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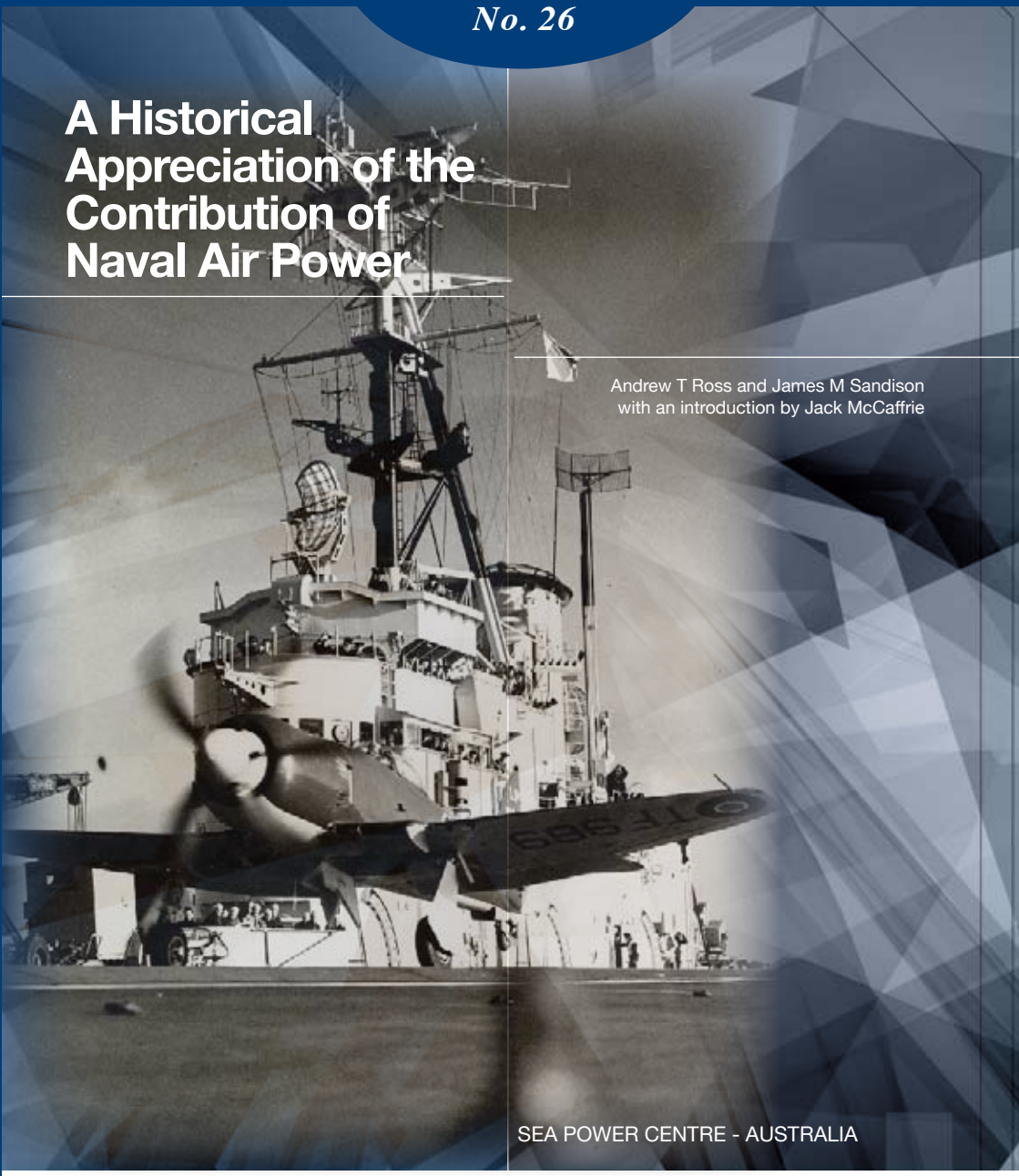
No. 26

A Historical Appreciation of the Contribution of Naval Air Power



Andrew T Ross and James M Sandison
with an introduction by Jack McCaffrie

SEA POWER CENTRE - AUSTRALIA

A HISTORICAL APPRECIATION OF THE CONTRIBUTION OF NAVAL AIR POWER

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Abbreviations and Acronyms

AAR	Air-to-Air Refuelling
ADF	Australian Defence Force
AEW&C	Airborne Early Warning and Control
ASW	Anti-submarine Warfare
C3	Command, Control and Communications
CSE	Central Studies Establishment
ECM	Electronic Counter Measures
FEBA	Forward Edge of the Battle Area
HMAS	His/Her Majesty's Australian Ship
HMS	His/Her Majesty's Ship
HNLMS	His/Her Netherlands Majesty's Ship
ICBM	Intercontinental Ballistic Missile
JFHQ	Joint Force Headquarters
JSF	Joint Strike Fighter
LCH	Landing Craft Heavy
LHA	Amphibious Assault Ship – General purpose
LHD	Amphibious Assault Ship – Multi-purpose
LPA	Amphibious Transport Ship
LPD	Amphibious Transport Dock
LPH	Amphibious Assault Ship – Helicopter
LSL	Landing Ship - Logistic
MAC	Merchant Aircraft Carrier
NAP/TAWS	Naval Air Power/Tactical Air Warfare System
NATO	North Atlantic Treaty Organization
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RN	Royal Navy
SACSG	Seaborne Air Capabilities Special Group
STOVL	Short Take Off and Vertical Landing
UAE	Unit Aircraft Establishment

UK	United Kingdom
UN	United Nations
UNITAF	United Task Force
US	United States
USAF	United States Air Force
USN	United States Navy
USS	United States Ship
USSR	Union of Soviet Socialist Republics

Introduction

Throughout the 1970s and early 1980s the Royal Australian Navy (RAN) was deeply engaged in trying to ensure the future of its carrier-based naval aviation force. The aircraft carrier, HMAS *Melbourne*, launched in 1943 and in RAN service since 1955, would need to be replaced sooner rather than later. As well, whether a replacement carrier was to be capable of operating conventional fixed wing aircraft, or only of operating short take off and vertical landing (STOVL) aircraft, would determine the operational lives of the A-4 Skyhawk and S-2 Tracker aircraft acquired in the mid-1960s.

