LIMITING DAMAGE FROM NUCLEAR ATTACK

ANNEX G

by

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'In the event of a nuclear war there will be no chances, there will be no survivors - all will be obliterated.'

- Lord Louis Mountbatten,

former Chief of the UK Defence Staff and Chairman of the Chiefs of Staff Committee, speech at Strasbourg, 11 May 1979.

'Should (a nuclear) conflict take place, we shall all die.'

- Hon. Lionel Bowen,

Deputy Leader of the Opposition, 'Disarmament: The World Needs Fewer Swords and More Plough Shares', (address to the Victorian Branch, Australian Institute of International Affairs, Melbourne, 12 February 1982), transcript, p.3.

'There is no defence against (nuclear) weapons;... nuclear warfare will destroy civilisation, and perhaps exterminate mankind. To hope for salvation from Civil Defence is a dangerous self-deluding pipe dream.'

- Lord Philip Noel-Baker,

Letter to the Editor, The Times (London), 25 January 1980.

'For a large range of possible nuclear wars, damage-limiting (D/L) systems can be designed that would reduce ... estimates of fatalities by 90 per cent or more.'

- William M Brown,

Limiting Damage from Nuclear War, The RAND Corporation, Santa Monica, RM-6043-PR, October 1969), p.v.

'Everybody's going to make it, ... if there are enough shovels to go around. Dig a hole, cover it with a couple of doors and then throw three feet of dirt on top. It's the dirt that does it.'

- T K Jones,

Deputy Undersecretary of Defense for Strategic and Nuclear Force, US Department of Defense, cited in Los Angeles Times, 15 January 1982, pp 22.

To the extent that there is a typical popular or lay view of nuclear war it is that the outcome would be nothing less than wholesale destruction, amounting to Doomsday either world-wide or at least for those countries subject to attack. According to this view, measures to limit damage are self-deluding and dangerous: not only will such measures inevitably fail to reduce casualties and urban-industrial damage should nuclear war occur, but by creating the illusion that damage can be reduced to 'acceptable' limits they actually increase the likelihood of nuclear war.

On the other hand, there is a group of strategic analysists who have become increasingly influential in the United States who argue that even relatively crude damage-limiting measures can reduce casualties and damage to extremely low levels. For example, Arthur A Broyles and Eugene Wigner have argued that current Soviet planning for evacuation together with plans for the construction of 'expedient' shelters could reduce Soviet casualties from an all-out nuclear exchange to 2 per cent or 3 per cent of the Soviet population - i.e. 5-8 million people.(1) And T K Jones, the Deputy Under-secretary of Defense for Strategic and Nuclear Forces in the Department of Defense has opined that if the US had a similar program it would be able to recover fully from an all-out nuclear exchange in just two to four years.(2)

Such assertions have generally been received with incredulity. They depend on some quite particular assumptions regarding the warning time available, the docility and co-operativeness of the population being evacuated, the mildness of the weather, and the commitment of both sides to population targeting. Even where the assumptions are reasonably realistic, the logic of the overall argument is extended beyond the point where the conclusions might still bear some relation to what would actually happen.

These extreme claims have done much to discredit damage limitation studies, but it remains the case that damage limitation measures are likely to prove more effective than the popular view is ready to concede.

The damage that would attend a nuclear attack is not invariant. It depends on numerous variables, of which the most important are the scale and nature of the attack, the meteorological conditions prevailing at the time of the attack, the warning time available, the geographical relationship between the target set and the population distribution, and the protective measures available to the population.

Some of these variables range over a wide magnitude, and others are subject to gross uncertainties, so that even for an attack of given size the damage estimates can vary by a factor of five or more.

Moreover, many of these variables are subject to policy decision. Bases and facilities which could figure as possible targets can be located away from populated areas.

Fallout shelters can be constructed, or at least the materials for expedient construction can be procured and stockpiled. Evacuation plans can be prepared in order to facilitate the rapid and efficient relocation of population in the event of crisis or warning of attack. And measures can be taken to assist post-war recovery.

