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Personal Submission of

Chaz Forsyth

(Citizen-ratepayer)

Dunedin City Council

Proposed District Plan Change 13

Hazardous substances

This is in lieu of **SUBMISSION FORM 5,** cited under Clause 6 of the First Schedule of the Resource Management Act 1991, as being the prescribed form for making submission on publicly notified proposed **District Plan Change 13 – Hazardous Substances**

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I **do** wish to be heard in support of this submission.

I would consider presenting a joint case with like-minded others at a hearing.

Specific provisions of Proposed District Plan Change 13 to which my submission relates are: Table 17.1 Explosives, p 17:38

My submission is that:

Preamble

I am a citizen-ratepayer aged 63, and have spent most of my life (including working life) in Otago, spending most of that time in and around Dunedin. I have been involved with recreational firearm use and with ammunition reloading in various forms for more than 40 years. I possess some qualifications pertinent to this discussion. I hold an arms licence issued under the Arms Act 1983 by the New Zealand Police and am a warranted firearm safety instructor of the New Zealand Mountain Safety Council. I also possess the following New Zealand Qualifications Authority qualifications of Ammunition Advisor, (NZ Arms Licence + Unit Standards (US) 9127, 9128 & 9129) and Firearms Safety Instructor (Arms Licence + US 9131 + 9720) and was accorded fellowship of the New Zealand Society of Gunsmiths in 2006.

Because of these limitations in my expertise, I shall confine my comments to class 1 hazardous substances, in particular, to those of class 1.1D, 1.3C and 1.4S.

It has long been stated that good law is simple law, making it easier for people to understand (enhancing compliance, minimising enforcement costs) and to follow. Complications tend to confound understanding, reducing clarity, generating incidental work for barristers and solicitors, and the confusion can lead to litigation, again a fruitful field through which barristers and solicitors happily trawl.

I refer to the grounds of need, mentioned in the Otago Daily Times of Saturday 03 December 2011, where a minister of the Crown rejected calls for the establishment of rules for monitoring private hire vehicle operators, "...on the grounds the matter is not yet a serious problem" (p. 9).

I refer to the grounds of enforcement difficulties, raised by a Dunedin City Councillor in the Otago Daily Times issue for Saturday 03 December 2011, where car parks have replaced the ride-share scheme. One of the grounds for the replacement was, they "...could not be easily enforced" (p.10).

As to the attempt to avoid every possible hazard, no matter how remote, I draw your attention to the Otago Daily Times of 02 December 2011, where the desire to add flood warnings to the Land Information Memorandums pertaining to Dunedin homes which was criticised on the grounds of attempting to "dodge every bullet that might ever possibly come its way" (p. 4).

It is surprisingly often that we find good intentions being confounded by bad ideas. We saw it with the "anti-smacking" legislation (the kids are still getting hurt and some are dying), and restrictions on ownership and use of inanimate chattels like knives, bayonets, swords, motor vehicles, firearms, explosives and so on.

It is sometimes hard to accept that it is not the equipment that makes bad things happen, it is bad people. The gear may make it easier to do bad things, but simply don't cause such events, even when used with malice or ignorance. The bottom line is that the education of citizens of good repute ("fit and proper") is far cheaper than the imposition of coercive measures for keeping us safe, even from ourselves. It may be noted too that even the existence of the most draconian of penalties do not deter offenders.

It is pertinent to reflect that the land area within Dunedin City is 95% rural, and measures approximately 100 km by 80km, making it the second largest territorial local authority in New Zealand. Amid all of this largely rural land area, live many hunters, shooters and farmers.

Support:

I support the provisions in **Table 17.1 as it deals with goods of class 1.3C, namely smokeless ammunition reloading powder in Group 1 zones.** My support arises because this is in accord with the provisions of Regulation 23 of the Hazardous Substances (Class 1 to 5 Controls) Amendment Regulations 2003 (SR 2003/177), this being found on p. 125 of the consolidated volume headed "SR 2001/116".

I have no objection to what is proposed for Group 2 zones, nor for Groups 3, 4, 5 and 7 zones. I am somewhat surprised at, but have no objection to the "No threshold" proposed for Group 6 zones.

Objections:

I have two objections:

1. I object to that portion of **Table 17.1 page 17:38 as it deals with goods of class 1.1D ("Gunpowder and blackpowder").** In particular, although this is the substance with which Guido Fawkes is reputed to have accumulated under the English Houses of Parliament more than four centuries ago, its hazard, clearly considered by the Hazardous Substances and New Organisms Act (1996) and subsequent Regulations, remains fixed at 15 kg nationwide.

Accordingly, my objection to this quantity, 5 kg, as proposed by Plan Change 13, is because it is only a third of what is allowed under the aforementioned Regulation 23 of the Hazardous Substances (Class 1 to 5 Controls) Amendment Regulations 2003 (SR 2003/177), this being found on p. 125 of the consolidated volume headed "SR 2001/116".

Gun (black) powder consumers tend to use more of the substance than users of more modern propellants do, this arising from the lesser efficiency (conversion of chemical energy into kinetic energy) of the older propellant. (This is one of the reasons smokeless propellants have become so much more widely used over the past 120 years). An outcome of this is that charges normally used in black powder firearms are approximately twice what those of more modern smokeless power firearms use, equating to approximately 5 grams (80 grains avoirdupois) per shot, instead of the more normal 2 to 3 grams (40 to 45 grains avoirdupois).

The involvement of cannon in various displays and celebrations requires greater quantities, requiring more stocks of gunpowder to be held by consumers of this class 1.1D product.

2 I also **object** to that portion of **Table 17.1 page 17:38** as it deals with **goods of class 1.4S**, "safety ammunition".

My reason for objecting to this part of the proposed Plan Change 13, is because it is only 40% of what is allowed under the aforementioned Regulation 23 of the Hazardous Substances (Class 1 to 5 Controls) Amendment Regulations 2003 (SR 2003/177), this being found on p. 125 of the consolidated volume headed "SR 2001/116".

It is appreciated that the quantity allowed is effectively an increase on what is currently permitted (when taken in conjunction with that for class 1.3C explosives), but in support of my observation, I would point to the following references which are attached to the rear of this submission as appendices:

1. SAAMI (undated, but circa 2000), *Small Arms Ammunition – Properties & Recommendations for Storage and Handling.* Small Arms Ammunition Manufacturers' Institute, Newtown, CT, USA.

2. Hampton, H. (1977), Facts About Sporting Ammunition Fires, in *Fire Journal*, January 1977, pp 1 – 6, National Fire Protection Association, Quincy, MA, USA.

3. Hatcher, J.S. (1962), *Hatcher's Notebook – A Standard Reference Book for Shooters, Gunsmiths*, Ballisticians, Historians, Hunters and Collectors. The Stackpole Company, Harrisburg, PA, USA. (pp 531 – 540).

These references all indicate that safety cartridges, commonly known as small arms ammunition, items of hazard class 1.4S, have long been recognised as a product which will NOT mass explode, is NOT super-sensitive, and when exposed to fire, does not produce fragments beyond a maximum of 15 m (50 feet), these being of such small size as to be contained by cardboard cartons, as Hatcher (1962)(pp 539, 540) attests.

The quantity suggested by proposed Plan Change 13 perhaps coincidentally matches the quantity allowed on "passenger service vehicles", and as transportation is a more hazardous undertaking than

mere storage of an already-recognised safe good, it remains puzzling as to why 15 kg, not the 25 kg maximum as stated by Regulation 23 of the Hazardous Substances (Class 1 to 5 Controls) Amendment Regulations 2003 (SR 2003/177)(p. 125)(SR 2001/116) is not observed.

More recent material from the US Small Arms Ammunition Manufacturing Institute (SAAMI) (1977) is just as authoritative and reliable, noting the absence of mass explosion hazard in testing undertaken by SAAMI, in one instance at the behest of the City of Chicago Fire Prevention Bureau. A comprehensive test programme involving the combustion of more than 140,000 rounds of ammunition showed an "extreme unlikelihood" of mass explosion, much noise akin to "popping corn" and "minimal missile hazard" from such conflagrations.

It is possible that the DCC, the first to suggest such a change, could be a 'pilot' for territorial local authorities, which if allowed to proceed, could become the model for the rest of the country. This is inferred from the justifications offered in notes released to the news media, where comparisons are made with measures taken by adjoining territorial local authorities.

Closer exploration of these territorial local authorities for controls on hazardous goods reveals the following:

Central Otago District: class 1 hazardous substances are (from the schedule supplied) as per Explosives Act (1957), with only two classes of materials, only the latter (' 1b) being designated for firearm use and without reference otherwise to safety cartridges (email of 08DEC2011 from Felicity Couper).

Clutha District: all class 1 goods are at levels set by HSNO Act (1996) and Regulations, telecon Forsyth/Brass of 1630/05DEC2011.

Waitaki District:...tba

Queenstown Lakes District: advised that HSNO levels prevail (email of 08DEC2011 from Keri Harrison).

Other territorial local authority areas examined worked from the following provisions:

Christchurch City Council: all class 1 goods for residential areas are at levels set by HSNO Act (1996) and Regulations (telecom L Osmers 1010/05DEC2011).

New Plymouth District Council: all class 1 goods are at levels set by HSNO Act (1996) and Regulations.

Wellington City Council: all class 1 goods are at levels set by HSNO Act (1996) and Regulations.

I seek the following decision from the Council

- In connection with my **support for the provisions in Table 17.1 as it deals with goods of class 1.3C,** namely smokeless ammunition reloading powder in Group 1 zones, I would like the **Council to retain the measures as proposed for residents of Group 1 zones** by District Plan Change 13.

- In connection with my **objection to that portion of Table 17.1 page 17:38 as it deals with goods of class 1.1D ("Gunpowder and blackpowder"),** I would like the **Council to change the quantity lawfully able to be held by residents in Group 1 zones from 5 kg to 15 kg** in accord with the HSNO Regulations (2003).

- In connection with my **objection to that portion of Table 17.1 page 17:38 as it deals with goods of class 1.4S ("safety ammunition"),** I would like the **Council to change the quantity lawfully able to be held by residents in Group 1 zones from 15 kg to to 25 kg** in accord with the HSNO Regulations (2003).

C I H Forsyth 09DEC2011

BA, Dip Grad (Economics), NZCE (Civil), Dip Tchg (Secondary), Dip Sp Stds (Secondary)

Appendices: (attached)

1. SAAMI (undated, but circa 2000), *Small Arms Ammunition – Properties & Recommendations for Storage and Handling*. Small Arms Ammunition Manufacturers' Institute, Newtown, CT, USA.

