The response to the 'mother of all storms': a combat agency view

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Introduction

Early in the evening of Wednesday 14 April 1999, a massive hailstorm struck the southern, eastern and inner suburbs of Sydney. It produced colossal damage and over the ensuing weeks turned out to be, in insured damage terms, the most costly natural disaster ever to have occurred in Australia's history. A massive emergency response was mounted, lasting several weeks and giving temporary protection to many thousands of hail-damaged dwellings. Six months later the permanent repair work was still being carried out and while most roofs had been fixed the repairs to a minority of difficult cases were not expected to be finalised until well into the year 2000.

The storm and its impact

This storm was an unusually intense and long-lasting supercell thunderstorm (Commonwealth Bureau of Meteorology, 1999). It was first noted on radar at about 4.25pm at Berry, on the New South Wales south coast, and it tracked northwards through the Kiama, Albion Park and Shellharbour areas where it deposited hail in large quantities shortly after 5pm. Thereafter the storm moved out to sea before travelling north and then re-crossing the coast near Bundeena, on the southern shores of Port Hacking, just before 7.30pm. From there it moved northwards across the Sutherland Shire, Botany Bay, Kingsford Smith Airport and Sydney's eastern and near-CBD suburbs before crossing Sydney Harbour and the northern beachside suburbs. The centre of the storm moved out to sea in the vicinity of Broken Bay shortly after 9pm and had collapsed by 10pm, more than five hours after formation. The storm's path is shown on Figure 1.

The storm was principally a hail event although wind gusts of up to about 80 kilometres per hour were recorded at some locations. Individual hailstones 9 centimetres in diameter – the equal of the largest known to have fallen in NSW – were confirmed by the Bureau, and there were anecdotal reports of stones up to 13 centimetres in diameter (Yeo et al, 1999,1).

In temperate Australia, hailstorms have tended to be the most damaging types of storms experienced (Blong, 1999,7). In this case, with giant hail falling over a sizeable and densely built-up urban area, the damage was particularly severe. The most serious damage occurred between Lilli Pilli (on the northern shore of Port Hacking) and Darling Point (on Sydney Harbour) in a band about 25 kilometres long and roughly three kilometres wide, though property damage was sustained as far north as Gosford and Wyong and for five kilometres on either side of the centre of the storm's path. In the worst-hit areas, including parts of Rosebery and Kensington, every dwelling in whole street blocks sustained significant damage by way of the holing or breaking of roofing material and in many cases the breaking of windows. There was also serious damage to tens of thousands of cars, to numerous industrial and commercial premises, to public buildings (including many