Australia as a Nuclear Target

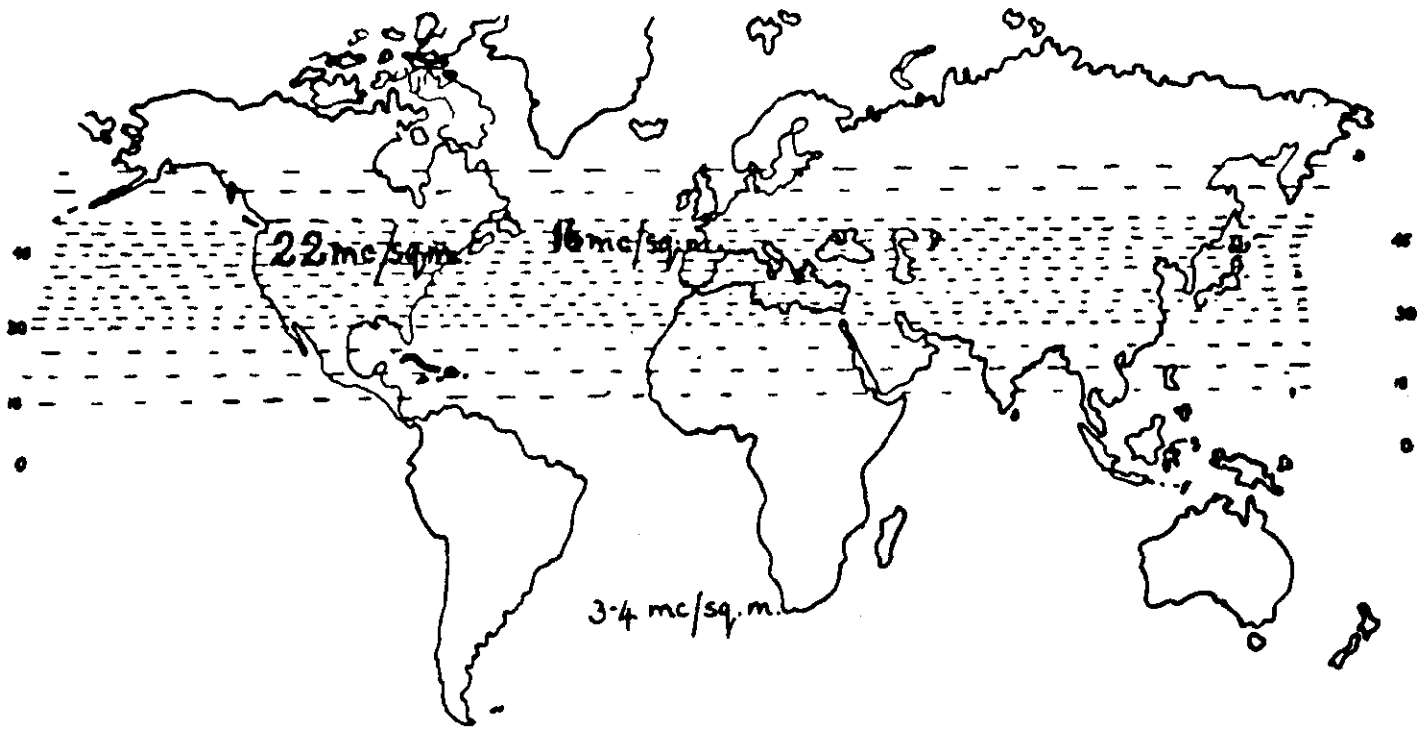
Statements to the effect that there will be no survivors from a nuclear war, that all will be obliterated, that mankind will be exterminated, are just as erroneous as the claim that 'everybody's going to make it'. The fatalities that would attend an all-out nuclear exchange between the US and the Soviet Union, in which China and Western Europe were also targeted, as well as other less central areas, and assuming no protective measures other than those already in place, would be most unlikely to exceed 400-450 million - ie less than 10 per cent of the world's population.(3) In the most reasonable scenarios, in which a significant proportion of each side's strategic nuclear arsenals is allocated to counter-military rather than urban-industrial targets, the maximum figure is more likely to be about 250 million fatalities. The great majority of these fatalities would lie in the actual areas subject to direct attack, and very few people would be affected at distances greater than 2000-3000 miles from these areas.

Given Australia's position as an island continent on the south-east of the globe, almost diametrically opposite those areas of North America, Europe and North Asia which would be the central areas of nuclear engagement, there would be no significant effects to Australia from a nuclear war unless targets in Australia were directly attacked. The scenario in On the Beach is simply science fiction.(4)

With regard to fallout, the pattern of tropospheric and stratospheric air movement is such that each hemisphere has a separate circulation, so that most of the debris from nuclear detonations falls out in the same hemisphere in which the explosions occur. Consequently, the fallout from a nuclear war in which nearly all the detonations take place in the northern hemisphere should be deposited in that hemisphere, although some small proportion may cross the Equator through mixing of the stratospheric air between the two hemispheres.(5)

As Mr R H Mathams, the then Director of Scientific and Technical Intelligence in the Joint Intelligence Organisation (DSTI/JIO) stated in 1978,

> The immediate effect on Australia of a major nuclear exchange in the northern hemisphere would be negligible; in the longer term, levels of radioactivity in the southern hemisphere will increase as a result of fallout transferred from the northern hemisphere, but the effects of this could be relatively easily



World-wide distribution of Strontium 90 in fall out, 1956, showing band of highest concentration in Northern latitudes.