2. Hampton, H. (1977), Facts About Sporting Ammunition Fires, in *Fire Journal*, January 1977, pp 1 – 6, National Fire Protection Association, Quincy, MA, USA.

3. Hatcher, J.S. (1962), *Hatcher's Notebook – A Standard Reference Book for Shooters, Gunsmiths*, Ballisticians, Historians, Hunters and Collectors. The Stackpole Company, Harrisburg, PA, USA. (pp 531 – 540).

4. Otago Daily Times of Saturday 03 December 2011, (p. 9).

5. Otago Daily Times issue for Saturday 03 December 2011, (p.10).

6. Otago Daily Times of Friday 02 December 2011, (p. 4).

APPENDICES

FORSYTH, DCC PC #13

Appendix 1

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SAAMI®

SPORTING ARMS AND AMMUNITION MANUFACTURERS' INSTITUTE, INC.
SINCE 1926

SMALL ARMS AMMUNITION

Properties & Recommendations for Storage & Handling

11 Mile Hill Road, Newtown, CT 06470-2359

Ammunition stored in the home, retail outlet or distributor's warehouse over extended periods in factory packaging, subject to the ordinary variations of temperature and humidity ranging from tropic to Arctic conditions, can be expected to perform satisfactorily and safely in the firearms for which it was intended if such firearms are in proper working order and condition. Extreme high temperatures (over 150° F) however, should be avoided.

Ammunition should not be immersed in water or exposed to any organic solvent, paint thinner, petroleum product, ammonia, etc. Such materials may penetrate a loaded round and reach the powder or primer; a deteriorating effect will result which may cause misfires or squib shots. The latter can result in a projectile's lodging in a gun barrel, the obstruction possibly causing serious damage or injury when another shot is fired.

Ideally, home storage of small arms ammunition is in a locked closet or cabinet out of the reach of children and uninformed or incompetent persons. Both guns and ammunition should be stored out of sight and reach of children and others not physically or mentally capable of giving them correct, proper use and respect.

Storing guns and ammunition in locked auto trunks may be convenient, or required by state or local law, during short periods when moving to and from the hunting field or target range. The possibilities of extremely high temperatures make it sensible to remove firearms and ammunition from vehicles following the trip. The passenger compartment of a closed car when exposed to the sun often develops an extreme high temperature and is thus not a desirable spot to leave ammunition.

While blank cartridges will not mass detonate if one in a box is caused to fire, the noise of firing outside a gun will be nearly as loud as in normal use and may be harmful to hearing.The blank's "explosion" may also be rather violent due to rapidly expanding gasses released during burning. Obviously, blank cartridges deserve the same respectful handling and careful storage as other ammunition.

Retail and wholesale stocks of ammunition, not required for display, should be stored in original outer cartons or boxes exactly as supplied by the factory. When placed on basement or warehouse floors subject to moisture it would be well to stack the cartons on pallets. In some locations police or public security regulations may prescribe the manner in which small arms ammunition stocks are displayed and the quantity that may be in sight. Check with local authorities. Packages of ammunition should not be placed in proximity to heavily trafficked aisles in the reach of children.

Small Arms Ammunition in a Fire

Although much has been written and rumored about the 4th-of-July characteristics and so-called havoc of ammunition in fires, it just isn't so. Members of fire fighting units are understandably uneasy when confronted by fires where ammunition is involved.

Several members of the Sporting Arms and Ammunition Manufacturers' Institute have undertaken extensive experiments to show what can be expected when ammunition is involved in a fire. These companies have also made careful investigations after such fires, which show that the missiles do not have sufficient energy to penetrate the garments and protective gear worn by fire fighters.

Tests also show that the whizzing sound heard in the vicinity of ammunition fires are caused by primers expelled from the burning cartridges. The "pops" and "bangs" are exploding primers; the propellant powders burn inefficiently and make little noise.

Metallic cartridges in a fire are difficult to sustain in a burning condition once the packing materials have been consumed due to the cooling effects of the metal parts and the relatively high ratio of metal weight to smokeless powder. Only a vigorous fire around metallic ammunition stocks will cause all cartridges to burn. Shotshell ammunition is difficult to ignite, but once ignited it will sustain its own burning due to the plastic or paper tubes (hulls).

Disposal of Unservicable Ammunition

Ammunition that has been in a structural fire, and has become wetted or scorched, or has been exposed to flood waters should never be returned to commercial sales channels or sold at salvage sales, since it could be rendered dangerous to the shooter by such exposure. It should be scrapped.

Never dispose of ammunition by burying it or dumping it in a waterway. It may be retrieved years later, fully "live," and pose dangers to children or uninformed persons.

Under most circumstances, unservicable ammunition may be scrapped by returning it to the manufacturer. Written permission should first be obtained from the Product Services Manager of the manufacturer before shipment is made. If the manufacturer is not known, contact SAAMI at the address listed on the cover of this brochure.

Know the Following
RECOMMENDATIONS ON STORAGE AND HANDLING
Issued by the National Fire Protection Association
Battery March Park, Quincy, MA 02269 and reprinted with their permission:

NFPA 495

Explosive Materials Code

Chapter 11
Small Arms Ammunition and Primers, Smokeless Propellants, and Black Powder Propellants

11-1 Basic Requirements.

11-1.1 In addition to all other applicable requirements of this code, intrastate transportation of small arms ammunition, small arms primers, smokeless propellants, and black powder shall comply with US Department of Transportation Hazardous Materials Regulations, 49 CFR, Parts 100-199.

11-1.2 This chapter applies to the channels of distribution of and to the users of small arms ammunition, small arms primers, smokeless propellants, and black powder.

11-1.3 This chapter does not apply to in-process storage and intra-plant transportation during manufacture.

11-1.4 This chapter applies to the transportation and storage of small arms ammunition and components.

11-1.5 This chapter does not apply to safety procedures in the use of small arms ammunition and components.

11-2 Small Arms Ammunition

11-2.1 No restrictions shall be imposed on transportation of small arms ammunition other than those imposed by the US Department of Transportation or by the presence of other hazardous materials.

11-2.2 No quantity limitations shall be imposed on the storage of small arms ammunition in warehouses, retail stores, and other occupancies other than those imposed by limitations of the storage facility and by public safety regulations.

11-2.3 Small arms ammunition shall be separated from materials classified by the US Department of Transportation as flammable liquids, flammable solids, and oxidizing materials by a distance of 15 ft (4.6 m) or by a fire partition having a fire resistance of at least 1 hour.

11-2.4 Small arms ammunition shall not be stored together with Division 1.1, Division 1.2, or Division 1.3 Explosives, except where the storage facility is suitable for the storage of explosive materials.

11-2.5* Small arms ammunition that has been exposed to fire or damaged by exposure to water shall not be returned to commercial channels for reasons of consumer safety. The manufacturer shall be contacted to obtain recommendations for disposal of damaged ammunition.

Firearms Safety Depends on You

1. Always Keep the Muzzle Pointed in a Safe Direction
This is the most basic gun safety rule. If everyone handled his firearm so carefully that the muzzle never pointed at something he didn't intend to shoot, there would be virtually no firearms accidents. It's as simple as that, and it's up to you.

2. Firearms Should Be Unloaded When Not in Use
Firearms should be loaded only when you are in the field or on the target range or shooting area, ready to shoot.

3. Don't Rely on Your Gun's Safety
The safety serves as a supplement to proper gun handling, but it is not a substitute for common sense. You should never handle a gun carelessly and assume that the gun won't fire just because the "safety is on."

4. Be Sure of Your Target and What Is Beyond It
Once a gun fires, you have given up all control over where the shot will go or what it will strike. Don't shoot unless you know exactly what your shot is going to strike.

5. Use Correct Ammunition
Improper or incorrect ammunition can destroy a gun and cause serious personal injury.

6. If Your Gun Fails to Fire When the Trigger Is Pulled, Handle with Care!
Occasionally, a cartridge may not fire when the trigger is pulled. If this occurs, keep the muzzle pointed in a safe direction. Keep your face away from the breech. Then, carefully open the action, unload the firearms, and dispose of the cartridge in a safe way.

7. Always Wear Eye and Ear Protection When Shooting
Exposure to shooting noise can damage hearing, and adequate vision protection is essential. Shooting glasses guard against twigs, falling shot, clay target chips, and the rare ruptured case or firearm malfunction.

8. Be Sure the Barrel is Clear of Obstructions Before Shooting
Even a small bit of mud, snow, excess lubricating oil, or grease in the bore can cause dangerously increased pressures, causing the barrel to bulge or even burst on firing, which can cause injury to the shooter and bystanders.

9. Don't Alter or Modify Your Gun, and Have Guns Serviced Regularly
Do not jeopardize your safety or the safety of others by altering the trigger, safety, or other mechanism of any firearm or allowing unqualified persons to repair or modify them.

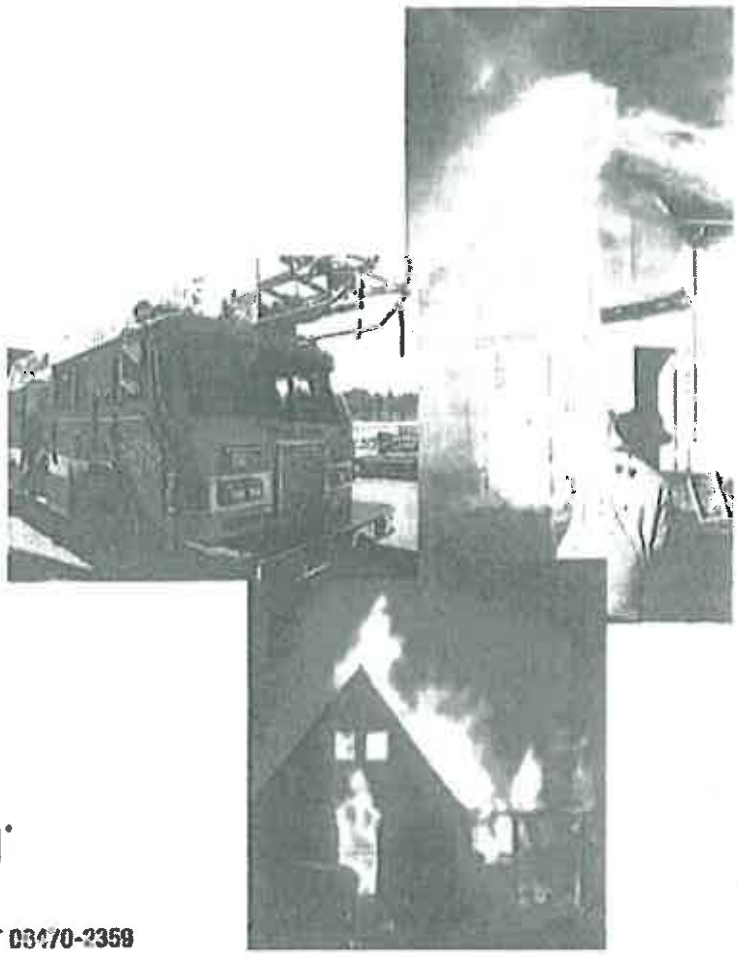
10. Learn the Mechanical and Handling Characteristics of The Firearms You are Using
Since guns can be so different, no person should handle any firearm without first having thoroughly familiarized himself with the particular type of firearm he is using, the safe gun handling rules for loading, unloading, carrying, handling that firearm, and the rules of safe gun handling in general.