Arguments for and against the continuation of fixed wing naval aviation were put in a variety of forums over the years, including Defence Committees, media, Parliament and, eventually (after the government decided to buy HMS *Invincible*), the Joint Parliamentary Committee on Foreign Affairs and Defence. As part of this process many papers and studies were prepared within the Department of Defence. One source of these writings was the Central Studies Establishment (CSE) – a Defence analytical agency established in 1969, which no longer exists. CSE produced one of the most important studies in this saga: the Naval Air Power/Tactical Air Warfare System (NAP/TAWS) Study, which began in 1970 and dragged on for some years.[1]

While the NAP/TAWS Study did not look favourably on the value of the capability provided by naval aviation, its findings were subsequently discredited by the Navy – but only after damage had been done to its case.[2] By contrast, a later CSE paper, 'Historical Appreciation of Naval Air Power', provided some strong arguments in favour of naval aviation by reference to a slew of historical case studies. This paper was prepared in January 1978 for consideration by the Navy-sponsored Seaborne Air Capabilities Special Group (SACSG) and it is reproduced here with some editing.[3]

The purpose of publishing the paper now is to provide to a wider audience some appreciation of a specific and (for Australia) very relevant use of aircraft carrier-configured ships and embarked aviation. In 2007 the government decided to purchase two very capable amphibious assault ships (LHD), comparable in size and general flight deck layout to *Melbourne*. They were to provide the Australian Defence Force (ADF) with the capacity to transport a battalion group and put it ashore, with landing craft operating from the ships' well decks and with helicopters operating from the flight decks.

The CSE paper examines the full range of uses to which carriers and their aircraft have been and can be put – some of these are beyond the capability of the selected LHDs. The CSE paper also catalogues and explains peacetime and wartime instances in which the use of an aircraft carrier – or an amphibious ship with a full length flight deck – was either the preferred or only way of getting troops to their area of operations

and supporting them in theatre. These, together with a listing below of more recent instances, provide a very useful illustration of the utility of the LHDs.

Much of this introduction will be devoted to the recent evolution of the ADF's amphibious (or expeditionary) capability, and provides further examples of aircraft carrier-like amphibious ships' use in the years since the CSE paper was written. First, however, to provide a context for the CSE paper, there will be a brief description of some of the major events associated with the RAN's quest in the 1970s and early 1980s to maintain its carrier aviation force.

The Aircraft Carrier Replacement Saga

The aircraft carrier and Australian naval aviation had been living on borrowed time almost since the formation of the Fleet Air Arm in 1948. The establishment of the Fleet Air Arm itself occurred despite Department of Defence opposition and Royal Australian Air Force (RAAF) efforts to establish unified control of ship-borne and land-based aircraft, to guarantee air superiority.[4] Furthermore, despite HMAS *Sydney*'s very successful Korean War duty and the introduction to service of *Melbourne* in 1955, the government had decided by 1959 that it could no longer support carrier-based naval aviation. That decision was made primarily on financial grounds, but there had been questions as to the need for 'two air forces' for some years previously.[5] In 1960, however, the government decided to retain *Melbourne* as an anti-submarine helicopter carrier.[6] Changing strategic circumstances then led to the 1964 reversal of the initial decision and the purchase of A-4 fighter-bombers and S-2 anti-submarine aircraft.

At that stage *Melbourne*, with her A-4s, S-2s, Wessex and later Sea King helicopters, seemed set to operate at least into the 1980s. Nevertheless, work needed to be done to ensure the future of what was undoubtedly Australia's most contentious military capability. An early example of this work was the 1970 CSE study into finding a replacement for HMAS *Sydney* in the troop transport role. By then, *Sydney* had long ceased to embark fixed wing aircraft, but could still operate helicopters. This work was overtaken in 1971 by the same organisation's NAP/TAWS Study, which extended over four years[7] and was authorised by the Chiefs of Staff Committee.[8] The NAP/TAWS Study concluded essentially that carrier-based naval aviation was not cost-effective in the scenarios studied.

For the RAN this was a damaging result, not least because parts of the study's results were leaked to the media. Ultimately, the Navy was able to refute the conclusions on the basis of inappropriate premises, and the Department of Defence itself also concluded that the study results were invalid.[9] Subsequently the Navy formed the Seaborne Air Capabilities Special Group, an entirely Navy body, to conduct further studies. The next major event in the attempt to secure the future of naval aviation was the appointment of Vice Admiral Anthony Synnot as Chief of Naval Staff in December 1976. Within a month

he had established the Aircraft Carrier Project Directorate and appeared determined to force a decision – in the face of significant opposition within Defence and the media. Despite this opposition, by September 1980 the government had determined that it would acquire an aircraft carrier (STOVL aircraft or helicopter capable) but would defer a decision on future fixed wing aircraft until 1983.[10] The decision to go ahead with the carrier apparently only spurred opponents on to greater things.[11]

By this time the examination of contenders to replace Melbourne had been narrowed to three: the *Iwo Jima* class LPH, a US designed sea control ship, and the Italian *Garibaldi* class STOVL carrier. The *Invincible* class was rejected because of cost. Over subsequent months the decision was made to acquire a suitably modified version of the United States Navy (USN) *Iwo Jima* class LPH (a helicopter capable amphibious ship) and in February 1981 a design contract was let with the US builder.[12] A project office was established in the US in March 1981 and the construction contract was near to being awarded in June 1981, when the British Government announced that it would sell one *Invincible* class ship.[13] The price would, of course, be very competitive.

After deliberation within the Department, in September 1981 the Minister for Defence announced that the *Invincible* class ship was to be included in the evaluation process. The RAN made a case for the *Invincible*, perhaps driven by the opportunity of having the ship available for delivery in late 1983 and by the attractive price – a total project cost of $478 million in August 1981 prices.[14] In doing so, however, it opened itself to criticism – which was not slow in appearing – that it was aiming to provide a very expensive platform for a mere four or five helicopters. This was probably indicative of the Navy's failure throughout to develop and articulate consistent and coherent arguments to support its case.[15]

Nevertheless, on 25 February 1982, the Minister for Defence announced that Australia would buy HMS *Invincible*. This marked the beginning of the Australian Labor Party's major attack on the carrier capability, which was to culminate shortly after its gaining power in the March 1983 federal election. Possibly because of this opposition and that expressed in the media, the government consented on 25 March 1982 to refer the decision to the Joint Parliamentary Committee on Foreign Affairs and Defence (the Katter Committee).[16]

Before the committee reported, however, the outbreak of the Falklands War caused Prime Minister Fraser to offer the British Government the opportunity to withdraw from the *Invincible* sale, an offer that was accepted. Consequently, on 13 July 1982, just two weeks after *Melbourne* and her fixed wing squadrons were decommissioned, the Australian Government announced that the Royal Navy (RN) would retain the ship.[17] Subsequently, the Katter Committee gave lukewarm support for the acquisition of an aircraft carrier but was especially concerned as to the cost implications of doing so relative to its assessment of the capability a carrier would offer in the anti-submarine warfare role.[18]

Further effort was made to examine available carrier options – including purchasing HMS *Hermes* – but nothing had been achieved before the March 1983 federal election. This resulted in the election of the Hawke Labor Government, which very quickly put paid to the RAN's carrier ambitions.