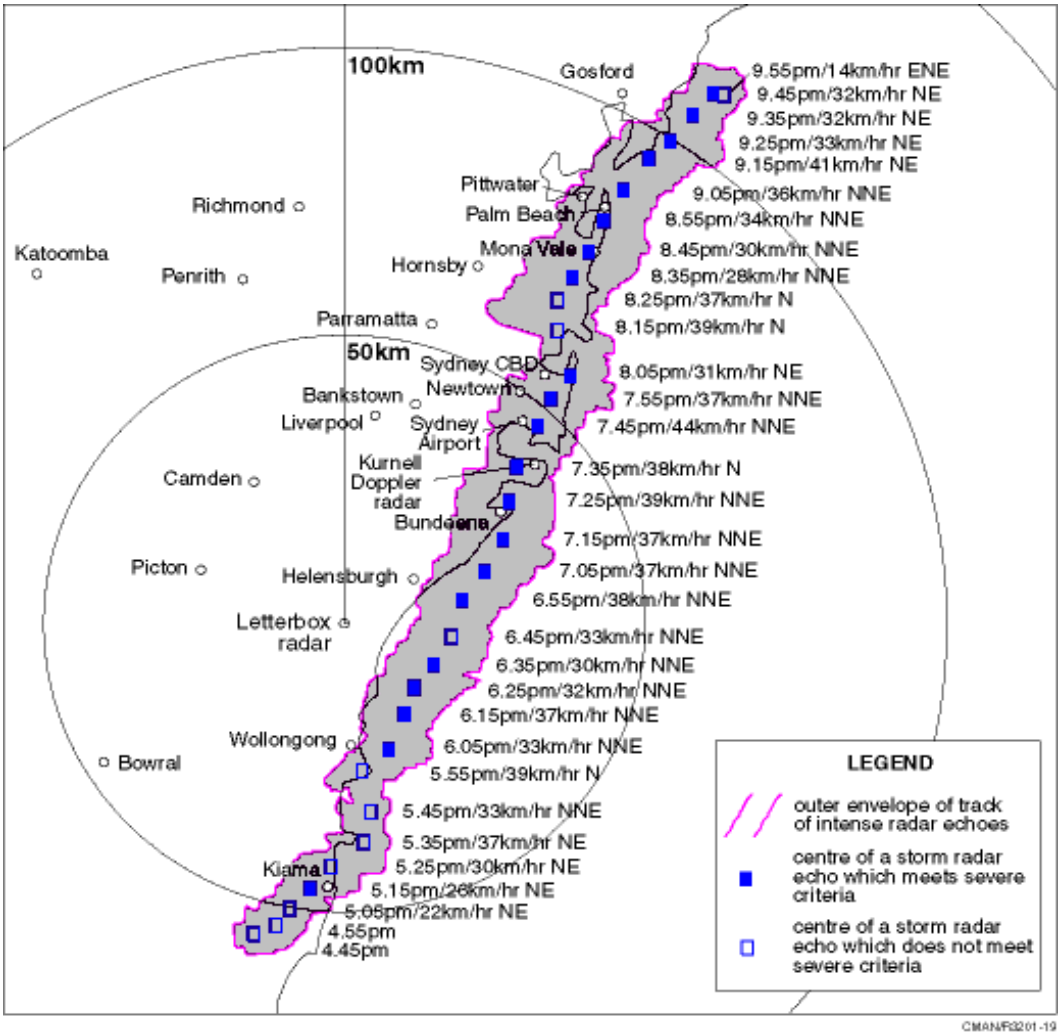

Figure 1: The storm's track as shown on radar and indicating speed and direction of movement (Commonwealth Bureau of Meteorology, 1999).

schools) and to facilities and aircraft at the airport. As far as is known only one death was directly attributable to the storm though there was a sharp increase in the hours after its impact in the number of people presenting themselves at hospital casualty wards with injuries.

Most of the building damage was to residential property. Because of the impact of the hail on slate, fibro and tile roofs, many ceilings were damaged, with the result that wall cavities and household effects became waterlogged. Many houses were rendered temporarily uninhabitable although, because no trees were brought down, few were completely destroyed.

The most outstanding feature of the storm's impact was its scale. However measured, whether in terms of the number of calls for help received from the public, the number of houses damaged or the total dollar value of the damage sustained, this was not only the biggest storm ever experienced in the state's history but by **far** the biggest. The historical record is sketchy, but with the total cost likely to be in the order of $2,200,000,000 (Emergency Management Australia, 1999, 9), the damage will probably be of the order of three to four times that sustained in the worst-known storms of earlier times. These were the storms which struck western Sydney in March 1990 and the northern suburbs in January 1991 and caused total costs of $550,000,000 and $670,000,000 respectively in

1997 dollar terms (see Table 1). The April 1999 storm damaged roughly ten times the number of dwellings that were hit in the 1990 event and three times those affected in January 1991. It really was 'the mother of all storms'.

The response

The emergency services in the area of impact responded quickly. On the first evening there were 270 State Emergency Service personnel in the field, along with more than a hundred Rural Fire Service volunteers and New South Wales Fire Brigades employees. By the second day of the operation there were more than 850 personnel involved, most of them by this stage from outside the impact area, and the number was well over 1400 on the third and fourth days (the weekend after the storm). The SES alone had approximately 90 teams in the field by the second day – 30 more than were involved in the whole of the first two **weeks** of the response to the northern suburbs storm of 1991 – and this number was exceeded the following day. By then, personnel from 16 of the state's 18 divisions (regions) had been deployed, with nearly 600 SES people in the field at a time.