Forsyth, DCC PC #13
Appendix 2

11

Facts About Sporting Ammunition Fires

By Harry Hampton



SAAMI
11 Mile Hill Road • Newtown, CT 06470-2359

THE SPORTSMEN AND HUNTERS OF North America shoot billions of cartridges and shotshells with their firearms annually. To enjoy hunting, marksmanship competition, trap and skeet shooting, and other recreational activities involving lawful use of rifles, shotguns, and handguns, the sportsman-shooter must be able to purchase ammunition of the particular type needed for his gun and the sport that he is pursuing.

To supply his requirements for ammunition, a sizable distribution system is necessary to provide transportation, warehouse storage, and retail stocking of ammunition. Currently there are more than 450 different ammunition items that the shooter can buy, depending on his needs and preferences. This diversity obliges the channels of trade to carry a relatively large supply of ammunition to satisfy their customers' needs.

Is there a fire hazard posed by these large supplies of sporting ammunition in warehouses and retail stores? What, if any, danger do these stocks of ammunition pose to the public and to fire-fighting personnel in the event of a fire in these establishments? Should municipal fire prevention ordinances limit quantities of ammunition that may be stored in a single structure in the interest of public safety?

Experience and tests over the last half-century clearly demonstrate that sporting arms ammunition stocks do not constitute a fire hazard of any great significance. Cartridges are considerably less combustible than many retail items, including dry goods, wooden articles, oil and alkyd-base paints and their thinners, and aerosol preparations. The ignition point of ammunition is much higher than that of these items and most types of ammunition will not even maintain combustion if ignited. To burn them requires help from adjacent combustibles.

But what if the structure containing ammunition burns and the ammunition supplies burn along with it? Are the effects of such a fire similar to the effects of hundreds of shotguns and rifles discharged in all directions as fast as their triggers can be pulled? The answer is an emphatic NO!

Ammunition fired in the open, not enclosed in a gun's chamber, discharges with such inefficiency that the projectile will not even penetrate an ordinary fiberboard shipping container panel at very close range. When not strongly and tightly confined, smokeless propellant powders burn relatively slowly and do not explode as we know they do when fired in a gun. Pressure within a cartridge case must build up to several thousand pounds per square inch to cause the cartridge to discharge as it does in a gun. Unless it is tightly confined, as in a gun chamber, no ammunition shell case will withstand the growing pressure of gases generated by burning propellant powder without bursting before the bullet or shot is expelled with violence or velocity.

Newspaper accounts of fires in hardware and sporting goods stores often tell of "whizzing" bullets or ammunition flying from the store windows, spraying the area with a devastating barrage. Yet miraculously, no one is ever seriously wounded or killed by the spray of bullets and shot. The fact is that bullets and shot are not projected at velocities higher than you could throw them by hand. The whizzing sounds that are reported are, for the most part, primer cups being popped from shells. Because they are of relatively low mass, they have very little energy, short range, and practically no penetrating power.

In 1974, the City of Chicago contemplated a fire protection ordinance to limit severely the stores of sporting ammunition permitted in commercial establishments. Local wholesale and retail outlets challenged the proposal, and the Court asked the Fire Prevention Bureau to determine what degree of hazard is involved in a structural fire involving ammunition. The Sporting Arms and Ammunition Manufacturers' Institute (SAAMI) volunteered to help the Chicago Fire Prevention Bureau obtain factual data to present to the Court.

SAAMI technical experts met with Chicago Fire Prevention Bureau engineers and a test program was developed. A location for the

tests was selected on abandoned powder mill, property of the Olin Corporation's Winchester-Western Ammunition Works near East Alton, Illinois. The test program agreed upon is summarized as follows:

1. Burn a frame structure containing packed sporting ammunition and observe the effects of the burning ammunition on the overall intensity of the fire and judge as to hazards to personnel and adjacent property.
2. Burn packed ammunition in an open area to assess missile hazard.
3. Burn packed sporting ammunition in a fire-resistant structure that provides close confinement and determine if build-up of heat and pressure in the close confinement increases the rate and intensity of burning, or possibly causes mass explosion.
4. Subject packed ammunition to severe shock to determine if any cartridges in the packages will fire; in the event they do fire, do they cause other cartridges in the container to fire?

Ammunition for the experiments was supplied by the four ammunition manufacturers who are members of SAAMI. A total of 111 cases of sporting ammunition containing 145,500 rounds representing most of the popular types and brands of shotgun shells, rimfire cartridges, centerfire pistol or revolver cartridges, and centerfire rifle cartridges were consumed in the series of experiments. This ammunition contained approximately 272 pounds of smokeless propellant powder and 9.2 pounds of priming compositions.

The experimental program, conducted October 2, 1974, was witnessed by Chicago Fire Prevention Bureau personnel and fire chiefs from several other cities, representatives from SAAMI and each of the member companies participating, as well as from the NFPA and the local press.

Ammunition in a Burning Structure

An abandoned manufacturing building scheduled for demolition was used in this experiment. It was a solidly-built frame structure, 20-feet-by-24-feet, 1 ½ stories high on a concrete pad, of wood sheathing with tar paper exterior, and a steeply pitched asphalt shingle roof. There were fourteen 3-foot-by-6-foot wooden sash glass windows and a 15 foot ceiling. The ammunition listed below was stacked inside the building near the left-rear corner, on a wooden platform.

24 cases shotshells	12,000 rounds
12 cases centerfire rifle cartridges	12,000 rounds
4 cases centerfire pistol or revolver cartridges	8,000 rounds
7 cases 22 rimfire cartridges	35,000 rounds
47 cases	TOTAL: 67,000 rounds

A large quantity of scrap lumber and fiberboard packing materials was piled adjacent to and under this ammunition. Fuel oil was poured over some of the scrap lumber. Fire was initiated by an electric squib in a small sack of black powder placed in a small pile of smokeless powder near the oil-soaked wood.

Sounds of ammunition "popping" began approximately one minute after ignition, and the "popcorn popping" effect lasted for 20 minutes, at which time the building was almost completely consumed. Olin Fire Protection Department personnel extinguished the blaze at that time. They had been spraying the adjacent trees behind the building from a distance of approximately 35 feet to prevent spread of the fire to the timbered area.

Fire-fighting personnel were as close to the building as the heat would allow during the height of the fire, while the ammunition was popping. They could have extinguished the fire with water from hoses at the scene, if they had so desired. No missile problems were encountered. They wore standard fire-fighter's rubberized coats and knee-high rubber boots, and their faces were protected by plastic face shields that extended from their helmets.

After extinguishing the fire, the witnesses searched the surrounding area for missiles. They found some cartridge shells as far as 135 feet from the fire. During the fire it was evident that smoking primer cups and cartridge shells were individually being thrown from the fire in an arcing trajectory. There

was no audible evidence of ammunition exploding en masse during the fire. The din of the "popping" was quite loud from a distance of approximately 100 feet, where most of the observers stood. Relatively few projectiles (bullets) were observed or found at distances of more than 40 or 50 feet from the fire's site.

Open Burning of Ammunition to Assess Missile Effects

This experiment was conducted to determine the extent of missile projection and the penetration effects from a fire involving sporting ammunition.

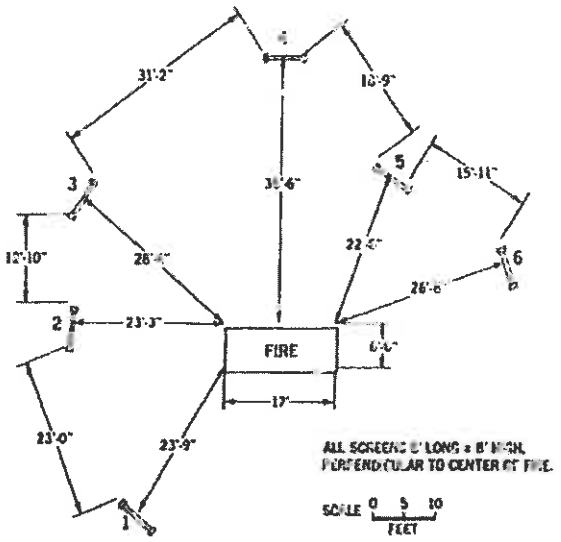
Cased ammunition was stacked on wooden pallets supported about three feet above ground level by concrete blocks. A large amount of oil-soaked scrap lumber was placed under and around the pallets to provide a hot fire. The area was flat and open, encircled on about half its perimeter by a wooded embankment 20 yards or more from the fire. The following stores of ammunition were consumed in this test:

22cases shotshells	11,000 rounds
11 cases centerfire rifle cartridges	11,000 rounds
3 cases centerfire pistol or revolver cartridges	6,000 rounds
6 cases 22 rimfire cartridges	30,000 rounds
42 cases	TOTAL: 58,000 rounds

To assess missile effects from the fire, six witness screens were deployed at various distances, facing the fire in a semicircular arrangement. Eight-foot-square frames of two-by-fours were covered on one side by tent canvas (15.7 oz/yd.) with the backs covered by ¾ inch Cellotex® insulation board. The canvas simulated protective outer clothing ordinarily worn by fire service personnel. The insulation board was used to show by depth of penetration of the missiles the relative velocity or wounding power of projected missiles that might puncture the canvas.