Source: A.Pirie (ed.), Fallout: Radiation Hazards From Nuclear Explosions, (MacGibbon & Kee, London, Second Edition, 1958), p.2.

> reduced by appropriate protective measures. In any event the amount of fallout would probably only be about twice that received in Australia from the combined atmospheric testing in the northern hemisphere during the early 1960s.(6)

Other conceivable effects, such as a diminution of the ozone layer in the stratosphere, in time may affect the entire globe, but current research indicates that these effects would be much less severe in the southern hemisphere than in the northern hemisphere.(7)

What, then, is the possibility of Australia being subject to direct nuclear attack? There is now a widespread acceptance within the defence community that in any general war between the superpowers there are a small number of targets in Australia which are likely to be attacked by the Soviet Union.(8)

Most analysts would attribute this possibility to Australia's hosting of US military communications, early-warning and intelligence facilities. For example, the Joint Parliamentary Committee on Foreign Affairs and Defence recently concluded that in the absence of the facilities it would be 'very unlikely' that Australia would be a nuclear target, whether or not it was a member of the Western Alliance.(9) However, the Minister for Defence has stated that the facilities do not draw attention to Australia:

> In the event of hostilities, risks of nuclear attack arise for Australia as an ally of the United States, whether or not it may be hosting particular United States facilities.(10)

The clearest statement on the possibility of nuclear threats to Australia is that of Mr R H Mathams in 1978:

> Although the likelihood of strategic nuclear attack against Australia is not great it is none-the-less finite... The most significant trend for Australia in strategic forces development is the large number of nuclear warheads available to the USSR, which now has sufficient warheads to adequately target the US and retain substantial reserves for use against secondary targets. We cannot determine the priorities the USSR attaches to targets in Australia, but joint US-Australian facilities would probably rank high, depending on Soviet perceptions of their strategic importance.
>
> In descending order of probability, Australia might receive strategic nuclear attacks against: US facilities in Australia; Australian defence establishments; industrial complexes and urban centres...(11)

1. US Facilities in Australia:

The US maintains a wide range of facilities in Australia - including ground stations for communications, early-warning, signals intelligence (SIGINT), navigation and geodetic satellites; several portable geodetic satellite observation posts; VLF communications and navigation stations; more than half a dozen seismic stations; and a solar observatory. Most of these facilities have quite marginal strategic significance.(12)

The three critical installations are the Naval Communications Station Harold E Holt, North West Cape; the Joint Defence Space Research Facility (JDSRF), Alice Springs, commonly known as Pine Gap; and the Joint Defence Space Communications Station (JDSCS), Woomera, commonly known as Nurrungar.

North West Cape is presently one of the most important links in the US global defence communications network. According to official brochures, the base 'may serve several purposes. However, its main reason for existence is to maintain reliable communications with submarines of the US fleet servicing in this area of the world (ie the Indian and Western Pacific Oceans)' - and, in particular, 'to provide communication for the US Navy's most powerful deterrent force - the nuclear powered ballistic missile submarine'.(13) The US VLF system for communicating with the Fleet Ballistic Missile (FBM) submarine fleet consists of stations at Annapolis, Maryland; Cutler, Maine; Jim Creek, Washington; Luoluolei, Hawaii; Yosomi, Japan; and Harold E Holt, North West Cape. The station at the North West Cape is the largest and most powerful of all of these, and according to a recent report of the US General Accounting Office (GAO),

> Two of these stations - Cutler and Harold E Holt - together provide VLF signals to virtually all ocean areas. In peacetime, the remaining VLF stations normally provide backup to the two main communications transmitters.(14)

North West Cape also has an array of high frequency (HF) transmitters which are extremely important to US military operations, as was dramatically illustrated during the American mining of Haiphong and North Vietnamese harbours in 1972, when the high frequency site on the base was fully committed.(15)

This capability to support more general (ie non FBM submarine) US military operations will be greatly enhanced with the installation of the AN/MSC-61 or AN/GSC-39(V)1 satellite ground station later in 1982, which will tie North West Cape into the US Navy's Fleet Satellite Communications (FLTSATCOM) system as well as into Phase III of the US Defense Satellite Communications System (DSCS III).(16)

The Pine Gap facility, which became operational in 1969, is located 19 km (12 miles) south-west of Alice Springs. The 'business end' of the facility currently consists of seven large radomes and an enormous computer complex, currently being even further expanded.