Aircraft Carriers in the Amphibious Role: Recent Experience

The CSE Study deals comprehensively with the peacetime and wartime uses of aircraft carriers up to 1976. Many of the instances quoted involved aircraft carriers in their standard form – ships with full length flight decks and capable of operating a range of fixed wing aircraft and helicopters. Many instances also involved ships modified for or specifically designed to carry out amphibious operations – ships of the type now being acquired for the ADF. These are often designated amphibious assault ships – general purpose or amphibious assault ships – multi-purpose (LHA or LHD), although smaller ones may be designated amphibious transports – dock (LPD). Many of these ships also have full length flight decks but most are only capable of operating helicopters. Some of these amphibious ships now also operate STOVL fixed wing aircraft, principally the Sea Harrier STOVL fighter aircraft (introduced in 1979) and its US Marine Corps derivative, the AV-8.

These amphibious ships have been used by their navies frequently since 1976, in both peacetime and wartime operations throughout the world. Although the following listing is not exhaustive, it shows that such use has been especially frequent since the end of the Cold War. The examples included relate essentially to the USN and the RN, mainly because they have operated the largest number of such ships.[19]

Peacetime Uses

a. 1980: During October, USS *Guadalcanal* among others assisted earthquake victims in the Algerian city of Al Asnam.

b. 1989: During October, USS *Peleliu* provided food and shelter to victims of an earthquake in northern California.

c. 1990: In the latter months of that year, USS *Saipan* and other amphibious ships evacuated non-combatants from Liberia.

d. 1991: During May, USS *Tarawa* and other ships provided large scale disaster relief after cyclone damage in Bangladesh.

e. 1992: During September, USS *Tarawa* and others provided relief against starvation in Somalia.

f. 1993: In April, the USS *Tripoli* task group returned to Hawaii from Somalia. While in Somali waters the task group had recovered 30,000 pieces of ordnance, 100,000

pounds of explosives, and launched over 2000 helicopter sorties, delivering over 175,000 meals and 25,000 gallons of water.

g. 1994: In July and August, the USS *Inchon* and *Wasp* Amphibious Ready Groups upheld UN Security Council sanctions against Haiti.

h. 1998: USS *Tarawa* evacuated US citizens from Eritrea.[20]

i. 1998: HMS *Ocean*, while still on trials, joined a multinational disaster relief operation in Honduras and Nicaragua in the wake of Hurricane Mitch.

j. 1999: HMS *Ocean* conducted humanitarian relief operations in Turkey after a major earthquake centred on Duzce.

k. 2000: In September, the USS *Tarawa* Amphibious Ready Group brought building materials and food to East Timor.[21]

l. 2000: HMS *Ocean* demonstrated ongoing support for the Sierra Leone Government.

m. 2005: In August and September, US Ships *Iwo Jima* and *Bataan* amongst others provided humanitarian assistance to the people of Louisiana and Mississippi in the wake of Hurricane Katrina.[22]

Wartime or Warlike Examples

a. 1979: In October, USN amphibious ships among other warships provided a show of force off Guantanamo Bay, Cuba, where they landed 1800 Marines in response to manoeuvres by Soviet combat troops in Cuba.

b. 1987: USS *Guadalcanal*'s helicopters conducted minesweeping operations in the Persian Gulf during July.

c. 1991: A large force of USN amphibious ships participated in Operation DESERT STORM, the war against Iraq beginning in January.

d. 1992: US Ships *Wasp* and *Saipan* took part in Operation RESTORE HOPE humanitarian relief activities in the Adriatic during the violent disintegration of Yugoslavia.

e. 1994: The USS *Tripoli* group deployed with 2000 Marines to the Persian Gulf in response to Iraqi troop movements on the Kuwaiti border.

f. 1995: The USS *Wasp* group joined other ships in the Adriatic during December for the Operation JOINT ENDEAVOUR peacekeeping mission.

g. 1999: During the latter months of the year, US Ships *Belleau Wood* and *Peleliu* provided helicopter support for Operation STABILISE in East Timor.[23]

h. 2000: HMS *Ocean* conducted a conspicuous amphibious demonstration, landing 600 Royal Marines to rescue the failing UN peacekeeping force in Sierra Leone.

i. 2001-02: Several USN amphibious ships were involved in launching attacks during Operation ENDURING FREEDOM late in 2001.[24]

j. 2001-02: HMS *Ocean* was part of the UK Amphibious Task Group poised to support Royal Marines in Afghanistan.

k. 2003: Several USN amphibious ships were involved in Operation IRAQI FREEDOM in the early months of the year.[25]

l. 2003: HM Ships *Ocean* and *Ark Royal* (the latter also operating as an LPH) conducted an airborne Royal Marine assault on the Al Faw coast in Iraq.

Although the USN is the predominant operator of LHAs, LHDs and LPDs, it is by no means the only operator of these types of ships. Countries that have the capability or have plans to develop it include:[26]

a. China: construction of an LHD apparently began in 2006. The ship was launched in December 2006 but it does not have a full length flight deck.

b. France: two *Mistral* class LHDs are being built, with the first commissioning in December 2006 and the second entering service during 2007.

c. India: In January 2007 the Indian Navy took over the ex-USS *Trenton*, an *Austin* class LPD.

d. Italy: three *San Giorgio* class LPDs were commissioned between 1988 and 1994, and initial studies have begun for an LHD displacing up to 20,000 tonnes.

e. Japan: three LPDs were commissioned between 1998 and 2003.

f. Netherlands: a *Johan de Witt* class LPD was launched in May 2006 and will enter service in 2007. It has a flight deck aft and will carry up to six NH-90 helicopters. There is also another LPD already in service.

g. Portugal: there is a plan to have one LPD in service by 2013.

h. Republic of Korea: one LPD was commissioned in July 2007.

j. Russia: there is one LPD in service.

k. Spain: one LHD is slated to commission in December 2008 and two Galicia class LPDs are already in service. The Spanish LHD design has been selected for the RAN.

l. Turkey: there are plans for an LPD displacing up to 15,000 tonnes.

m. UK: there are two *Albion* class LPDs and an amphibious assault ship-helicopter (LPH) in service.

n. US: four amphibious assault ships – multi-purpose (LHA) commissioned between 1976 and 1980 with eight more commissioned between 1989 and 2008.

These developments demonstrate that the capability provided by these ships remains relevant and is becoming relevant to more and more nations.