After ignition by the same procedure used in the building-burning experiment, the fire proceeded rapidly and burned for 23 minutes, after which the smoldering remains were extinguished by Olin Fire Protection

Figure 1



Department personnel. Cartridges started popping one minute after ignition and popped steadily until the fire was extinguished. The popping created considerable din during the apex of the fire. Some observers standing about 150 feet away reported that a few missiles dropped in their vicinity, and at least one observer standing about 75 to 100 feet from the blaze said that he was hit harmlessly by a missile.

The witness screens were located at distances from the fire that varied from 22½ feet to 38½ feet, as shown in Figure 1.

After the fire subsided, the observers examined the witness screens. A more thorough assessment was made a few days later; the results are tabulated in Table 1.

Nearly all punctures of the canvas were made by primer cups. A few punctures were caused by small flying shards from ruptured cases of metallic cartridges. One "spitzer"-type small caliber bullet pierced the canvas and was "trapped" in the fabric. No other bullets penetrated the canvas or the Cellotex® boards. Penetration depths recorded in the boards and observation of the canvas punctures lead observers to the conclusion that no serious wounds would have been sustained by fire-fighting personnel struck by missiles

from a fire involving sporting ammunition at distances beyond 50 feet, if standard protective garments and face masks were worn. This observation is substantiated by the experience of sporting-ammunition manufacturers over the past half-century and more. It reflects precisely the industry's knowledge concerning fires involving military stores of small arms ammunition.

Table 1

Screen #1 23' 9" from fire center
Punctures in canvas upper half — 4
lower half — 6
Depth of penetration in Cellotex® Max. 3/32"
Min. 1/16"

Screen #2 23' 3" from fire center
Punctures in canvas upper half — 6
lower half — 14
Depth of penetration in Cellotex® Max. 3/32"
Min. 1/16"
Two large rifle primer cups and one small pistol primer cup stuck in the insulation board to a depth of 1/4".

Screen #3 28' 4" from fire center
Punctures in canvas upper half — 47
lower half — 25
Depth of penetration in Cellotex® Max. 3/32"
Min. 1/16"
One shot shell primer cup stuck in the Cellotex® which had penetrated to a depth of 3/32".

Screen #4 38' 6" from fire center
Punctures in canvas upper half — 6
lower half — 4
Depth of penetration in Cellotex® Max. 3/32"
Min. 1/32"

Screen #5 22' 6" from fire center
Punctures in canvas upper half — 11
lower half — 7
Depth of penetration in Cellotex® Max. 3/32"
Min. 1/32"
One shot shell primer cup and one small rifle primer cup stuck in the Cellotex® to a depth of 5/32".

Screen #6 26' 8" from fire center
Punctures in canvas upper half — 35
lower half — 17
Depth of penetration in Cellotex® Max. 1/4"
Min. 1/16"
Two shot shell primer cups and one large rifle primer cup stuck in Cellotex® to depth of 3/32". One sliver of metal penetrated 1/4".

Burning Ammunition in Close Confinement

To simulate an ammunition fire in relatively close confinement, as might be encountered in a small basement storage room, a cubical concrete block structure six feet square and five feet high was constructed. A heavy steelmesh grille was supported by concrete blocks about two feet off the concrete floor. Cased ammunition was stacked on the grille. Oil-soaked scrap lumber beneath the grille provided a hot ignition fire.

Quarter-inch-thick flat boiler plates were placed over the top of the structure. One missing concrete block at the bottom-center of the structure provided necessary air draft to support combustion The leakage around the edges of the boiler plate "lid" provided the only exit for the products-of-combustion. The ammunition of various types and brands consumed in this test is listed below.

20 cases shotshells	10,000 rounds
3 cases centerfire rifle cartridges	3,000 rounds
3 cases centerfire pistol or revolver cartridges	6,000 rounds
3 cases 22 rimfire cartridges	15,000 rounds
29 cases	TOTAL: 34,000 rounds

Ignition was provided by the method used on the frame building. Cartridges started "popping" three minutes after ignition and continued a steady popping for 36 minutes. Dense gray smoke curled out of the structure, and "puffs" or minor gas explosions were observed, resulting from the ignition of accumulations of combustible gases above the fire in the relatively tight structure. The combustible gases were probably produced because insufficient air was provided to support complete oxidation of the combustibles. The heat of this fire was intense enough to cause the steel grille to collapse, and several small cracks developed in the mortar joints between some of the concrete blocks. Some missiles were projected from the fire through the opening at the bottom of the structure. A few of these were projected approximately 100 feet from the structure. There was no evidence of mass propagation of the ammunition in this fire.

Experiments of Severe Shock to Packed Ammunition

These experiments were conducted to determine the capabilities of packed ammunition to sustain severe shock without cartridges firing, and to determine if one shell firing in a container will "propagate" or cause others in the container to fire, which might cause mass explosion of the contents. Three types of experiments were conducted to investigate these phenomena: drop tests, rifle bullet impact tests, and firing a cartridge by remote control while it is in normal position within a container.

One case of 500 12-gauge shotshells, one case of 5,000 22-caliber long rifle rimfire cartridges, and one case of 1,000 30-30 centerfire rifle shells were raised in a derrick's clamshell to 30 feet above a concrete pad and dropped. The impact on the concrete caused the containers to break open and some of the contents to scatter, but no cartridges fired.

A much more severe experiment to determine the possibility of mass propagation was conducted by shooting highpower rifle bullets into cases of ammunition. One case each of 1,000 30-06 centerfire rifle cartridges, 500 12-gauge shotshells, and 5,000 22 long rifle rimfire cartridges were used in these experiments. 308 Winchester 150-grain soft point ammunition was fired from a rifle into each case at a range of 35 yards.

The case of rifle cartridges was struck twice, once on case-end center and again on case-end off-center. A puff of smoke was emitted from the case on each shot; on the second shot, a top flap of the case was jarred open. The bullet exits at opposite ends of the case produced a tear. Observers opening this case found that considerable damage was done to the, cartridges by the two expanding bullets, and that several cartridges within the shipping container had indeed fired, but there was no evidence of propagation — i.e., the discharge of one cartridge did not cause any of the adjacent rounds to fire.

The case of shotshells was hit three times on the case-end and on the side, a puff of smoke resulting on each impact. A corner of the case was torn off by the exit of one of the expanding bullets on the opposite end. Again, damage to the contents was extreme, caused by the expanding bullets' shock waves of energy. Several rounds within the case did fire, but again, there was no evidence of propagation.

The case of 22 long rifle rimfire cartridges was hit at the case-end centrally and again on the bottom. The exit of the bullets from the opposite side of the case produced a hole in the container about two inches square. Puffs of smoke were emitted on each impact. Inspection of the contents revealed considerable damage to the contents and several cartridges fired. There was no evidence of propagation.

A test criterion has been established for packed sporting ammunition by the United Nations Committee on Transport of Dangerous Goods. In order that the product may be classified as "safety explosives" and be transported without restriction as to quantity, it must meet a test whereby the firing of a single cartridge located centrally within the sealed shipping container results in total confinement of any explosion occurring within the container. The codes of this international body apply to international shipment of dangerous goods.

This test was performed on a case of shotshells, using electric ignition to fire shells located near the center of a regular case containing 500 rounds. Primers were specially prepared with a small hole in the center of the crown of each primer cup through which the priming charge was exposed. Shotshells were loaded with these special primers. Electric squibs were taped to each shell head so that on firing, the flash would impinge on the exposed priming mixture. This in turn fired the propellant powder in each shell.

Two shells so prepared were placed in a box of 25 shells in the normal position, with a regular shell between the two. The wires to the squibs were led out of the box through punctured holes in the inner case wall and through the top flaps of the case. The box was in the bottom layer, placed so that the test shells would be centrally located in the case. Nineteen more boxes of regular ammunition were packed and sealed to simulate a factory-

packed container (case) of shotshell ammunition ready for shipment.

When the electrically ignited squibs fired, there was a muffled report, and a puff of white smoke was observed. The case remained intact and was not punctured by explosion or debris from the firing. Examination of the contents showed that both shotshells had fired as they would be expected to fire without confinement in a gun chamber. No other shells had been caused to discharge by the two squib-ignited shells. Thus, the test would have qualified the commodity as "safety explosives" under the United Nations code.

Comments and Conclusions

1. This series of experiments confirmed the assertion that mass detonation of sporting ammunition in a fire is extremely unlikely, an assertion substantiated by all previous experience of the sporting ammunition industry. This characteristic results from the dilution effect of inert portions of sporting ammunition cartridges that separate the propellant and ignition charges into small increments, coupled with the fact that smokeless propellants burn relatively slowly and inefficiently at the low pressure levels generated before shell case failures occur. Even under extreme conditions of heat and confinement created in the close confinement burning test, there was no indication of either mass detonation or explosion.
2. Ammunition fires are noisy, generating the amplified sound of "popping corn." Confronted by such sound levels, fire protection personnel understandably could be unnerved if they were not accurately informed of the nature of the fire being fought.
3. Missile hazard is minimal even at relatively short distances from a fire involving sporting ammunition. The missiles of highest velocity are the primer cups which, because of their poor aerodynamic shape and light weight, lose velocity rapidly. At very close distances they could cause superficial flesh wounds. The heavier bullets, shot charges, and shell cases are not ejected from an ammunition fire at velocities sufficient to cause them to penetrate canvas screens within 25 feet of a fire.

It is obvious, however, that the face and exposed portions of the body must be protected. This protection is usually provided by face masks and protective clothing normally worn by fire protection personnel.

This article was prepared by the staff of the Sporting Arms and Ammunition Manufacturers' Institute based on the tests described, the present state of knowledge and experience, and observations in the industry that span four decades. It is being published in the interests of safety, but is not intended to be comprehensive or to modify or supersede safety suggestions, standards, or regulations made by competent authorities, public or private. The Institute expressly disclaims any warranty, obligation or liability whatsoever in connection with the information contained herein or its use.

It should be noted that the tests described in this article involved factory-loaded ammunition, manufactured by members of the Institute and packed in containers approved by the Department of Transportation. In none of the tests were separate stores of ammunition components such as primers, smokeless powder, and black powder present. Likewise, there were no stocks of other flammable or hazardous commodities ordinarily sold by hardware and sporting goods distributors, such as propane tanks, paints, solvents, thinners, and products in aerosol cans.

Chapter 11 of NFPA 495-1996, *Explosive Materials Code*, details recommendations that should be followed precisely for storage and handling of small arms ammunition, small arms primers, and propellant powders. As a matter of normal operating procedure, fire protection units are advised to acquaint themselves with the storage and sales facilities of distributors and retailers of these commodities.