Pine Gap is organisationally a facility of the US National Reconnaissance Office (NRO), although it is operationally controlled by the US Central Intelligence Agency (CIA). The station was originally established as part of Project Rhyolite, which involves a small number of signals intelligence (SIGINT) satellites in geostationary orbit capable of 'sucking up like a vacuum cleaner' a wide spectrum of Soviet and Chinese military communications and radar transmissions and beaming them back down to Pine Gap. The frequencies covered by these satellites embrace a number of very significant radio emanations. First, it includes most radar transmissions, allowing the mapping of the extensive Soviet early-warning and air defence networks. Second, it includes telemetry data transmitted during Soviet ballistic missile tests. Analysis of these signals has become one of the principal means by which the US has been able to monitor Soviet missile developments - and hence Soviet compliance with the Strategic Arms Limitation (SAL) agreements. And, third, these satellites have the capability for intercepting Soviet and Chinese telephonic and radio microwave communications.(17)

Nurrungar, which is located within the Woomera restricted area, about 480 km (300 miles) north-west of Adelaide, is one of two ground stations for the American satellite early warning system. Officially known as the USAFs Space and Missile Systems Organization (SAMSO) Detachment 2, Nurrungar provides a real-time data link between the North American Air Defense Command (NORAD), the Strategic Air Command (SAC) and the National Military Command System on the one hand, and the satellite early-warning system on the other hand. (The second ground station for the system is at Buckley, Colorado.) Data are derived from infra-red, charged particle and radiation sensors aboard the geostationary satellites of the Code 647 or Defense Support Program, which detect missile firings shortly after lift-off.(18) Program 647 has been officially described as 'the most important' system which the US relies on for early warning of ballistic missile attack.(19)

These three facilities are significant enough to be targets in their own right. As Mr R H Mathams stated in testimony to the Joint Parliamentary Committee on Foreign Affairs and Defence on 9 February 1981,

> .. my view would be that the Soviet Union would certainly consider the North West Cape installation (which obviously is a communications facility and involved with the command of submarines) and probably the other two facilities to be in some way

> connected with American strategic nuclear forces. As a result, they would feature on the Soviet target list. But I have never been able to assess if they would be near the top or bottom of the list. One could argue quite cogently for either depending on what one believes to be Soviet perceptions.
>
> However, let us accept that there is a finite risk of their being attacked.(20)

And as the Joint Committee itself concluded,

> It would be prudent for Australian defence planners to assume that the joint facilities at North West Cape, Pine Gap or Nurrungar are on the Soviet target list and might be attacked in the course of a nuclear conflict between the two superpowers. In other words, there is a finite risk that one or all of the facilities would be attacked during a Soviet-United States war that involved their nuclear strategic forces.(21)

There are many situations in which the taking out of one (or more) of the North West Cape, Pine Gap and Nurrungar facilities would degrade the US strategic capability more than would an actual attack on the strategic forces themselves - and even more situations where some measures to reduce or limit damage from nuclear attack could be achieved.

With regard to situations where the destruction of the installations would disproportionately degrade the American strategic forces, the most obvious is probably the destruction of the communications network for the American FBM submarines. The missile-launching-submarines are undoubtedly the least vulnerable leg of the American strategic Triad; they also carry the bulk of the US strategic nuclear warheads - more than 5,000 out of some 10,000 warheads. American nuclear submarines in general are quieter and faster than their Soviet counterparts, and Soviet hunter-killer submarines are quite inferior to the US nuclear attack submarines protecting the American FBM submarine fleet. The Soviets could be confident of destroying only a very few of these submarines, even in an all-out search and destroy mission. On the other hand, they could relatively easily immobilise the whole American sea-based force by destroying its communications. At the very least, they would prevent the use of SLBMs against high-priority time-urgent targets, and would allow Soviet missiles to be launched or their bombers to be dispersed while the American submarines were sorting themselves out. Time would also be bought for the evacuation of cities, thus greatly limiting casualties in the event of an American counter-city response.