From the fifth day (the Monday after the storm) all SES divisions had despatched personnel and the rotation which was necessary to sustain what was to become a very long-lasting commitment was well established. The New South Wales SES contingent was bolstered from that first Monday by SES volunteers from outside the state beginning with a contingent from the Australian Capital Territory. Later, SES volunteers from Victoria, Queensland and South Australia joined the effort.

Meanwhile the two New South Wales fire services maintained a strong presence throughout the first week and indeed throughout the three and a half weeks of the so-called 'emergency phase' of the response. There were also contributions either during the early days or later from the National Parks and Wildlife Service, the Volunteer Rescue Association, the ACT Fire Service and the Australian Army – not to mention the 'off-roof' contributions of the Police, the Ambulance Service, the Department of Community Services, the Wireless Institute Civil Emergency Network and the Royal Volunteer Coastal Patrol to name but a few. At times there were more than 3000 people in the field not counting the many individual volunteers, not connected to particular agencies, who worked on sandbag filling and other tasks.

The escalation of the task

This large-scale commitment, complemented by considerable operations centre and logistic support behind the scenes, was a response to what was known from the start to be a very large requirement. Within the first two days there were some 7000 calls for assistance from members of the public, and this figure continued to escalate – not just for a few days but in fact for weeks. On the third day it passed 9000, by day five it was approaching 12,000 and by the end of the first week of the operation it had exceeded 15,700. Eventually, the number of calls for assistance was to grow to more than 40,000.

The degree and longevity of this escalation in the scale of the task was unprecedented. In past storm events in New South Wales the size of the job was basically known within two or three days. The 1991 northern suburbs storm was slightly unusual in that damaged houses and their occupants were still being

TABLE 1: SEVERE STORM EVENTS IN RECENT NSW HISTORY

DATE	LOCATIONS OF MAJOR IMPACTS	PRINCIPAL CONTENTS	ECONOMIC COST ($ 1997)	MAIN TYPES OF DAMAGE CAUSED
March 18 1990	Western Sydney (Auburn, Bankstown and vicinity). Track was from Ingleburn to Narrabeen.	Giant hail up to 8cm diameter, very strong winds, flash flooding.	$550 M	More than 2000 houses sustained window and roof damage; a wet and windy autumn exacerbated damage further over later weeks. Very severe damage to car yards and private vehicles and to schools.
January 21 1991	Northern Sydney (Turramurra, Pymble and vicinity). Storm tracked from Camden to Barrenjoey.	Giant hail up to 7cm diameter, winds to 230kph, rainfall recorded of 35mm in 6 minutes and more than 60mm in 30 minutes causing flash flooding.	$670 M	More than 7000 houses damaged; 20 demolished; 200 public buildings damaged; severe access problems because of downed trees and wires.
February 12 1992	Sydney (western and north-western suburbs).	Rain, wind; giant hail up to 7.5cm diameter, flash flooding.	$335 M	Approximately 500 houses damaged, most sustaining damage to roofs.
September 28 1996	Armidale, Tamworth and large areas of north-west NSW (many separate storms).	Giant hail up to 8cm diameter, very strong winds, three tornadoes.	$340 M	Damage to cars, roofs of houses, CBD premises and institutions; significant crop damage.
November 23 1996	Coffs Harbour	Up to 300mm rain in 2 hours, flash flooding, strong winds	$ 20 M *	Over-floor inundation of residences and CBD shops; many vehicles and caravans destroyed.
December 11 1996	Singleton and vicinity	Giant hail up to 7cm diameter, very strong winds, flash flooding.	$ 49 M *	More than 600 houses damaged in town; others in vicinity. Many cars and crops damaged.
December 19 1997	Sydney (western and northern suburbs).	Wind, hail.	$ 40 M *	Trees and power lines downed; damage to houses and industrial premises.
August 17 1998	Wollongong	Rain (200mm in 3 hours), flash flooding.	$125 M *	Heavy residential, commercial and institutional losses, many cars written off.
April 14 1999	Sydney (inner, eastern, southern suburbs). Storm tracked from Bundeena through southern and eastern suburbs to Gosford.	Giant hail up to 9cm diameter confirmed, reports of larger stones, some strong winds.	$ 2.2 B	More than 20,000 houses damaged mainly with roofs holed; more than 100 houses made temporarily uninhabitable; 40,000 cars damaged; numerous factories and public buildings damaged. Building damage exacerbated by windy and wet weather over following months.