Forsyth, DCC PC #13 APPENDIX 3 10

THE STACKPOLE COMPANY
HARRISBURG, PENNSYLVANIA

A Standard Reference Book for Shooters, Gunsmiths, Ballisticians, Historians, Hunters and Collectors

By JULIAN S. HATCHER
Major General, U. S. Army, Retired

HATCHER'S NOTEBOOK

FIRST EDITION
First Printing, August, 1947
Second Printing, July, 1948
Third Printing, April, 1952

SECOND EDITION
First Printing, October, 1957

THIRD EDITION
First Printing, January, 1962
Second Printing, April, 1966

Library of Congress Catalog Card Number: 62-12654

Printed in the United States of America
By THE TELEGRAPH PRESS, *Established 1831*
Harrisburg, Pennsylvania

in glass jugs, as is so often the case, is negligible as a fire hazard. In case of a fire, nothing can happen until the flames actually lick the container for some time; then all that happens is a ball of flame several feet in diameter, and lasting not much over a second. Should flames come in contact with a gallon jug of gasoline, the jug will eventually crack, the gasoline will run out, and there will be an enormous volume of flame which will last long enough to ignite everything on that floor with great thoroughness.

An acquaintance of mine told me, with some embarrassment, of a gasoline incident that happened to him. He had gasoline for a power lawnmower in a 1-gallon glass jug. Desiring to clean some tools with it, he brought it into the basement workshop where he had been doing some handloading. As he tipped the jug up to pour out some gasoline, the jug struck lightly against a bench vise, and cracked wide open, and the gasoline poured out on the basement floor and ran over toward the furnace. In just an instant, there was a loud pouff, and the basement floor was covered with a sheet of flame, the gasoline vapor having ignited from the furnace. My friend rushed out of the room, closed the door, and phoned the fire department. After the fire was out, it was found that the handloads that had been left standing base down on the bench had been burned, and had gone off, but a sheet aluminum air duct just above them was unmarked.

To sum up; small arms powder properly packed in the factory containers, and in small quantities is not a fire hazard. It is however, smart to keep it where fire cannot get at it. My friend W. E. McNellis, of Gallup, N. M., an avid handloader, keeps his powder in old abandoned refrigerators which he purchases for a few dollars from the local junkman. He knocks off the latch, so no children can lock themselves in, then fits a hasp and padlock, and keeps these refrigerators with powder in them in his back yard. This method has the advantage of keeping the powder temperature even. A short time after he adopted this system a fire occurred which burned several buildings adjoining his back yard, but the powder was safe inside the refrigerators.

Small Arms Ammunition as a Fire or Explosion Hazard

Enough experiments have been made on this subject so that almost any question that might arise can be answered with definite information based on tests. As for any possible explosion hazard from small arms ammunition, even in large quantities, it can be said with confidence that there is no such danger. Much information on this subject is contained in a small but highly authoritative pamphlet issued Jan. 12, 1956, by the Sporting Arms and Ammunition Manufacturers' Institute, 250 East 43rd Street, New York 17, N. Y.

As stated on the title page of this pamphlet, it illustrates and describes a series of very severe and thorough tests made for the purpose ascertaining whether or not small arms ammunition is

dangerous to handle in warehouses or freight stations, on docks and wharves, or in transit by rail, water truck, and by air, when subjected to rough or careless handling, falls, shock or fire.

A large shipping container full of cartridges was hoisted up to a height of 30 feet over a solid concrete block, and dropped. The wooden case was shattered to pieces, but no explosion occurred, though some of the cartridges were mutilated by the sheer force of the impact.

A freight car with the entire floor covered with cases of .22 caliber cartridges, 10,000 to a case, was subjected to such rough treatment that many of the wooden cases were broken open or shattered: but there was no explosion.

The ability of small arms ammunition to take a terrific shock without exploding was shown by firing a .30 caliber rifle bullet into a full case of the blank cartridges used for actuating stud drivers and similar powder operated tools. These do not contain bullets; the space otherwise occupied by the bullet contains extra powder instead, so these cartridges would seem to be the most likely to cause trouble in such a test.

There was a small burst of flame at the instant of impact, but no explosion or fire occurred though the case was burst open and the cartridges were scattered around from the impact of the bullet. This test was made on both fibreboard and wooden packing cases full of ammunition, with the same result. Out of the 10,000 cartridges contained in one case, 176 were damaged by the impact of the bullet; 130 fired; and 9694 were completely unaffected.

A standard shipping case containing 500 12-gauge shotgun shells had 2.30 caliber bullets fired into it from a distance of 50 feet. Both bullets penetrated into the first and second cartons nearest the point of entrance, causing several of the cartridges in these two cartons to burn. White smoke issued from the case for an instant after each bullet hit, but the case was not distorted, and there was no communication of fire to the rest of the case.

A case of 10,000 .22 caliber rim fire cartridges was fired into by a high powered rifle from a distance of 100 yards. The case was burst open by the impact, and some cartridges were strewn around, but no explosion occurred.

A fibreboard case containing 500 12-gauge shotgun shells was placed on a metal rack over a pile of kindling wood, and the wood was ignited. After the case was burning, the blazing wood was dragged away. The burning continued until the case and all the shells had burned. At no time did any of the shells explode with violence. The powder charges burned quietly, and barely opened the crimped shells. No propelling of shot charges could be detected. However, some of the primers did pop off audibly.

Moreover, in other tests by the same organization, a large num-

ber of metallic cartridges and shotgun shells were burned in a fire of oil-soaked wood. The cartridges and shells exploded from time to time, but there was no general explosion or propulsion of shot or bullets with any great force or to any great distance. Throughout the test, the men conducting it remained within 20 feet without injury. This test showed that small arms cartridges, whether they are metallic cartridges or shotgun shells, when involved in a fire, will not explode simultaneously but rather piece by piece; that the bullets or the shot are not projected with any great velocity; and that the material of which the cartridges or shells are made will usually not fly more than a few feet.

Newspaper Accounts Often Misleading

In spite of the fact that people who are acquainted with ammunition know these facts, they are not commonly realized by the public, and distorted or inaccurate newspaper accounts of incidents involving ammunition in a trash fire or the like have spread a contrary impression. Many times such erroneous reports originate when some individual tries to explain an unwise or illegal action by blaming it on a cartridge in the fire for which he could not have been responsible.

A boy is forbidden to play with firearms, but he sneaks a gun out when nobody is looking, and manages by bad luck to wound himself or a companion; so he evades punishment or a scolding by saying they were burning some leaves and an explosion occurred and he was hit by a bullet from a cartridge which must have gotten in the fire in some way. In one such case in which I was consulted, I pointed out that the bullet recovered from the boy's leg showed rifling marks. He then admitted the fire story was invented, and that he and a friend had been playing with a cheap revolver his friend had acquired in a trade.

A fairly common occurrence is for a youngster to find a .22 cartridge, and then lay it on a rock and pound it with a hammer. In such a case the powder may be more or less confined at the moment of ignition between the hammer and the rock, and the bullet may be projected with enough force to penetrate flesh.

In a case reported in the papers, a hunter was said to have been shot through the arm by the bullet from a cartridge which exploded in his shirt pocket; when an attempt was made to pin down the exact facts, the victim became highly evasive. The facts were that he didn't want to admit that he had been shot with his own rifle because in that state it is illegal to have a loaded rifle in an automobile, so what was easier than simply to say that the cartridge had exploded in the shirt. It was when we insisted in seeing how much damage the cartridge did to the shirt pocket that the story came out.

It was a newspaper account of the accidental death of a prominent South Carolina hunter that caused me to make a whole series of experiments which will be described presently. According to the item,

1 2 3 4

1. Piece of brass removed from eye of boy who exploded 22 cartridge in vise with screwdriver.

2. 22 l.r. cartridge exploded by heating on hot-plate while covered with cardboard box. No piece penetrated.

3. Black powder cartridge (.41 rim fire) exploded on hot-plate under cardboard box. No piece penetrated.

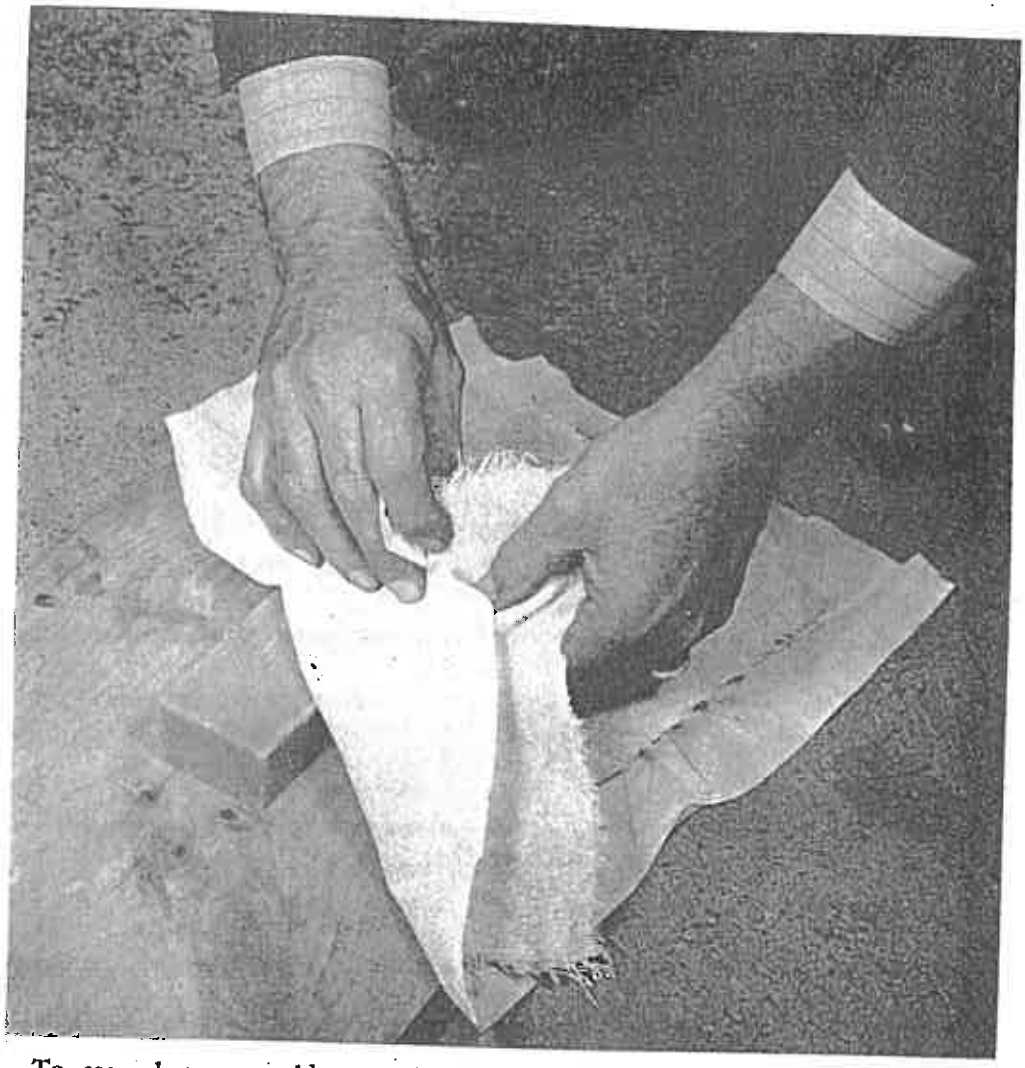
4. 38 S & W revolver cartridge exploded on hot-plate under cardboard box. No piece penetrated the box.