The destruction of the communications system for the US FBM submarine force is now taken for granted by US officials. For example, Admiral R Y Kaufman, USN, testified with regard to this system that 'we have to assume that an attack will be made on our communications facilities'.(22) In 1963 the Director of the US Navy's Special Projects Office, Admiral

Gallatin, described the VLF stations as constituting 'lucrative targets'.(23) And more recently, the Assistant Secretary of Defense for Communications, Command, Control and Intelligence (C^3I), Dr Gerald P Dinneen, testified that these stations 'are vulnerable. They are soft targets.'(24)

Attacks on navigation and geodetic facilities can also have disproportionate impact in terms of reducing the effectiveness of opposing strategic forces. The lethality of a nuclear force is determined primarily by the accuracy with which it can be delivered - which depends, in turn, on precise knowledge of the launch position (ICBM silo or FBM submarine) and the aim point for the intended target - missile silo, military base, or city. If accuracy is degraded, then many more warheads are needed for a given lethality or level of destruction - or, alternatively, a given number of weapons can do much less damage. Destruction of navigation and geodetic facilities can thus limit damage to Soviet military forces and value targets. Further, if accuracy is sufficiently degraded, some targets could no longer be destroyed at all. In the case of SLBMs, for example, as the elements which provide navigation for the submarines (such as the US Navy's Navigation Satellites) are removed, those missiles lose entirely whatever capacity they would normally have for destroying hardened targets.

There is also great strategic value to be gained from the destruction of the command, control and real-time surveillance facilities of an adversary. This is particularly so in the case of contingencies involving 'controlled responses', especially situations involving limited, sequential nuclear exchanges. At present the United States has a greater capability for these operations than does the USSR, but much of the American capability is dependent upon the maintenance of its military satellite systems. The destruction of these systems would not only remove the US advantage in these contingencies but might even effectively prevent US participation in controlled, sequential exchanges.

There are also some conceivable situations short of an attack against the United States in which the Soviet Union might attack the US facilities in Australia. Most Australian observers are prone to dismiss this possibility, but it is one which has engaged the attention of US strategic planners. For example, the Pentagon's recent Satellite Mission Survivability Study has a section on the vulnerability of the two Code 647-DSP ground stations, in which consideration is given to a Soviet attack on Nurrungar intended to demonstrate Soviet resolve and capability and at the same time degrade the US ICBM early-warning system, while avoiding the political and strategic consequences of a similar attack on the station in Colorado.

Some commentators have argued that the Soviets would not want to target US C^3I facilities since to destroy an opponent's information, command and communications systems could lead to the loss of any restraints in a nuclear exchange.

Moreover, to launch missiles at a facility concerned with monitoring the Soviet ICBM fields for missile launches (ie the DSP facility at Nurrungar) would itself provide early-warning of attack. However, such arguments can only be made given ignorance about either the disproportionate strategic impact of modern command, control, communications, navigation and intelligence systems, or about the current strategic nuclear war-fighting doctrines of the US and the Soviet Union.

Soviet policy is to attack C^3I systems at the outset of any strategic nuclear exchange, in an effort to disrupt and degrade the enemy's military forces, political and administrative control, and industrial support capacity. As Major-General Van C Doubleday testified in 1979, 'Soviet strategic doctrine indicates Soviet strategic targeting specifically includes US C^3'.(25) Uri Ra'anan has recently noted that

> the publications of Soviet military theoreticians and planners stress the need for paralyzing the adversary's C^3 system in the opening stage, obviously not sharing the preoccupation of Western analysts with the thought that functioning C^3 systems would be required to enable both sides to negotiate a halt in an escalatory process.(26)

And Joseph D Douglass and Amoretta M Hoeber concluded from their recent study of Soviet Strategy for Nuclear War that 'there would likely be an intensive, overt, active attack on reconnaissance, command and control, and communications assets at the very beginning of the war.'(27) The destruction of US national command-and-control facilities would disrupt US attacks and would allow the Soviet Union to control the progress of the conflict and to conduct military and political reconstitution more effectively. Attacks on strategic and tactical command-and-control systems would be an integral part of the missions against the strategic nuclear and other military forces. As Col. Shrokov wrote in 1966:

> Under conditions of a nuclear war, the system for controlling forces and weapons, especially strategic weapons, acquires exceptionally great significance. A disruption of the control over a country and its troops in a theatre of military operations can seriously affect the course of events, and in difficult circumstances, can even lead to defeat in a war. Thus, areas deserving special attention are the following: knowing the co-ordinates of stationary operations control centres and the extent of their ability to survive; the presence of mobile command posts and automatic information processing centres; the communication lines' level of development and, first of all, that of underground and underwater cable, radio-relay, ionospheric and tropospheric communication lines; field communication networks and duplicate communication lines; communication centres and the extent of their facilities, dispersion and vulnerability.(28)

Attacks on early-warning and signals monitoring facilities would of course alert the US to the fact of a Soviet strike, but without these eyes and ears the US would have difficulty ascertaining the scale and nature of the attack and hence the US response could well be far less effective than otherwise. (29)

2. Australian Defence Establishments:

The only Australian defence establishments which are of sufficient importance to warrant consideration as possible nuclear targets in the event of a US-Soviet conflict are HMAS Stirling at Cockburn Sound, WA, and the RAAF Base at Darwin, NT. These are both Australian facilities under full Australian control, but their periodic use by nuclear-related US forces must invite Soviet interest.