* Insured losses only. Total economic costs would be much higher – possibly 3-10 times higher if ratios of insured loss to total loss as estimated by Joy (1991) for different hazards are used.

Sources: Emergency Management Australia (1999); unpublished records of the Commonwealth Bureau of Meteorology, State Emergency Service and Insurance Council of Australia.

‘discovered’ a week later, but in that instance many roads had been blocked and telephone lines brought down by fallen trees. In 1999 neither access nor telephone communication was a serious problem except for some congestion of telephone lines in the first few days, but the size of the task continued to grow relentlessly and for a very long period.

Several factors contributed to this. Among them were the demographics of the impact area, where a high proportion of the population is elderly and/or does not speak English and where many people had little awareness of the help available from the emergency services. The fact that many people put off calling the SES because they thought their problem was not sufficiently severe (or reported their difficulties only when they encountered response crews in the street), was also influential, as was the fact that there were two episodes of quite severe wet and windy weather in the fortnight after the initial storm. This last factor may be particularly important: it had the effect of ‘flushing out’ people who had not realised they had a problem, usually of cracked tiles rather than actual holes in the roofs, until the rains began. It also created a number of completely new tasks which were unrelated to the original storm but which inevitably became lumped in with the general response.

The continued escalation in the number of tasks under these circumstances calls into question the notion that people calling in to report their needs should be treated as the primary means of determining the nature and scale of the job to be done. That said, it is also clear that reconnaissance would equally not have given an accurate picture of the whole requirement immediately after the event. Road and air reconnaissance were carried out from the beginning but many tasks involving cracked roofing tiles could never have been picked up by these means and only became obvious with later rain. Such cracks could only have been found by people inspecting roofs up close, which is only possible at the level of the individual householder. Some of the jobs that were eventually dealt with by the emergency services were in fact only discovered well after the storm when large areas were ‘swept’ by doorknock teams staffed principally by the Rural Fire Service and covering much of the impact area.

The real size of the task which had to be managed could not have been known within the first day or two. This event was not like an aeroplane crash or a landslide in the sense that the scale of the task in such events is usually easily visible and cannot grow significantly after first impact. The problem in April 1999 was quite different. Nevertheless the fact that the impact had been huge was quickly appreciated and it was known within the first few hours that a very large response would be required. A media release issued by the SES on the afternoon after the storm noted that the job could be as big as in the 1990 and 1991 cases, and at a press conference the next day the Director General of the organisation suggested that it would in fact be larger. Just how much larger it would eventually be could not at that stage have been foretold by anyone: three weeks later, new tasks were still being notified.

Media reactions and the question of army assistance

The question of the adequacy of the early appreciation of the scale of the task is important because it bears upon the reaction of some sections of the media and the public to the nature of the response operation. Within the first two days the potential role of the army was being actively canvassed on radio and in the press, and before

long an insistent call for the army to be brought in had developed. At the beginning this was resisted, on several grounds – among them the fact that the state's resources were far from being exhausted or proved inadequate (a condition of Commonwealth assistance in emergencies), the knowledge that the army was a relatively small resource by comparison with what the front-line services (the SES and the two fire brigades) could call upon, and the fact that few army personnel were trained for the sorts of work required in this operation. By contrast SES volunteers routinely train for storm damage control work, and most have considerable experience of it given the frequency of storm activity in the state. Nearly half of the work done by the SES relates to severe storm activity, in fact, and includes as a central element the placing of tarpaulins on roofs.