the hunter died when the gun he was leaning on collapsed from a broken stock, and the gun struck a shotgun shell in his shirt pocket, causing it to explode and blow his head off. Investigation showed that the gun did indeed collapse while he was leaning on it, from the breaking of a weak plastic stock. As the stock folded, the trigger guard bent inward, pressing on the trigger; and as the muzzle of the gun was pointing up under the victim's chin, part of his head was blown off. At the same time the charge of shot did graze the shell in his pocket, and ripped it open, but it did not explode.

Actually, if the gun had been empty, and the shell in his pocket had been exploded as described, the hunter might have had a good scare, and might have imagined he had experienced a close call, but he would have been in no real danger, because while it would be unpleasant to have such a thing happen, it would not be dangerous to life.

What actually happens. To get some reliable first-hand information on what really happens when a 12-gauge shotgun shell is exploded while not in a gun, and when it is separated from the flesh only by a thin layer of cloth, as it would be in a shirt pocket, I took a bar of laundry soap, covered it with a piece of a white sheet, and laid a shell on the sheet. Over the shell I laid a piece of bath towel to represent a coat. White cloth was used to make it easier to see how much scorching occurred, if any. The shell contained an ounce and an eighth of No. 7½ shot and 3 drams equivalent of powder.

A wire attached to one electrode of an electric welding torch was twisted around the metal base of the shell, and the carbon rod in the other electrode was laid against the primer of the shell.



To see what a cartridge would do if it were accidentally discharged in a shirt pocket, soap was used to simulate flesh. White sheeting simulated the shirt, and bath toweling the outer coat. Cartridge was laid on the sheeting, covered with the toweling, and fired.

In this way, as soon as the electricity was connected to the welder, heat would be applied to the primer, and the shell would be fired. An ordinary corrugated cardboard box was then inverted over the arrangement just described, to catch any fragments, and to indicate what force they might have.

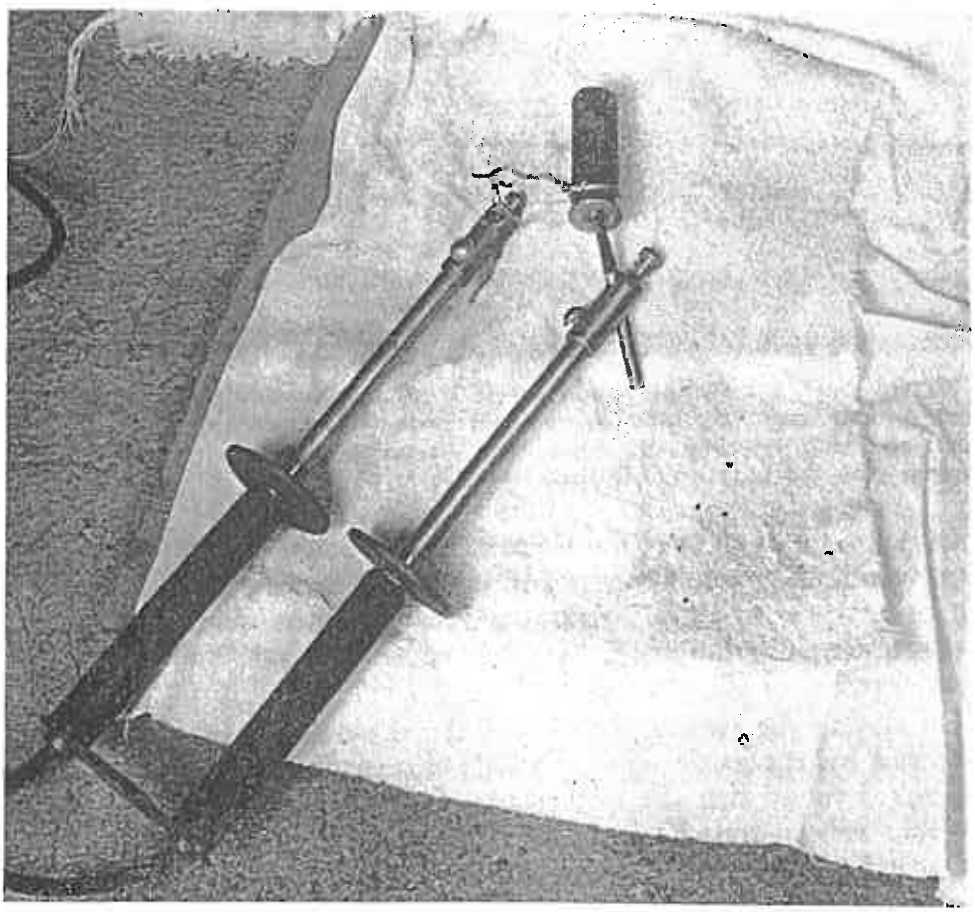
On closing the switch, the pop of the exploding primer was heard, followed by the rattle of shot inside the cardboard box. On lifting the box, I found that the end crimp of the shell had opened up, and the shot was scattered all around, together with the wads and some unburned powder. There were no marks on the inside of the box, and no scorch or burn on the cloth, and the soap was not dented or bruised.

The next thing I did was to explode a .45 Automatic Colt pistol cartridge in the same way. There was only a dull pop, something like a champagne cork being pulled, and again, there was no bruising of the soap or scorching of the cloth. The bullet made a slight mark on the wall of the cardboard box, just a little polished place that could not be called a dent. Most of the powder was lying around unburned, and the empty case had not even moved out of the wire loop.

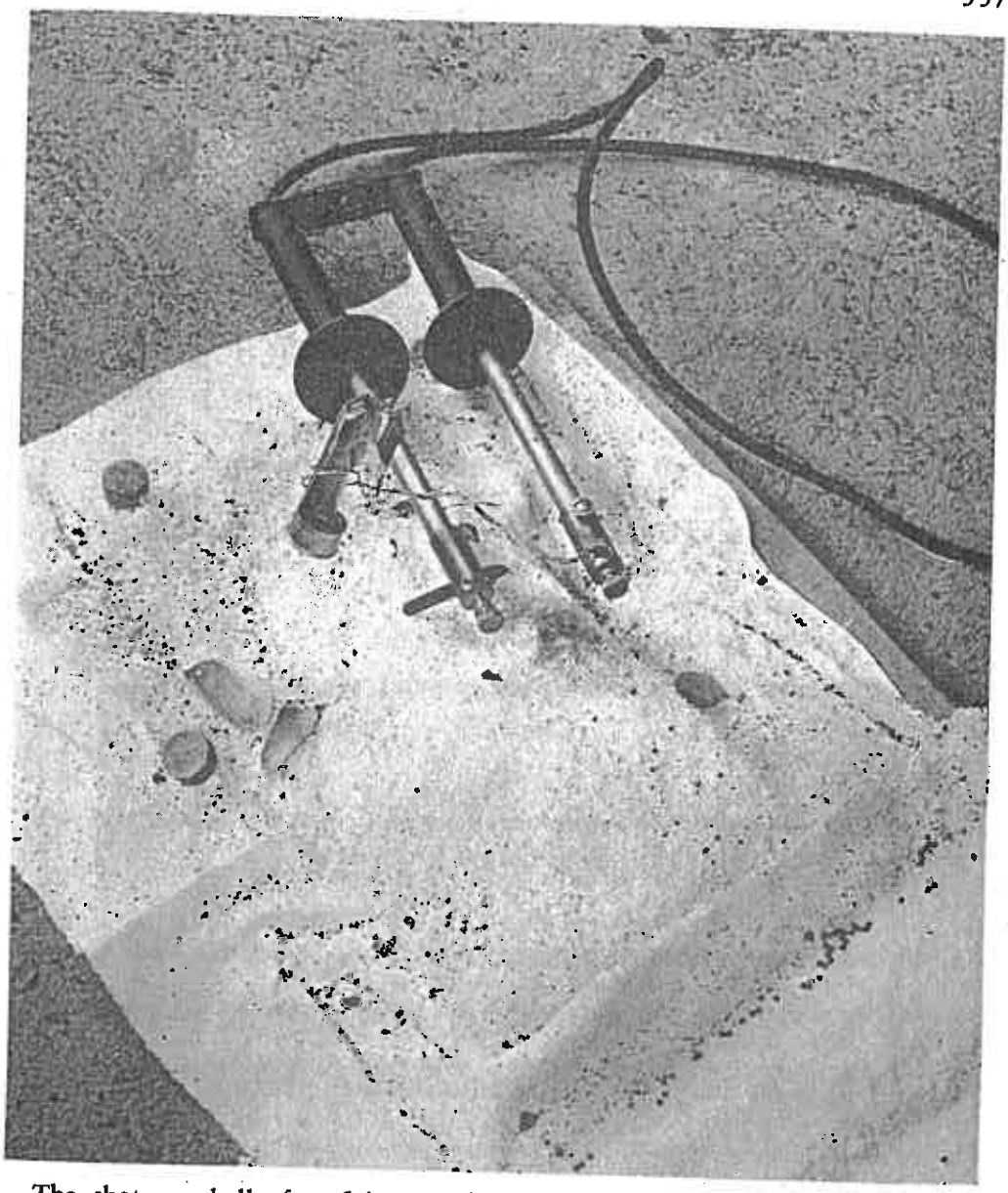
Next cartridge fired was a .30-06. This made a dent on the soap about a quarter of an inch deep. That would have been a mean bruise. We found that the cartridge case had burst open and thrown some bits of brass around, and had left a smoky smudge about an inch long on the cloth. The only damage suffered by the cardboard box was a slight mark where the bullet had struck.