Amphibious Assault Ships for Australia

Australia's drive to acquire amphibious assault ships can be traced back to 1987. The Defence White Paper produced in that year, *The Defence of Australia* made it clear that in maintaining a self-reliant defence posture Australia would see that 'priority is given to those capabilities which are needed for the defence of Australia and its direct interests'.[27] At that time the defence of Australia was the major force structure determinant and there was an expectation that this would enable the ADF to undertake other operations 'in support of regional allies and friends'.[28] Very little capacity existed for any kind of expeditionary operation and such operations were not anticipated.

Nevertheless, in response to the first Fiji coup, a decision was made on 14 May 1987 to embark a company group of the Operational Deployment Force, to enable any necessary evacuation of Australian nationals from Fiji. No such evacuation was needed, but the operation highlighted the ADF's force structure limitations. The troops were airlifted from Townsville to Norfolk Island and then helicopter-lifted offshore to HMAS *Tobruk*, a landing ship-logistic (LSL) and the RAN's only troop carrying ship. Lifting the troops and their equipment from Norfolk Island required 58 helicopter sorties. A further 61 sorties and some jackstay transfers were then used to distribute the troops among the ships of the force assembled for Operation MORRIS DANCE.

Despite the untidiness of the ADF's response to the demands of the Fiji operation, there was no immediate force structure outcome. For many analysts it was a 'one-off' event. Nevertheless, within a year the Army had stated a requirement for a simultaneous company group helicopter lift from ship to shore. Such a lift would require a minimum of six helicopters, each capable of carrying twenty troops and their equipment. It would also require a flight deck large enough to provide six helicopter spots or a combination of smaller flight decks to provide the six spots.

But Operation MORRIS DANCE was not a one-off event and over the next ten years the Navy's amphibious and sealift ships (HMA Ships *Tobruk* and *Jervis Bay*) and other units were involved in five operations:

a. 1988 – SAILCLOTH: on standby to evacuate Australian nationals from Vanuatu and ultimately not needed[29]

b. 1990 – DEFERENCE: on standby to evacuate Australian nationals from Bougainville[30]

c. 1992-93 – SOLACE: support for the UNITAF peacekeeping and humanitarian relief effort in Somalia

d. 1994 – LAGOON: support for the Bougainville peace conference, and

e. 1997-98 – BEL ISI I: support of the truce monitoring group in Bougainville.

Additionally the *Strategic Review 1993*, while maintaining the defence of Australia as its main focus, acknowledged the possible need for Defence supported evacuation of Australian nationals in the region, while cautioning that such tasks would not necessarily require additional specific purpose capabilities.[31] In a roundabout way, however, additional capabilities were already planned. The 1991 Force Structure Review had accepted the need to replace *Jervis Bay* with a training and helicopter support ship.[32] Funding was eventually cancelled in the 1993-94 budget and a cheaper alternative sought. This cheaper alternative materialised in the form of two ex-USN *Newport* class amphibious transport ships (LPA) at a purchase cost of $61 million. Modifications and repairs to the ships cost about $400 million, against the expected $70 million, and took a considerable time.[33]

Despite the delayed introduction into service and the huge cost overrun the two ships, commissioned as *Kanimbla* and *Manoora*, now provide the RAN and the ADF with a substantial and increasingly important capability. Each ship has capacity to transport and land 450 troops and can operate either three Sea King or four Black Hawk helicopters. The embarked helicopters enable the simultaneous landing of platoon sized groups in a single lift.[34] This remains far short of the Army's stated goal of a company group lift. Each ship also has comprehensive command and control facilities and extensive medical facilities. Since completion of their modification and repair they have participated in operations in East Timor (subsequent to Operation STABILISE), the Solomons, Iraq, and more recently in the tsunami and earthquake relief operations in Indonesia.[35]

Operation MORRIS DANCE and subsequent expeditionary operations demonstrated that Australia's capacity for evacuation operations was limited, and that our regional geography actually encouraged the use of sea transport for the movement of troops and heavy equipment. Even if these operations did not cause Defence to think more seriously about a need for an ADF expeditionary capability, the peace enforcement operation in East Timor, Operation STABILISE, certainly did.

Australia's response to the escalating violence in East Timor, following the plebiscite on independence, showed that its amphibious and sealift capabilities were inadequate and that without the earlier lease of the fast catamaran, commissioned as *Jervis Bay*, the position would have been even worse. *Tobruk* was used very heavily in the early stages of the operation for bringing troops and equipment from Darwin to Dili and, despite being long overdue for refit, performed admirably. The smaller heavy landing

craft (LCH) also performed a vital role in resupplying land forces throughout East Timor – a task that simply could not have been completed in any other way.

Confirmation of a change in Defence thinking came with the publication of *Defence 2000: Our Future Defence Force*. It pointed out that Australia would, if attacked, seek to engage enemy forces as far from our shores as possible. It also argued that the ADF should be prepared to contribute to regional peacekeeping and humanitarian operations, sometimes undertaking simultaneous operations.[36] In making these points *Defence 2000* also accepted that our deployment capabilities could be hard pressed. Significantly too, it highlighted the need for the ADF to be able to undertake coalition operations, even beyond our immediate neighbourhood, while acknowledging that such operations could involve relatively high intensity conflict.[37]

Australia's answer to the terrorist attacks of September 2001 and since has included expeditionary operations in the Persian Gulf, and has involved the now very well regarded and valuable LPAs – mainly in command and control and combat support roles.[38] The national response has also confirmed Australia's willingness to participate in coalition operations and there has been an acknowledgement that they are in future more likely to include operations 'further afield'.[39]

As previously noted, Australia's response to humanitarian emergencies in the region has also involved the LPAs, most notably for the December 2004 tsunami in Aceh, and then in March 2005 for the earthquake in Sumatra.

One significant result of the recent commitment to expeditionary operations, especially those further afield, is that the *Strategic Review 1993* statement to the effect that our forces were sufficiently versatile to carry out international security commitments without significant structural change is no longer valid. In fairness, however, the strategic situation and our assessment of where we may need to project military force in defence of our interests have changed dramatically.

These changes have resulted in the emergence of an Army requirement for the transport by sea of a battalion group of up to 1800 troops and their equipment. Specifically, the stated requirement amounts to:

a. the capacity to land some 1200 troops

b. space, deck strength for and the capacity to unload more than 100 armoured vehicles, including some Abrams tanks and about 260 wheeled vehicles

c. hangar space and landing spots for at least 12 helicopters

d. the capacity to support forces deployed ashore for up to 10 days at a time

e. command and control facilities for a joint force commander, and

f. the ability to mount air and watercraft operations in weather conditions up to sea state four.[40]

The ability to transport, land and support a battalion group ashore will represent a huge capability leap for the ADF. The government's preferred method of achieving the capability is to build locally two medium-size LHDs, which are planned to enter service between 2012 and 2014.[41] The selected design is the Spanish strategic projection ship of 27,000 tonnes displacement. Each of these ships will have well decks and six helicopter landing spots. The two ships will cost about A$3 billion.