Cockburn Sound: On 30 January 1980, during a visit to Washington to discuss the Soviet invasion of Afghanistan, Prime Minister Fraser offered the US the use of the new naval base at Cockburn Sound as either a 'home port' or a 'base port' for US nuclear-powered aircraft carriers and other warships involved in Indian Ocean deployments. A team of US Navy officials visited Cockburn Sound in April 1980 to make a technical survey of the base, but in April 1981 the Navy decided to proceed no further with consideration of the Prime Minister's offer.(30)

However, the US Navy has increasingly used Cockburn Sound as a transit point for its ships patrolling the Indian Ocean over the past two to three years. For example, at least 35 warships stopped over at Cockburn Sound during the first eight months of 1981, including four aircraft carriers, eight nuclear-powered attack submarines, and several missile cruisers and destroyers.(31) The nuclear-powered attack or hunter-killer submarines are now visiting Cockburn Sound at an average of about one a month, with each stop-over averaging 6-7 days, so that there is one tied up at the base some 20-25 per cent of the time.

VISITS BY US NUCLEAR ATTACK SUBMARINES TO HMAS STIRLING, WA

1976 - March 1982

Dates of Visit	Name of Submarine
14-18 August 1976	USS Snook
19-27 April 1979	USS Tunny
20-25 October 1979	USS Pintado
24-29 October 1979	USS Gurnard
26 March - 1 April 1980	USS Haddock
1-7 April 1980	USS Los Angeles
19-26 May 1980	USS Guardfish
18-25 July 1980	USS Puffer
25-30 July 1980	USS Baton Rouge
13-19 August 1980	USS Tautog
6-11 September 1980	USS Groton
11-16 September 1980	USS Permit

VISITS BY US NUCLEAR ATTACK SUBMARINES TO HMAS STIRLING, WA

1976 - March 1982 (continued)

Dates of Visit	Name of Submarine
10-17 November 1980	USS Omaha
16-22 December 1980	USS Haddo
23-29 December 1980	USS Philadelphia
6-11 February 1981	USS Memphis
27 February - 6 March 1981	USS Gurnard
15-22 April 1981	USS Cavalla
22-27 May 1981	USS Pintado
29 May - 3 June 1981	USS Bluefish
6-13 July 1981	USS Los Angeles
8-13 July 1981	USS Cincinnati
11-17 August 1981	USS Haddock
23-30 September 1981	USS New York City
5-12 October 1981	USS Bremerton
22-28 October 1981	USS Flasher
30 November - 7 December 1981	USS Aspro
29 January - 5 February 1982	USS Tautog
10-17 February 1982	USS Puffer
19-26 March 1982	USS Sea Horse

Sources: Hansard (House of Representatives), 26 March 1981, p.1080; 5 May 1981, p. 2004; 10 June 1981, p.3596; 19 August 1981, p. 459; and 4 May 1982, p. 2226.

Nuclear-powered submarines, including hunter-killer as well as FBM submarines, together with the bases which support them, must rank very high on Soviet nuclear target lists.

RAAF Base, Darwin: In February 1980, the US Air Force began low-level navigation flights by B-52 aircraft over northern Queensland. During 1980, these flights were conducted on an average of twice a month; in 1981, the frequency increased to an average of 3.5 per month. These B-52s, based at Guam, did not land in Australia.(32)

On 11 March 1981, the Australian and United States Governments reached agreement on the terms and conditions governing US Air Force B-52 staging flights through RAAF Base Darwin. The Agreement provides that the B-52 flights shall be for sea surveillance in the Indian Ocean area and for navigation training; that the agreement of the Australian Government would need to be obtained before the facilities at Darwin can be used in support of any other category of operations; that the B-52 aircraft on surveillance flights will be supported by KC-135 tanker aircraft for aerial refuelling and the operations shall consist of periodic deployments of up to three B-52 and six KC-135 aircraft; and that about 100 US Air Force personnel and associated equipment will support the staging operations and some of these may be stationed at RAAF base Darwin.(33)

The first B-52 in this operation arrived in Darwin on 5 May 1981, a day after the first KC-135 landed.(34)