Next we tried a .32 caliber pistol cartridge loaded with black powder. It went off like a very sick firecracker, and there was no damage.

During all the firing, the pasteboard box was penetrated only once,



Set-up for firing shotgun shell experimentally. The entire arrangement was then covered with an inverted cardboard box.

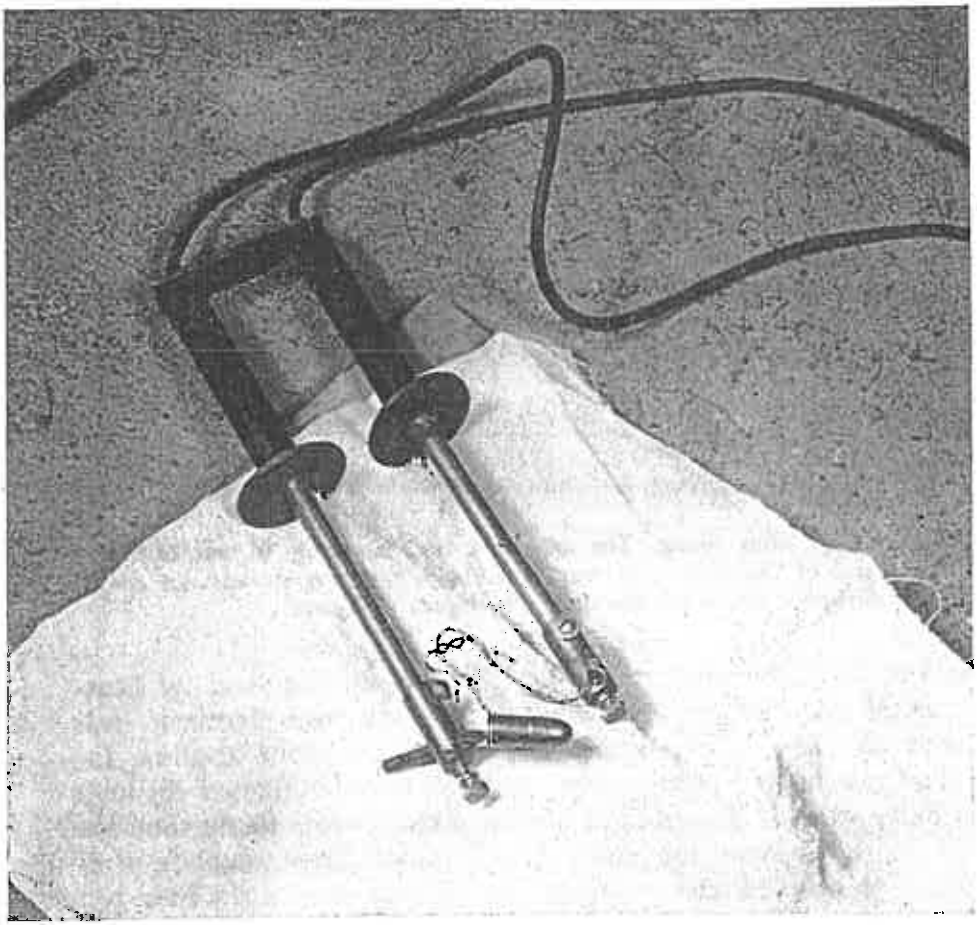


The shotgun shell after firing. The carboard box covering it was not even dented. The sound of the explosion was so mild it did not sound like an explosion at all, but more like a marble dropping into a dishpan.

and that was by the primer, when we tried firing the shell by heating the metal and not the primer. In this case, the electrode was laid against the side of the brass case, and the current applied. Instantly the brass melted at that spot, and the powder flamed through the hole for 7 seconds with a loud hissing sound, while flame shot out of a hole in the side of the case. It was about three seconds after the powder was all burned out that the primer went off. This test shows also that if the powder is to be burned in any snappy fashion at all, it takes the primer to do it.

In another exhaustive series of experiments, I took various cartridges for both rifle and pistol, loaded with smokeless powder and with black powder, and placed them base downward in a lead melting pot that was arranged to be heated by electricity. On top of the pot I laid a piece of corrugated cardboard, with the cartridge standing on its base underneath so the bullet was pointing directly at the cardboard. Then the heat was turned on until the cartridge exploded. In no case did the bullet pierce the cardboard, or even dent it deeply.

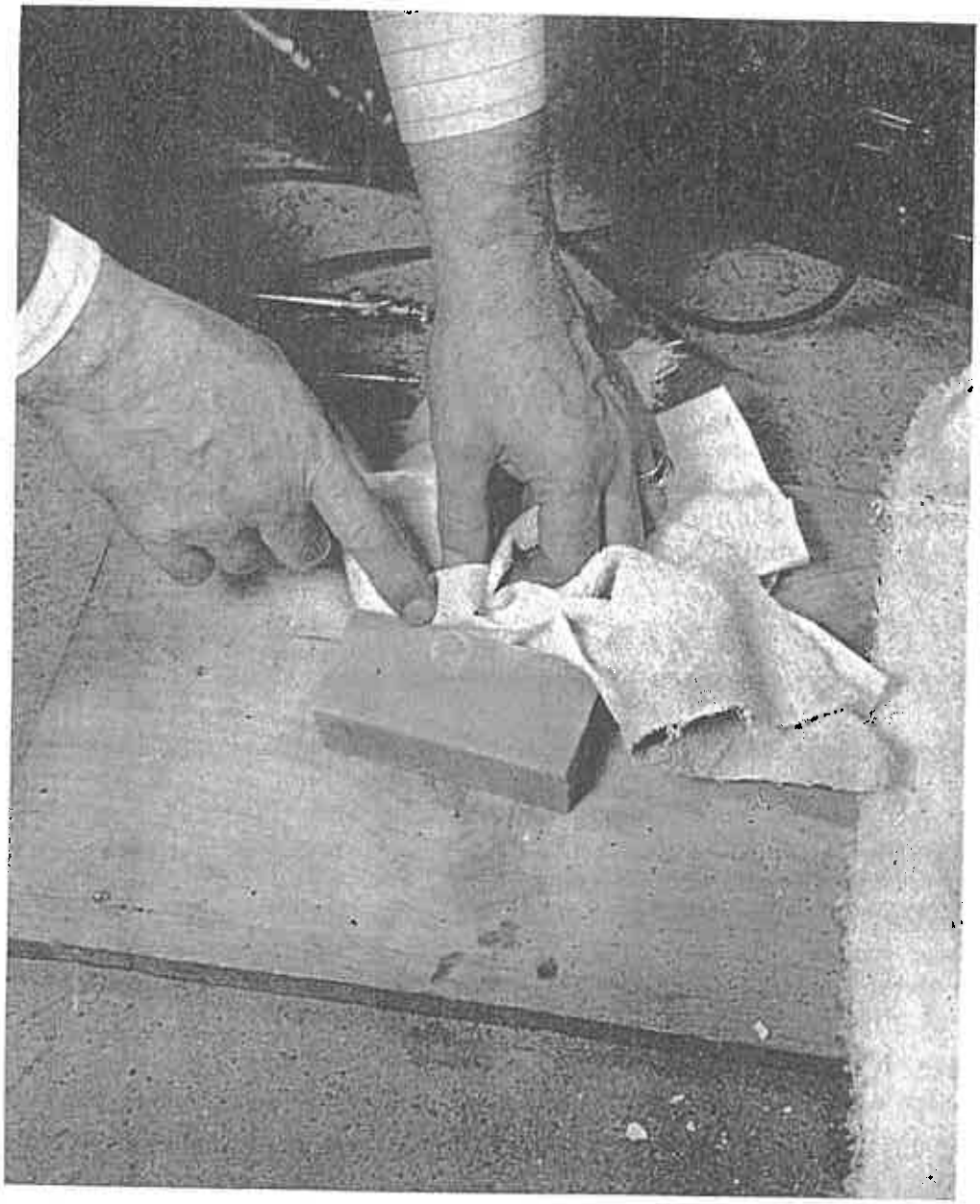
A slightly different type of test was instituted after I read an item in the Washington, D. C. daily papers of July 22, 1955, about two boys who had been playing in the park when, as they told it, they heard a shot, and one of them was wounded in the neck. Later, a piece of thin brass, evidently a fragment of a cartridge case, as taken from the boy's neck. Under close questioning, he then admitted that they had found a .22 caliber cartridge, and that one of them had held a match under it until it had exploded.



To fire the cartridge experimentally, it was arranged as shown, with the electrode of an electric welding torch in contact with the primer.

To see just exactly what would happen in such a case, I took a high speed .22 long rifle cartridge and suspended it by looping a wire around the case just behind the bullet. I then arranged a small birthday candle on a sliding piece so it could be pushed precisely under the rim of the cartridge. Lighting the candle, I placed a corrugated cardboard box over the arrangement, and pushed the lighted candle under the cartridge rim, at the same time starting a stop-watch.

It took 10 seconds for the cartridge to go off. No piece came



When .45 pistol cartridge was fired lying on the cake of soap, the only effect was a slight dent on the soap, corresponding to a minor bruise in flesh. The cloth was very slightly scorched.

through the cardboard box; when the box was lifted, it was found that the bullet had made a very slight dent in the cardboard. The case was blown to fragments, and the head of the case was stuck into the cardboard with just sufficient force to cause it to break the outer surface. Had this fragment struck flesh, it would have broken the skin. Such a piece would be dangerous to eyesight.

The experiment was repeated with a .22 short of the type which has a very light frangible bullet, with a muzzle velocity of about 1600 f.s. This cartridge took 15 seconds to go off. The bullet made a deep dent, about halfway through the corrugated cardboard. The head of the case made a dent about half as deep as that made by the bullet, or about 1/32 inch. Two slivers of brass from the case made an edgewise penetration of about ⅛ inch and just broke the far surface of the cardboard. The main piece of the case struck a small piece of wood that was lying inside the cardboard box, and penetrated the board about 1/16 inch and stuck in it. Again, this fragment would have broken the skin, but at a few feet distance its velocity could have been much reduced, so that a person would have to be quite close to the explosion to be in any danger of injury.

In this test we found that an ordinary pasteboard match will burn for about 20 seconds, while the .22 long rifle cartridge took only 10 seconds to explode with a flame under the rim. Thus it would be quite possible for a boy to lay such a cartridge down with the rim exposed, and hold a match to it long enough to explode it, and in such a case he would most likely be injured by pieces of the case.