The decision to acquire ships of this type has drawn criticism on two main grounds. Critics argue firstly that two such large ships will offer less flexibility than would a larger number of smaller ships.[42] This criticism is valid to the extent that with both ships needed to achieve the battalion group lift, this level of lift will not always be feasible because of the ships' maintenance cycles. A recent paper on the subject estimated that both ships would be available for 60 per cent of the time, while one ship would be available for the remaining 40 per cent.[43] The same paper noted that three ships of the size selected would provide the required battalion group lift at all times. Government has apparently determined that the cost of achieving that guarantee is too great in current circumstances.

Those critics who favour a larger number of smaller ships also argue that three or four smaller ships would be cheaper and more versatile than two larger ships. In a general sense, the versatility argument is valid. Four ships would guarantee the constant availability of two ships; thus, for example, enabling responses to two separate commitments. Unfortunately, four smaller ships (say 10,000 tonnes) would not guarantee the battalion group lift because of their limited troop carrying capacity and helicopter operating spots.[44] Thus the greater flexibility provided by the four smaller ships would apply only to much more limited operational scenarios than those underpinning the amphibious ship acquisition.

Arguments in favour of the smaller ships also suggest that they would be cheaper to acquire and operate than their larger counterparts. On two measures, however, the figures are revealing. According to McLennan and Gilbert, the acquisition cost penalty of a 25,000 tonne ship over one of 15,000 tonnes is about 25 per cent – not a huge increase, especially when the additional size and cost provides a 70 per cent increase in internal ship volume.[45] The cost penalty of generating a similar capacity increase with the smaller ships would be in the order of 60 per cent. Size is not the major factor in the cost of ship acquisition. Rather, cost is determined more by weapons, sensors, command and control systems, propulsion, electrical power and auxiliary systems.[46] These all have to be present in smaller ships just as they do in the larger ones.

Personnel are also a significant factor in selecting warships, both because of the cost of training and employing people in uniform and because of the continuing difficulty

in attracting and retaining capable people. Again, however, ship size is not the major determinant of crew numbers. Most of the systems found in larger ships will also be found in smaller versions – such as weapons, sensors, command and control systems and machinery. Consequently, the typical complement for an amphibious ship of about 9000 tonnes is from 135 to 170 people, while that for a ship of about 20,000 tonnes is from 160 to 285 people – depending on the extent of automation and other measures associated with minimum crewing.[47] As a result, up to 680 people would be needed to crew four smaller amphibious ships, while a maximum of 570 would be needed to crew the two larger ships. *Jane's Fighting Ships* lists the complement of the strategic projection ship as 243 personnel, which does not include members of the embarked air group.[48]

The second line of criticism of the larger amphibious ships is that they represent part of a Navy agenda to regain its status as an operator of aircraft carriers.[49] The far more prosaic reality is that the plan to acquire two large amphibious ships is a response to an Army generated and government approved requirement for the transport, landing and support ashore of a battalion group and their equipment.

This writer is aware of no Navy agenda to re-introduce an aircraft carrier capability, yet there are elements of the accusation that merit some reflection. The acquisition of the amphibious ships recognises the need for an expeditionary capability in the ADF. To dominate the maritime battlespace and to project power in defence of Australia and its interests, the ADF must be able to conduct sustained operations at considerable distances from home bases. Even operations in the waters to the near north of Australia can be categorised as being at considerable distance from home bases and so the term 'expeditionary' does not apply only to operations in distant parts of the region and beyond.

Wherever they are deployed, but depending on the potential threat, however, the amphibious ships would expect to be escorted by Aegis-fitted air warfare destroyers and other surface combatants to provide protection against submarine, surface or air threats during transit and in the area of operations. The surface combatants would also be able to provide air defence and naval gunfire support to ground forces, especially in the early part of an operation and while they remained relatively close to shore.

Depending on the threat type and level, the air defence capability could also include support from airborne early warning and control (AEW&C) aircraft and tactical fighters – which might also conduct ground support operations. The presence of these aircraft could depend on the availability of air-to-air refuelling (AAR) and of friendly airfields near the area of operations. The five AAR aircraft being acquired under project AIR 5402, depending on the nature and location of operations, could be both reliant on the availability of friendly airfields and hard-pressed to support intensive air operations.

Those who see the amphibious ships as an answer to years of suspected silent but intense Navy prayer might be granted one point. If Australia is to embark on a genuinely expeditionary approach to the use of military force it must surely be prepared to consider a tactical air capability in its deployments. RAAF tactical aircraft, such as the F/A-18 or the F-35 Joint Strike Fighter (JSF) in future, will not always be needed, either because the threat level or type will not demand their presence, or because they will be provided by another Service – in our case this would most likely be one of the US Services if we are part of a coalition force.

Nevertheless, in cases where tactical aircraft are needed and will not be provided by another country's forces, RAAF aircraft must be a part of the expeditionary force. They could be needed as part of the air defence shield for the deploying ships and for the ships and ground forces in the area of operations. They could also be tasked for attack missions in support of the ground forces. If air support of this kind is needed, the RAAF would in present circumstances need access to one or more overseas air bases, depending on the location of the area of operations. This kind of access can be difficult to arrange and in some cases may not be achievable. It would also depend on a very significant logistics support effort, which might itself depend on sea transport.

An alternative solution to the provision of tactical aircraft for expeditionary operations could involve the operation of STOVL JSF aircraft from one or both of the large amphibious ships. For this to be a viable option, the amphibious ships would need to be capable of operating the aircraft. The Spanish design meets this requirement and the ship is fitted with a ski jump. Additionally, the ships would need to be able to embark and operate the JSFs as well as the helicopters embarked for troop lift. Clearly, only a limited number of JSFs could be embarked and thus the air defence or attack capability provided would also be limited. Nevertheless, in conjunction with the AEW&C aircraft and the air warfare destroyer's Aegis air defence capacity, the aircraft could provide a credible capability in many scenarios.