New South Wales Fire Brigades personnel also have considerable relevant training as do many of the members of the Rural Fire Service. Both these agencies regularly support the SES in storm damage operations and have done so for years. Moreover, the equipment their crews carry is suited to the task and they require less equipment support from the SES than do other agencies.

Clearly, the army could not have been brought in during the initial stages of the operation. It could not have been demonstrated within the first two or three days that the state's resources were exhausted or inadequate, and in any case the army is unable to deploy as quickly as the front-line services regularly do. Before the first week was over, however, with the escalation in the number of jobs clearly far from tapering off, the front-line services being bolstered by out-of-state assistance and the weather being forecast to turn against the operation, the decision to request the deployment of army personnel was justified and was made.

By this time, however, the perception had been created in the minds of many that the failure to call in the army at the very beginning indicated that the response was insufficient. There appeared to be a belief in some media circles that the army represented 'professional' support which would be able to do what the volunteer resources of two of the three front-line agencies could not, and a conclusion was drawn by many that the problem could not be solved quickly **unless** the army was brought in. The reality was quite different, of course. The entire army strength in New South Wales is of the order of 4000 personnel, which means that it is smaller by far than the State Emergency Service, the New South Wales Fire Brigades and the Rural Fire Service **individually**. Indeed the entire armed services of Australia, including the air force and the navy, would be able to call upon fewer people than these three agencies, taken together, can claim in New South Wales alone. During the operation more than 12,000 people were involved, of which fewer than 700 came from the army.

The army's contribution was most welcome and was very valuable. It could never have been **the** critical element in the response, however: it is not the large-scale resource, always available to help the civil community, that sections of the media portrayed it to be. It must also be noted that what was supplied was a disciplined workforce rather than a workforce which came already skilled in the particular areas required by this operation. The majority of the personnel deployed were artillerymen and infantrymen who had to be given basic training in roof-covering methods and on-roof safety by SES officers before they began to work. This training had to be repeated on most days as new army personnel were brought in to the operation, and most of the necessary equipment had to be supplied to them.

Part of the pressure to involve the army in the early stages of the response reflected an understandable concern that all possible resources should be applied immediately. To finish the task speedily is a commendable goal, of course, but it cannot be accomplished merely by throwing resources willy-nilly at the problem: doing that risks a loss of co-ordination with regard to equipment and tasking, the development of supply glitches in relation to materials, and the potential for the response to exhaust itself before the job is completed. There were in the first few days, for example, some difficulties with regard to the supply of tarpaulins. Under the principle of 'just-in-time' management, large stocks are no longer routinely held, and had there been more responders in the field during the first two or three days they would certainly have run out of tarpaulins to place over damaged roofs. Other stocks would also have been threatened with exhaustion.

From the start, the response that was organised was the largest one possible. The limiting factors were not those relating to numbers of personnel in the field but to their effective resourcing and co-ordination. The response could not have been larger even if the full size of the task had been known with precision on the first day.

In truth there was some naivete in parts of the media about what could be achieved by the emergency services and about the army's capabilities. Many unrealistic expectations were created in the public mind, among them the notion that the task would be completed quickly **only** if the army was called in. The emotion that was generated by this demand was further fuelled by journalists' discoveries of a number of elderly people in the impact area who had apparently 'fallen through the cracks' and whose houses had not been seen to as quickly as would be desired. Sadly, it is impossible when dealing with a massive response task to guarantee that such cases will never arise. When disasters occur the environment is in a sense turned upside down and problems develop in trying to right it: when the storm is the worst ever experienced it is to be expected that the fix will be an unusually difficult and time-consuming one to accomplish.

Not all of the comments in the media were critical of the response effort and its management, of course. There was widespread recognition of the great scale and complexity of the task, most newspaper and radio comment was supportive and the SES received a good deal of favourable publicity. About 80 per cent of the news items generated, in fact, were assessed as being favourable to the SES, but some of the remainder were hostile and damaging.

