evidence that the Kaska oil and gas activity would have been available in 2000 and that an appropriate period of business disruption was January 19, 1999 to December 31, 2000. In my view, the helicopter business of TNTA was fully recovered by January 2001, when it occupied its permanent premises.

[310] In addition, TNTA claims a significant loss related to an increase in insurance premiums. Mr. Bethell, on behalf of TNTA, stated that the insurance premiums increased for two reasons: the January 18, 1999 fire loss and the June 2000 operational loss. The TNTA claim for increased insurance premiums is $735,800.

[311] The Clark report for the defendants claims that the increase in insurance premiums is attributable to the helicopter crash of June 2000 and not the Hangar C fire of January 18, 1999. The Clark report places the loss at zero to a maximum of $365,500. I am satisfied that the opinion of Mr. Bethell, who was the actual TNTA broker knowledgeable about TNTA’s insurance business, can be relied upon. His opinion is

supported by common sense, in that a devastating fire would inevitably result in an increase in insurance premiums when followed by an unrelated operational loss in June 2000. I find the insurance premium loss of $735,800 to be valid.

[312] The defendants claimed that the sum of $114,500, representing earned interest on insurance proceeds, be deducted from the TNTA business interruption loss claim. I am not aware of any authority for this proposition. It would seem quite inappropriate to penalize the plaintiff for interest earned on insurance proceeds that it contracted for and paid premiums on.

(e) Summary of Damages

[313] The TNTA damages awarded are as follows:

a)	Agreed Upon	$ 5,585,400
b)	Loss of Hangar C	$ 2,788,100
c)	Hangar C Parts and Accessories	$ 1,959,100
d)	Business Interruption Loss:	
	i) Lost contribution margin for 1999 and 2000	$ 1,147,884
	ii) Loss due to increased insurance premiums	$ 735,800
	TOTAL:	**$ 12,216,284**

[314] The damage claims for Summit Air, Almon Landair and Robert Cameron are as follows:

a)	Summit Air	$1,102,000
b)	Almon Landair Ltd.	$ 675,000 (USD)
c)	Robert Cameron	$ 58,500
	TOTAL:	**$1,160,500 (CAD)** **$ 675,000 (USD)**

[315] The plaintiffs shall have judgment against the defendants for the above damages. I award pre-judgment interest and counsel may speak to that issue, if necessary.

COSTS

[316] This trial has taken place over a period of three months. Although counsel made efforts to agree on many of the damages, liability was hotly contested and consumed the majority of trial time. The issues were complex and required a considerable amount of expert evidence. Causation was particularly complex. The plaintiffs shall have their costs against the defendants on scale five. Counsel may speak to any issues that arise on costs.

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VEALE J.