This suggestion that the RAAF could operate STOVL JSFs from the amphibious ships is in line with the UK situation in which the Royal Air Force will fly STOVL JSFs from the Royal Navy's new attack carriers. In this sense then it is not in any way a return to the 'glory days' for the RAN but simply a way to ensure that air support is always available for expeditionary operations, through making full use of the capabilities of the amphibious ships and of two versions of the JSF aircraft. Even if the idea is not taken up, however, selection of the Spanish amphibious ship design will enable allied or coalition partner STOVL aircraft to operate from the ships. US Marine Corps STOVL JSFs would be the most likely partners.

Conclusion

The recent government decision to acquire two large 'flat-top' amphibious ships for the RAN will provide the ADF with an unprecedented capability to project military force from the sea. Acquisition of any kind of ships for the RAN, but especially large ones, often generates criticism, informed and otherwise. The acquisition of these amphibious ships is no exception, with some commentators seeing them as simply 'too big' and others seeing in them some devious Navy plan to reintroduce aircraft carriers.

The attached 1978 Central Studies Paper, supported by some more recent material in this introduction, aims to meet these criticisms and to provide a rationale for the acquisition of these ships. The paper itself shows that in the years up to 1976 there were many instances in which the capability proved to be invaluable in both peacetime and wartime or warlike operations. This introduction provides more contemporary examples to reinforce the point. It also shows that several countries either have already introduced amphibious ships of the LHD type to their navies, or have plans to do so. Finally, the introduction provides some thoughts as to how the expeditionary force capabilities of the ADF could be extended with the embarkation of STOVL JSF aircraft in these ships.

Notes

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A HISTORICAL APPRECIATION OF THE CONTRIBUTION OF NAVAL AIR POWER

by
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Reprinted from the 1978 Department of Defence Working Paper of the same name.

General Introduction

The purpose of this study is to provide a consolidated historical record of the operational use of aircraft carriers in peace and in war, with a view to identifying the key factors that operated in favour of sea-based air power in the situations examined. The study is confined to an appreciation of the operational experience pertaining to aircraft carrier types in the various forms in which they have existed to date. Table 1 contains a short list of nomenclature and description of aircraft carrier types considered. Aircraft embarked in carriers as air groups, which comprised a mixture of aircraft that could undertake a variety of tasks.

The study is divided into three chapters. Chapter 1 considers the main aircraft carrier roles in peacetime, and concentrates on:

a. defining the peacetime uses of forces

b. identifying the types of situation which have involved aircraft carriers

c. noting the important capabilities possessed by aircraft carriers which determine their suitability for peacetime roles

d. examining the reasons why aircraft carriers were preferred to other means for the situations analysed.

Chapter 2 considers the main wartime roles of aircraft carriers with respect to relevant historical experience. The analysis:

a. identifies the important strategic and tactical roles played by aircraft carriers during war

b. examines the reason why aircraft carriers were superior to or preferred to other means for execution of the tasks.

Chapter 3 summarises the conclusions of the analysis of historical employment of aircraft carriers in peace and in war, listing the important factors that led to their choice and the capabilities they afforded. A short discussion completes the study, by considering the possible relevance of the conclusions of this analysis to Australia today [Ed: that is 1978] and in the future, making reference to ongoing studies and the impact of technological advances where applicable.

The obvious but important caution to the reader is that future studies examining replacement options, which include new equipment and new technology, must do so in the light of the true capability required. For example, a cruiser equipped with a landing pad and four small helicopters could conceivably be defined as an aircraft carrier. It patently could not replace the capability of a conventional aircraft carrier such as HMAS *Melbourne*. But the capabilities represented by *Melbourne* may no longer be what are required for Australia from naval air power.

Chapter 1: Aircraft Carrier Roles in Peacetime

Introduction

This part of the study considers operational experience with aircraft carriers so as to establish the number of distinctive methods of employing them in peacetime. There are significant differences in political constraints between peacetime and wartime roles, particularly with regard to the actual employment of force. A peacetime role may involve, for example, the discharge or exchange of live ordnance. However, in adopting a strategy that requires the use of armed services in a peacetime role, the initiating government and its armed service advisers take great care to minimise the risk of entering a state of war, whether it be declared or undeclared. An exercise of peacetime force that evolves into a state of war is a disastrous failure of policy. Therefore, although the peacetime roles include the use of the armed services, there are severe limitations and constraints on the use of armed force.

Peacetime use of force

The exercise of force, or the threat of its use, has not been confined to wartime. It has been an intrinsic part of normal governmental peacetime international activities (although conducted under more restraint than in war) providing a means of acting and projecting power and influence when normal diplomatic measures, such as diplomatic lobbying, extension or withdrawal of diplomatic representatives, or severing of trade agreements have failed to achieve a satisfactory result. Underlying these acts of peacetime force is a number of coherent strategies, which indicate how such acts are to be employed for maximum effect. We shall call them the strategies of:

a. corrective force

b. preventative force

c. precautionary force

d. demonstrative force.

Each of the strategies envisages the use of one or several parts of the armed services in various ways, either direct or subtle, to achieve an end.

Corrective force is the strategy by which governments seek to reverse the course of unfavourable external events that have overtaken them; events that were not wholly foreseen and that have failed to be contained by diplomatic action. Provided that there is sufficient armed strength available to meet the requirements of the task, the objective is to reverse the course of events by an act that could provoke the outbreak of war if it is not judged carefully.

Preventative force is the strategy by which governments seek to prevent the development of unfavourable external events that they have foreseen, and that have failed to be contained by diplomatic action alone. Provided there is sufficient armed strength to meet the requirements of the contemplated task, the objective is to use the armed services to take pre-emptive action so as to deter or physically prevent the opponent from achieving his aim.

Precautionary force is the strategy by which governments respond to external situations that herald the prospect of some threat to specific national interest in particular areas. However, there are usually uncertainties surrounding the definition of the threat that do not allow the use of preventative force, which is predicated on a clear knowledge of the potential opponent's capability and intention. Precautionary force often attempts to overcome the uncertainty of the situation by ambiguous deployment of forces, in a manner that is evident to those elements that may pose a threat, yet could also be construed as having an innocent purpose. The main aim of the use of precautionary force is to deter any opponent by posing a latent threat to any emerging hostile influences.

Corrective, preventative and precautionary force are strongly related to one another; the main differentiating factors being timing and actions. Precautionary force deployments, if successful, should obviate the need for preventative or corrective measures, while preventative force deployments should likewise obviate the need for corrective ones. All run the inherent risk of escalation, and for this reason the use of force in such a manner has become characterised by the following important underlying principles:

a. the use or threat of force and the size of forces involved must be clearly related to the achievement of a limited objective that, by definition, does not threaten the survival (or national security) of the other party or nation

b. to this end, such forces employed must be deployable near the symbolic centre of the conflict

c. the purpose of those employing force must be recognised not only as limited – but as tolerable. It must be more acceptable to the opponent than a resort to war. An element of ambiguity about the presence of the forces deployed is sometimes an advantage

d. the forces employed must be capable of achieving the intended purpose; to deter, prevent or correct the developing situation, regardless of the reactions of the other party

e. the violence employed should manifestly be the minimum needed to achieve the objective. Damage or casualties must be strictly related to achieving the aim. Otherwise, it will appear to the opponent that the hostile intentions are not confined to the achievement of an immediate and limited result

f. the use of surprise reduces the opponent's ability to respond adequately to the act, lowering the possibility of an extended fight escalating to eventual war.