The first week of the operation was successful notwithstanding the fact that many people's needs could not be serviced immediately. Before the weather broke on day seven, the vast bulk of the emergency task appeared to have been done. In fact, 12,500 dwellings of the 15,700 known to be in need of treatment by the end of the first week of the operation had been attended to by that time despite the insistence of some sections of the media that the operation was going far too slowly. Then strong winds ripped tarpaulins and loosened ropes, necessitating hundreds of call-backs to jobs completed earlier, and heavy rain caused renewed water damage and compounded the misery of those whose houses had not been given protection.

The deterioration in the weather ensured that the 80 per cent clean-up rate which had been achieved at the end of the first week would not be reached again for a further two weeks. As it happens, the completion rate of the first week represented a

far higher level of ‘productivity’ than was achieved in earlier responses to severe storms in Sydney.

The media clamour had several consequences towards the end of the first week. One was the introduction of a new control arrangement, the Commissioner of the Rural Fire Service being brought in to effect forward control at the tactical level and to establish and lead the multi-agency daily briefings which had not been held during the first few days. These changes caused some confusion as regards who was actually controlling the event, which itself led to uncertainties about the management of information flows and to some loss of morale on the part of SES volunteers in the field. The change in management and the deterioration in the weather made for a difficult few days in the second week – including the management of the now large-scale need to revisit work which had previously been done and the renewed growth in the number of tasks coming in. The SES, incidentally, retained strategic operational control and continued to supply the materials for roof-covering work to all the agencies working in the field.

The emergency response continued at a very high level of commitment of personnel for a further two and a half weeks after the introduction of the Commissioner of the Rural Fire Service. By the end of that time the vast bulk of the task of covering roofs had been completed although in the inner city some difficult cases of steeply-pitched and high roofs remained unfinished. From this point the focus switched to a recovery effort co-ordinated in the first instance by the State Recovery Committee which had been established within the first few days of the operation and which had the task of managing the permanent repairs.

Patrols of the storm-hit areas continued for most of the winter, however, the inevitable bouts of windy weather periodically loosening and ripping the tarpaulins and allowing further water entry when rain fell. Unfortunately, the late autumn and winter months were both windier and wetter than usual in Sydney. SES teams from various parts of the state, including Sydney, kept up with the tasks of patrolling the damaged areas and attending to the re-fixing of tarpaulins as the need arose.

Lessons learned

All large and complex operations create difficulties which were not fully foreseen or which are not managed perfectly, and there are inevitably opportunities to learn from the mistakes or organisational deficiencies which are exposed. The debrief process after the emergency response phase to this event was over generated several recommendations applicable to the SES as the relevant combat agency and to the state’s emergency management structure. Space does not allow these to be dealt with exhaustively here, but some comment can be made on the key issues as they relate to the combat agency.

One of these issues relates to dealings with the media. Today the media spotlight is harsher than it has ever been, weaknesses or alleged weaknesses are quickly discovered and misunderstandings of complex matters are broadcast as fact. These things being so, the management of the media must be given a high priority. If this is not done effectively the core business of the operation – in this case the fixing of tarpaulins to roofs – can be derailed to the detriment of the victims of the disaster.

The SES in New South Wales was not well placed here. It has no specialist media staff, much less a media cell, and as a result it was unable effectively to counter the line that by failing to bring in the army it was ignoring appropriate professional help and under-responding to the severity of the situation. In some sections of the media this appraisal became an axiom and, because it was not countered, it took root in the public mind. There was no clear public explanation of the reasons why the army could not have been introduced at an early stage, and garbled media explanations of matters relating to command and control (as outlined in legislation and in the State Disaster Plan) went uncorrected.

Criticisms of the SES's Director General on radio and in the print media and of some volunteers on talkback radio became a distraction and had a negative effect on the morale of volunteers in the field. Having a properly trained and staffed media unit would have allowed the organisation to service media enquiries more effectively and perhaps to dispel some of the criticisms that were levelled. There is a real risk, if media misunderstandings (as distinct from fair criticisms) are not corrected, that emergency service organisations will be forced to run to a media-created agenda with regard to operational decision making. If this is allowed to happen there are likely to be serious problems in relation to appropriate resourcing and deployment decisions.