Private-hire fears rejected

No evidence taxi business seriously poached, minister says

By MATTHEW HAGGART

A CALL from the New Zealand Taxi Federation to establish clear rules to monitor private-hire vehicle operators has been rejected by Minister of Transport Steven Joyce.

Mr Joyce has rejected the issue on the grounds the matter is not yet a serious problem.

Taxi Federation president Tim Reddish has responded by asking its member companies to provide examples of when private-hire operators are working as taxis.

Taxi companies moved to protect their business from private-hire operators in August.

Steven Joyce

This was shortly after legislation for compulsory security cameras and monitoring took effect.

However, despite fears their business may be poached by private-hire operators, there appears to be little evidence to back the federation's claims.

The *Taxi* industry magazine recently reported Mr Joyce had received advice there was no evidence the private-hire issue had become a "serious problem".

In a letter to Mr Reddish, Mr Joyce acknowledged concerns about the possibility of unfair and illegal competition from former taxi drivers operating under the guise of private hire.

New Zealand Transport Agency principal transport officer Dermot Harris said private-hire operators were not a major issue in the Otago-Southland region.

He said the agency had not received any complaints locally in relation to private-hire vehicles since August.

Most private-hire registrations in Otago-Southland were small business operators, Mr Harris said.

They offered tourism and limousine-style services, including for weddings and cruise-ship tours, he said.

The agency held regular discussions with taxi operators in the Otago-Southland region.

The issue of private-hire competition had been raised in the past, Mr Harris said.

"The relevant legislation and the limitations of private-hire service has been explained," he said.

"We have had no incidents reported to us that needed follow-up action."

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By ELSPETH McLEAN

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P. 102

Car parks replace ride-share schem

Free and lower-cost spaces approved

By DAVID LOUGHREY

DUNEDIN'S tertiary sector will soon have about 100 new free or lower-cost car-parking spaces, following the demise of what was supposed to be an environmentally sustainable system designed to reduce emissions and take the pressure off parking.

The ride-share system was dumped recently after almost 11 years, after confirmation it was subject to significant abuse, was only marginally successful and could not be easily enforced.

Jinty MacTavish

The Dunedin City Council voted to end the scheme in October, and transportation planning staff took their proposals to replace it to the council's planning and environment committee this week.

That involved introducing $1-an-hour, $5-a-day parking to 32 spaces on Cumberland St. and 68 free spaces with a two-hour limit on Cumberland, Clyde and Forth Sts, and Harbour Tce.

The council had already removed about 45 parks from the ride-share scheme.

The ride-share scheme, which had been in place since 2000, had about 145 on-street parking spaces open to staff and students at the University of Otago and the Otago Polytechnic.

The numbers were approximate, transportation planner Emerson Yeoman said this week, because the parks had no line marking. People who wanted to use the system had to register, and were provided with tokens.

The objectives of the scheme included improved options for commuters and a reduced number of single-occupant vehicles, which helped reduce emissions and parking pressure.

However, the scheme was subject to significant abuse, with 41% of users contravening the rules, and while the council tried a variety of methods to deal with the scheme's problems, in the end it ran out of ideas.

A report to the committee from Mr Yeoman said discussions were held with groups including the New Zealand Transport Agency, the Otago Polytechnic and the University of Otago property services division.

Four-hour time-limited free parking was popular with tertiary institutions, but the council argued it was not enforceable, and instead became de facto free all-day parking.

The cloud of controversy that surrounded the council's last attempt at major changes to parking in the city, a 2009 policy that led to a furious campaign by retailers, was not forgotten at the committee meeting.

Cr Syd Brown suggested a trial period, in case similar problems occurred.

Cr Jinty MacTavish hoped the sustainable aspects of the ride-share scheme, which encouraged fewer vehicles travelling to the university, would not be lost.

The committee voted to approve the changes, and that staff would work with the tertiary precinct planning group and users to ify options for improving tra the area.

A report on this was sche for September next year.

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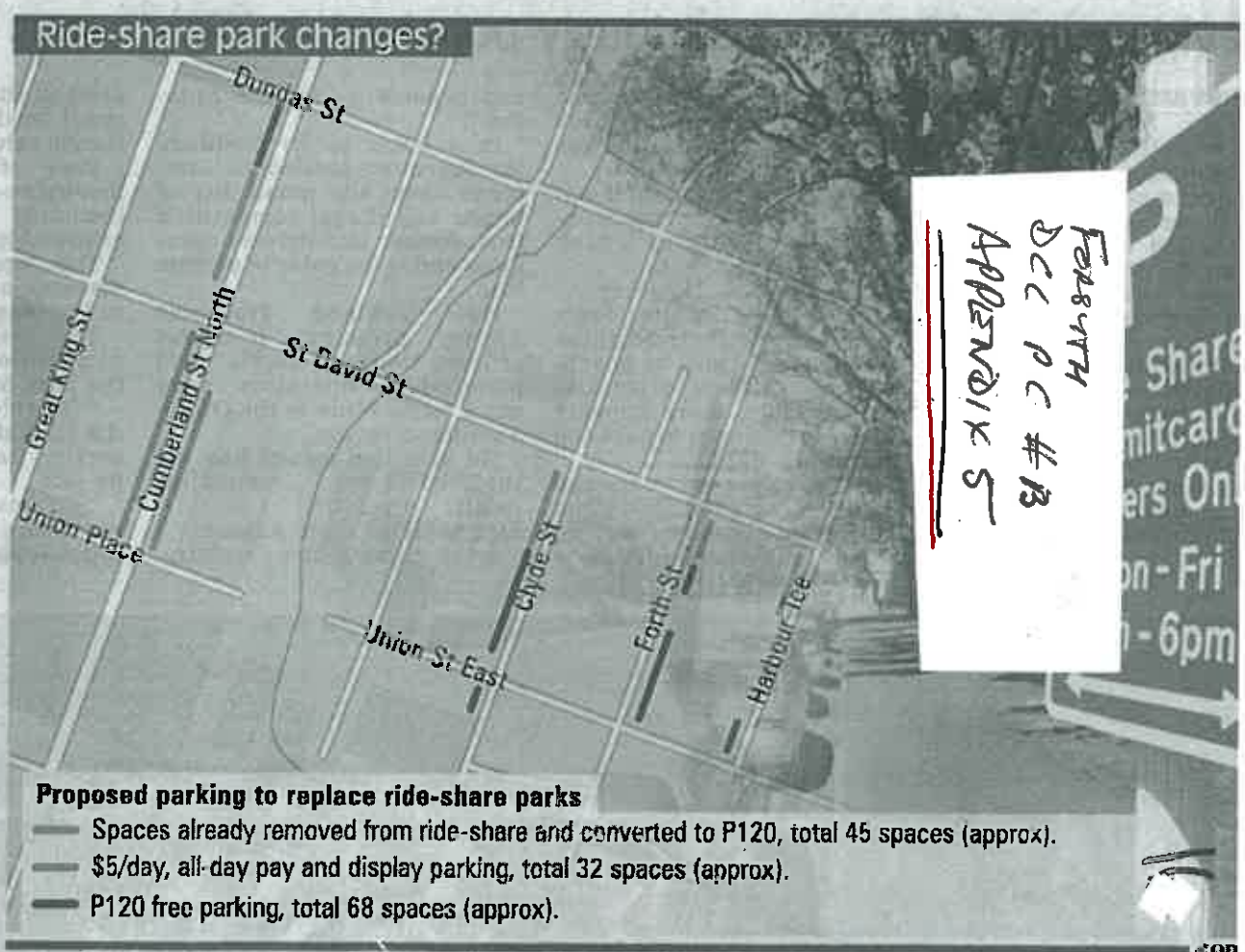

Feature
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Appendix 5

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FORSYTH
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APPENDIX 6

Latest flood warnings 'ridiculous'

Houses too hard to sell, REINZ says

By CHRIS MORRIS

THE Dunedin City Council's decision to add flood warnings based on computer modelling to Dunedin homes' land information memorandums (LIMs) has been criticised as "ridiculous" by the Real Estate Institute of New Zealand.

REINZ Otago spokeswoman Elizabeth Nidd told the *Otago Daily Times* she believed the warnings were an attempt by the council to "dodge every bullet that might ever possibly come its way".

Property prices in affected areas could drop as a result, and buyers could be scared off, she said.

"I just feel that they're making it so hard. People aren't going to want to buy anywhere in Dunedin.

"I just think it's getting ridiculous. Everyone is ducking for cover to such an enormous extent it's . . . increasingly more difficult to sell houses in this town."

Elizabeth Nidd

Her comments came days after Dunedin Mayor Dave Cull warned the council's plan to add the warnings to LIMs risked devaluing homes and exposing the council to legal action from disgruntled owners.

Council operations general manager Tony Avery confirmed at Tuesday's infrastructure services committee meeting the warnings, based on computer-modelling of climate change, sea-level rise and floods, would be added to the LIMs of homes in areas shown by the modelling to be at risk, if predicted problems were left unchecked.

The warnings would note the maps generated by the modelling were not accurate enough to show the potential risk to individual homes.

The modelling had been carried out as part of work on integrated catchment management plans for much of the city, used to plan council investment in stormwater infrastructure during the next 50 years. It aimed to identify trouble spots within the city's stormwater network, to guide investment in new infrastructure and avoid problems.

Mr Avery this week reiterated the council had a legal obligation to disclose the results to avoid the threat of legal action.

"We don't have a discretion around it, and nor should there be a discretion. Councils have been sued in the past for having information which they didn't disclose."

Maps showing at-risk areas would also be made public at the same time warnings were added to LIMs, which was expected to be within "the next day or two", he said.

It was possible most homes would receive one of the warnings, by being in an area affected by one or other of the 14 scenarios modelled, he said.

However, the council was trying to be careful about the exact wording to avoid any "fear and angst", he said.

"There's nothing that's changed in terms of the underlying system. We've got a bit more information and the plans are going to be available for people to look at," he said.

Insurance Council of New Zealand chief executive Chris Ryan said it would be up to individual insurers to decide how they responded to the LIM warnings, but homeowners were required to disclose anything that could affect future claims.

"Where risk is general to the area, this will be more problematic for homeowners to assess, though," he said.

Mrs Nidd said many sale contracts were now conditional on a LIM report, and real estate agents and lawyers would be left to explain the flooding warnings to potential buyers.

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