All three of the above strategies have an element of demonstration about them, especially when aircraft carriers are involved.

In this paper the term demonstrative force is used to describe the strategy by which governments may escape the commitment involved in the other three peacetime strategies, yet still may make a gesture more strongly than diplomatic methods will allow. This usually results in a flag-showing exercise, designed to emphasise government attitudes and to attempt to lend verisimilitude to what otherwise might be unconvincing statements of intent. An act of demonstrative force can also be used to provide an outlet for public emotion; to prove to an outraged public that its government is doing something, without the attendant risk that a more determined act might bring. The conditions defining an act of demonstrative force differ somewhat from the other peacetime roles:

a. the demonstration needs to be made near the symbolic centre of the crisis area

b. only token forces are employed

c. the demonstration force needs to be very obvious. It should be capable of advertising its presence.

There is a fifth, but secondary role not involving the threat or actual use of force in which aircraft carriers have played an important historical part: disaster relief. Disaster relief is the aid extended to counteract the effects in one's own or another nation's territory, especially in remote areas, of large scale catastrophes, such as earthquakes and dam collapse. The motives behind the extension of such aid can range from a sense of moral obligation, to attempts to curry favour as a means of gaining some future advantage.

Tables 2 to 6 record, according to role, the relevant operational instances in which aircraft carriers have been employed in peacetime. Great care has been taken to study the background events and facts of each instance to associate it with the correct role. However, there will no doubt be a few instances that readers will still be inclined to reorder. There will always be some difficulties of this nature, as not all historical events conform completely to the necessarily simplified theories that are developed to help explain them. The important point is that the majority of relevant instances that have occurred will be sufficiently obvious in their characteristics to give ample support to the validity of the writers' method of analysis.

Tables 2 to 6 also characterise each instance by date, geographic location and a short narrative describing forces involved and the consequence of events. Each instance is also classified as either 'close' or 'distant'. A distant incident is one that occurs beyond the effective radius of action of aircraft operating from the involved nation's nearest

secure military air base. The converse circumstances make for a close incident. The significance of this distinction is discussed later. For those three roles in which force is employed or threatened; corrective (Table 2), preventative (Table 3) and precautionary (Table 4), incidents are further categorised by:

a. the interest threatened

b. the form or nature of the threat; for example naval, air, or ground elements. The term ground elements is used to describe any military or para-military forces ranging from regular troops to insurrectionists or rioters

c. the key capabilities of the force deployed for the particular situation; that is, whether troops or marines formed an essential part of the force and what types of aircraft were important for operational availability or actual operations.

In the following paragraphs the nature of the incidents within each group is discussed in more detail.

Corrective force (Table 2)

A classic incident of the application of corrective force occurred in 1964, when the Tanganyikan [Ed: now Tanzanian] Army mutinied against its national government. The British Government decided to intervene against the rebels and despatched the light fleet carrier *Centaur* with a complement of 600 marines and helicopters, plus her normal air group. Within four days of departure from Aden, *Centaur* was sailing off Dar Es Salaam, the centre of the mutiny. A surprise helicopter assault succeeded in recapturing key points in the city and trapping the rebel units within their barracks. Other rebel units in other parts of the country quickly surrendered in the face of threatened carrier fixed wing aircraft strikes, combined with further marine commando assaults.

The British forces involved, which later included Royal Air Force (RAF) and Army units, were sufficient to achieve the limited aim of controlling the rebellion, but not to gain any other objective, such as the re-occupation of Tanganyika. For this reason, the general population accepted and aided the British troops against the indigenous rebel army units.

The factor that most characterises the 16 incidents listed in Table 2 – with the notable exception of maritime incidents, such as those at Hainan Island, the Gulf of Tonkin and off the North Korean coast – has been the existence of a credible threat from military or dissident ground force elements to the safety of nationals or of a friendly indigenous populace. Therefore, corrective force could not be applied solely by aircraft, whether land-based or sea-based, and troops or marines have been an important component of what has invariably been a joint force operation. In all but one such incident, these troops or marines have been inserted ashore. The important capabilities of aircraft carriers in incidents involving the application of corrective force have therefore been:

a. the provision of a mobile sea base with associated command, control and communications (C3) and Joint Force Headquarters (JFHQ) facilities – the amphibious assault ship (or LHA) concept

b. the provision of rotary wing tactical transport facilities

c. the provision of rapid response, direct fixed wing tactical aircraft, with ground or surface strike and reconnaissance capabilities, in those situations in which the naval, air or ground threat was sufficient to warrant it.

Preventative force (Table 3)

A recent example of the use of preventative force occurred during the Yom Kippur War of October 1973. Israeli military fortunes improved steadily after the first week of the war, and the Egyptian and Syrian military initiative appeared likely to collapse as a consequence. Then, the Union of Soviet Socialist Republics (USSR) threatened to send in Russian troops directly to aid the Arabs, unless the US agreed to an immediate ceasefire. This would have left the Arabs with a substantial part of their military conquests from Israel.

The US rejected the threat and moved the Sixth Fleet (which it had been unobtrusively reinforcing for the previous week) into positions in the eastern Mediterranean, from which the fleet could selectively interdict all sea and air routes into Syria and Egypt. This confronted the USSR with the prospect of having to remove the Sixth Fleet if it was to succeed in its plan. It was by no means certain of achieving this task short of total war, and certainly not in time to render useful assistance to Egypt and Syria before they were defeated.

The result was that the USSR had to back down on its threat and the US was largely able to determine when the war would finish. Even though this example involved the use of aircraft carriers, the exercise of preventative force can be carried out by other elements of the armed services, as may corrective force. The recent crisis in Belize [Ed: in 1977] was in fact met by British Army and Air Force units exercising preventative force.

As would be expected from the intrinsic nature of the 11 incidents in Table 3 calling for the use of preventative force, the situations had not then reached the point at which corrective force would have been required. Consequently, there were fewer instances, although they were still amongst the most important, in which troops or marines formed an essential component of the deployed force.