Along with the media staff there will need to be a clear media policy which sets out how information is to be provided to media organisations and the community. There will also need to be appropriate training and support for those who can speak for the SES at different levels – state, regional and local.

Gaining a clear understanding early in the event of the scale of the task to be managed was a problem which raises questions about the means by which assessments are made. The number of calls for assistance in this instance failed to give a complete picture at an early stage, and improvements can be expected if the SES is made easier to contact. A single call number, linked to a commercial call-taking facility, would be appropriate and is being established. This number will need to be advertised, and the promotion of it will help establish the SES in the public mind as the relevant agency to call if storm damage has been sustained. At present, many people appear to be unaware of how to seek help.

Other means of determining where and how serious the needs are will also be necessary, however, and the SES is re-examining its procedures with regard to the carrying out of reconnaissance. Emphasis needs to be increased, in SES training, on the importance of reconnaissance during storm operations, and in addition the organisation will have to look at obtaining external assistance with the reconnaissance task. It may be that more aerial reconnaissance at an early stage would have been useful in this instance, but it must be said that this is most valuable when there are many trees down and roads are impassable or when the damage to structures is obvious enough to be visible from a distance. While many of the roofs holed in this storm were visible from the air, others were damaged in ways that could not have been seen except by up-close inspections by people standing upon them.

These problems notwithstanding, increased use of aerial reconnaissance will be necessary. There will be difficulties, however, it if proves impractical to train SES personnel to become proficient aerial observers able to provide accurate

assessments of impacts. External helicopter operators, including the Police Air Wing, may constitute alternatives.

The recruitment of neighbourhood-based wardens has also been suggested. Such people would be useful in reconnaissance and reporting as well as in providing advice to response teams and assisting with task allocation. Warden systems are, however, difficult to maintain and if they are to be organised effectively they will need to be linked with existing community-based initiatives such as Neighbourhood Watch or the Safety House Program. Sponsorship will be necessary to establish the credibility of any such system and to publicise its existence.

One of the shortcomings of the SES has always been the quality of its operational facilities in the Unit Headquarters which operate at the local level. In some of the more densely-populated areas of Sydney, including the area which was hit by the hailstorm, this problem is especially acute. Some of the present headquarters are simply old houses located on noisy, congested city streets with no on-site parking and inappropriate internal spaces for the management of operations. A much improved building subsidy scheme is needed here, along with improved provision for operations centre equipment including computers and appropriate operational software to allow for a more efficient and standardised collation of incoming information. Better accommodated and better equipped SES units will not only be able to operate more effectively, of course; they will also be better placed to recruit new members than will units with overcrowded and badly equipped facilities.

The storm also proved the importance of having high-quality and standardised operational procedures. In big events, where out-of-area assistance is vital, it is important that people operating in an unfamiliar environment are able to function effectively. Training resources which have been prepared by the SES on themes such as working in an operations centre will help in establishing standard procedures. Standardised operations centre equipment and fitouts will also be helpful in this regard.

Standardisation issues arose in various contexts: another was the difficulties which were experienced at an inter-agency level in managing the vast amounts of data coming in from the field. The three front-line agencies had non-compatible data transfer and data representation technologies and had to decide quickly on a standard system to permit integration. Since the storm, a whole-of-government approach to the spatial display of information has been adopted and protocols are being developed for a more coherent integration of operational information in the future.

Conclusion

By the standards of previous storm responses, the response to Sydney's most damaging storm event ever was an effective one. It started quickly and was sustained for a long period of time under difficult circumstances involving strong media criticism and weather which made operating on roofs unpleasant and sometimes dangerous. There were, of course, mistakes made, but the SES volunteers and the personnel of the many other agencies involved can be confident that they performed with great credit to themselves and their organisations. The response was a real test of training, of management procedures and of personnel: quite possibly it was the biggest test the SES has ever had in New South Wales. If,

in the aftermath, the SES is made more easily contactable, can manage the media more effectively, is more able to determine the scale of the task at an early stage and can overcome operational shortcomings produced by deficiencies of accommodation and equipment, the result will be an improvement in the organisation's ability to respond effectively when future storms strike.

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