B-52 STAGING OPERATIONS RAAF BASE DARWIN 1981

1. 5 May
2. 19 June
3. 17 August
4. 14 September
5. 14 September
6. 28 September
7. 10 November

Separately, B-52 aircraft conducted navigation training over Australian territory on the following dates:

1980

1. 27 February
2. 12 March
3. 2 April
4. 16 April
5. 30 April
6. 13 May
7. 27 May
8. 10 June
9. 26 June
10. 8 July
11. 19 July
12. 22 July
13. 5 August
14. 19 August
15. 2 September
16. 9 September
17. 16 September
18. 7 October
19. 21 October
20. 4 November
21. 18 November
22. 2 December
23. 16 December

1981

1. 6 January
2. 13 January
3. 20 January
4. 27 January
5. 3 February
6. 10 February
7. 17 February
8. 24 February

1981 (contd)

9. 10 March
10. 17 March
11. 24 March
12. 31 March
13. 7 April
14. 14 April
15. 21 April
16. 28 April
17. 12 May
18. 19 May
19. 26 May
20. 2 June
21. 9 June
22. 23 June
23. 7 July
24. 14 July
25. 28 July
26. 4 August
27. 11 August
28. 25 August
29. 2 September
30. 8 September
31. 6 October
32. 13 October
33. 15 October
34. 20 October
35. 22 October
36. 27 October
37. 29 October
38. 3 November
39. 17 November
40. 24 November
41. 1 December
42. 8 December

Source: House of Representatives, Answer to Question No. 2155, 16 February 1982.

The Australian Government has espoused a firm policy that aircraft carrying nuclear weapons will not be allowed to fly over or stage through Australia without its prior knowledge or agreement. The Exchange of Notes of 11 March 1981 provides that the facilities at RAAF Base Darwin cannot be used in support of operations other than sea surveillance and navigation training. There is also an unsigned record of conversation between the Minister for Foreign Affairs, Mr A A Street, and the Secretary of State, Mr A M Haig, which states that all B-52s engaged in operations through or over Australia 'will be unarmed and carry no bombs'.(35) And the B-52s used

to date have in fact had the bomb racks replaced with sophisticated monitoring equipment.

However, the Soviet Union could well consider that the agreements and the current B-52 configuration might not pertain in the event of a US-Soviet conflict. The bombers can readily be re-configured to carry nuclear weapons. The Street-Haig record of conversation has no standing in international law and is not binding as an agreement in any way. And the US has rarely been meticulous in observing more formal agreements of a similar nature. In any case, the support equipment and personnel at Darwin would enable the base to host other B-52s on a makeshift basis, and in the event of a nuclear exchange the Soviet Union would be likely to attempt to deny the US access to any facility which could provide succour for the B-52 force.

3. Industrial Complexes and Urban Centres:

There are two arguments sometimes put forward which involve nuclear attacks against Australian urban-industrial areas. Neither of them is very persuasive.

One argument relates threats to urban-industrial areas to the presence of the US installations. For example, some commentators have suggested 'blackmail' scenarios in which an adversary (of the US, not necessarily of Australia) might issue an ultimatum to the Australian Government to dismantle the installations or suffer a nuclear attack on an Australian city. This 'linkage' scenario was addressed by the Joint Parliamentary Committee on Foreign Affairs and Defence in 1981 as follows:

> In a general war would the presence of the facilities attract hostile attention to other centres in Australia, particularly areas of high population density?
>
> The answer to this question is probably no. If for no other reason this unlikelihood can be attributed to the need of the Soviet Union (which like the United States has less nuclear warheads than potential 'counterforce' targets) to concentrate on targets which are of a higher priority than Australian cities.(36)

The second argument is that in a nuclear war the Soviet Union may have a motive to destroy Australia's capacity to support or succour the US (after the latter has been severely damaged in such a war) in order to impede the post-attack economic recovery of the US and ensure Soviet dominance in the post-war world.

It is true that Australia's major cities could be incapacitated by only a very small fraction of the Soviet nuclear arsenal. However, at the point in a nuclear exchange where large-scale attacks have already been undertaken against each side's urban-industrial areas this arsenal would be much depleted; it would be most unlikely to number more than a couple of hundred weapons. The Soviets would probably wish

to retain the greater fraction of this number as a deterrent force, against any residual US capability as well as against any third countries, and, in any case, there would be many economic recovery targets in Europe and elsewhere far more lucrative than Sydney or Melbourne.

The probability of attacks on major Australian cities is thus of a different order to the likelihood of strikes against North West Cape, Pine Gap and Nurrungar, and perhaps Cockburn Sound and Darwin. However, the consequences of attacks against the major cities would be so horrendous that some consideration must be given to possible means of limiting damage in the event that this most remote contingency does nevertheless eventuate.

The Effects of Nuclear Attacks on Australia:

The Soviet Union has a number of alternative strategic nuclear delivery vehicles (SNDVs) which could be used to attack targets in Australia. These include the single-warhead SS-11 Sego ICBMs, the MIRVed SS-18 ICBMs, various SLBMs carried by FBM submarines operating out of Vladivostok or Petropavlovsk, or strategic bombers such as the Tu-95 Bear and Tu-22M Backfire if staging facilities were made available by Vietnam. The characteristics of these various SNDVs are described in the following table:

SOVIET STRATEGIC NUCLEAR
DELIVERY VEHICLES RELEVANT TO ATTACKS ON AUSTRALIA:

January 1982

	No. of Delivery Vehicles	Range (NM)	Throwweight (Thousand lbs)	No. of Warheads (n)	Yield per Warhead (MT)	CEP (feet)
ICBMs:						
SS-11 Sego	518	5,700	2	1	1.0	5,000
SS-18 Mod 1	50	5,500	16	1	24	1,400
SS-18 Mod 2	68	5,500	16	8	.9	1,400
SS-18 Mod 3	50	5,500	16	1	20	1,155
SS-18 Mod 4	140	5,500	16	10	.5	900
SLBMs:						
SS-N-6 Mod 1)	469 -	1,300	1.6	1	.7	3,000
SS-N-6 Mod 2)		1,600	1.6	1	.65	3,000
SS-N-6 Mod 3)			1.6	3	.35	4,500
SS-N-8	302	4,300	1.8	1	.8	3,000
SS-N-18 Mod 1)	176	4,050	2.5	1	2	2,000
SS-N-18 Mod 2)			2.5	3	.5	2,000
BOMBERS:						
Tu-22M Backfire	90	3,075	4	2	1	3,000
Tu-95 Bear	113	4,000	8	4	1	3,000

All of the potential targets in Australia are 'soft', ie, they would be destroyed by the application of relatively low blast overpressures. The VLF antenna at North West Cape and the radomes at Pine Gap and Nurrungar could probably withstand no more than about 5 pounds per square inch (psi) of peak blast overpressure and, indeed, perhaps only one or two psi of dynamic overpressures. The facilities at Darwin and Cockburn Sound would be destroyed by 25 psi. In the case of urban-industrial areas, substantial damage would be rendered by one to three psi, and the area receiving blast damage at five psi or above would be essentially destroyed. Within the five psi blast area at Hiroshima, for example, two-thirds of all buildings were destroyed and casualties were approximately 50 per cent dead and 30 per cent injured.(37)

Attacks on targets such as these would not require the relatively high accuracy of the more modern Soviet ICBMs, such as the SS-18s, but could be undertaken almost as effectively with the obsolescent SS-11 ICBMs or some of the Soviet SLBMs, leaving the SS-18s for allocation against hard targets such as underground missile silos.(38) There are 120 SS-11 ICBMs within range of Australia, located in three fields at Drovyanaya, Olovyannaya and Svobodnyy,(39) but a disadvantage of a single-warhead missile is that one missile must be allocated to each target; indeed, most planners would allocate two warheads - hence two missiles - to each target to compensate for potential reliability problems. On the other hand, a single SS-18 missile with eight or ten warheads could cover all the interesting targets in Australia with two warheads each. The use of SLBMs is also a possibility. The FBM submarines in the Soviet Pacific Fleet between them carry some 312 SLBMs (176 SS-N-6, 72 SS-N-8 and 64 SS-N-18 missiles), the use of which would have the advantage of reducing the warning-time to 5-15 minutes; however, it is unlikely that Soviet planners would choose to send a submarine with 12 or 16 missiles (and perhaps 48 warheads) down to the southern hemisphere, which might take those missiles out of range of many interesting targets in the northern hemisphere, when no more than 10 warheads would be needed to cover the whole Australian target set.

Whatever the delivery vehicle chosen, the maximum damage to the sorts of equipment and buildings at each of the possible targets in Australia would be rendered by detonating the warheads in the air rather than at ground level. For a 1-Mt warhead, the optimum height of Burst (HOB) for targets of 5 psi is about 9000 feet; for targets of 25 psi, it is about 3000 feet. At these altitudes, there would be very little fallout as compared to a weapon detonated at ground level.

The effects of long-term exposure (ie a week to a month) to radiation such as received from fallout is shown in the following table. The acute lethal dose (usually described as the dose from which 50 per cent of those exposed will die) is in the range from 450 to 500 REMs.(40)