In the majority of cases, the interests at stake have been the sovereignty of a colonial administration or the security of a friendly government. Significantly, in eight of the eleven incidents, the threat posed had included naval or para-naval elements attempting to infiltrate ground force elements or supplies. This activity required the rapid establishment of an air and sea blockade in the immediate vicinity of the crisis.

Note that especially in peacetime, when board and search operations are mandatory, this is also an operation that cannot be carried out solely by aircraft, whether they are sea-based or land-based. The important capabilities of aircraft carriers in incidents involving the application of preventative force have therefore been:

a. provision of rapid response, including direct support by fixed wing tactical reconnaissance aircraft with the threat of ground attack or surface strike if required at the desired location

b. provision of C3 and JFHQ facilities for tactical control of air and sea blockade operations

c. provision of a mobile sea base with rotary wing aircraft, troops or marines and their logistic support – the LPH or LHA concept.

Precautionary force (Table 4)

A recent example of the exercise of precautionary force concerned the uncertain position of US nationals in Uganda during March 1977. The disturbed nature of Ugandan affairs and widespread killing, matched with the unpredictable behaviour of President Amin, led the US Government to fear for the safety of its nationals when they were detained on the orders of the Ugandan President. In addition to vigorous diplomatic efforts to ensure their safety, the US Government ordered the carrier *Enterprise* to cruise off the Kenyan coast to back up their diplomatic actions with the hint of the direct use of force against key targets.

The firepower that the *Enterprise* could bring to bear on Uganda outweighed anything that country could do adequately to defend itself, but was limited by the need to fly through Kenyan airspace. The Kenyan Government was prepared to allow US aircraft to carry out operations which were directly related to the safety of US nationals in Uganda, but nothing more. Uganda was surprised by the speed of the deployment of US forces, and responded to the vigorous diplomatic efforts by releasing all US nationals.

With the exception of two sea control or rights of passage incidents (Straits of Tiran and Sulu Sea) the essential feature of the remaining 17 events listed in Table 4 and in which precautionary force was used, has been that no air or naval threat existed or was posed directly or indirectly to elements of the deployed forces. Any threat that might have emerged would generally have been restricted to some form of ground element that could hazard the security of a local administration or the safety of nationals. Thus, the scale of operations has seldom required any force with capabilities beyond that of the mobile sea base (LPH or LHA) concept. The important capabilities of aircraft carriers in incidents involving the application of precautionary force have therefore been:

a. the provision of a mobile sea base with associated C3 and JFHQ facilities – the LPH or LHA concept

b. the provision of rotary wing tactical transport facilities, troops or marines and their logistic support

c. the notion of some ambiguity of purpose associated with the deployment, which may be assisted by the presence of fixed wing tactical strike and reconnaissance aircraft within the force.

The questions of rights of passage and sea control deserve some attention. A majority of nations that are party to the *United Nations Convention on the Law of the Sea* subscribe to the view that warships have rights to innocent passage through straits and other contiguous seas that other nations hold to be sovereign territory. It is often a courtesy rather than a requirement that permission is sought from the nation claiming sovereignty before any transit is made by a warship. [Ed: The *United Nations Convention on the Law of the Sea 1982* gives warships the right of innocent passage in territorial waters, without seeking approval from or advising the coastal state.]

If permission is refused, assertion of rights may be a policy option, and there are examples in the references of such options being activated. Whether this is an example of use of precautionary force or demonstrative force depends on the circumstances, but it is significant that aircraft carriers have very seldom been used to conduct such operations. Other studies have contended that, with the increasing sophistication of available anti-ship weapon technology, which is becoming more readily available to smaller nations, aircraft carriers and fixed wing tactical aircraft may either be:

a. essential to the operation, to pose a threat of retaliatory or pre-emptive strikes against selected targets, such as coastal missile batteries, or

b. too expensive an asset to risk in such circumstances.

The case rests.

Demonstrative force (Table 5)

An interesting example of the exercise of demonstrative force occurred in November 1969, relating to the Spanish claim to Gibraltar. A change in some key personalities in the Spanish Government prompted international and domestic speculation that Spain would press her claim for Gibraltar less vigorously than in the past. To refute these views, but to avoid escalating the dispute, the government ordered its helicopter carrier (LPH) *Dedalo* plus 12 other warships to visit Algeciras Bay and to anchor in sight of 'the Rock' in what was meant to be a pointed and expressive gesture of continued Spanish determination. It was met by an equally demonstrative gesture from the British Government, which had quietly slipped the aircraft carriers *Hermes* and *Eagle* into Gibraltar shortly before the arrival of the Spanish warships.

An alternative example that indicates the exercise of demonstrative force is not confined to the use of aircraft carriers, concerns the confrontation between Uganda

and Kenya during June and July 1976. To indicate its support for Kenya in the event of a war between the latter and Uganda, the US made the symbolic gesture of sending two P-3 aircraft to Nairobi and the frigate *Donald B. Beary* to Mombasa. These moves were eventually supported indirectly by the movement of the aircraft carrier *Ranger* and support ships into the Indian Ocean.

Apart from the 13 incidents listed in Table 5, there have been other flag-showing operations, too numerous to list, in which aircraft carriers have not been present. Aircraft carriers are included for their obvious prestigious attractions as powerful capital fleet units. Their inclusion also demonstrates the range of operational capabilities they afford, for use of force in peacetime or in war and that can be brought to bear at comparatively short notice.

What has been significant is the choice of geopolitical location for employment of demonstrative force by aircraft carriers. Table 5 shows this to have been regions of existing or anticipated political instability. This study has not pursued in detail the long-term or short-term success of such demonstrations, but the inclusion of aircraft carriers as instruments of demonstrative force seems on the whole to have been a substantially successful contribution to stabilising a situation, with one or two notable exceptions.

Disaster relief (Table 6)

Table 6, 'Aircraft Carriers and the Exercise of Disaster Relief', is a list of the more important operations concerning the use of aircraft carriers in this way since 1945. They have been involved usually when there has been significant difficulty in transferring supplies from ships to the disaster area. This has largely occurred during floods or in the aftermath of cyclones and earthquakes, when roads and airfields have been seriously disrupted. Carrier aircraft and helicopters operating from their own self-reliant and unaffected air base have frequently been used to distribute supplies and civil defence personnel in rescue operations.

Peacetime Roles in Comparison to Other Means

Capabilities

Governments have used aircraft carriers in applying force in peacetime, to project power and influence as an extension of diplomacy. Examination of the preceding historical experience, exemplified by the incidents listed in Tables 2 to 6, shows the following important capabilities or definitive qualities that have been applicable to aircraft carriers and their air groups in peacetime roles:

a. They can provide a mobile sea base equipped with rotary wing aircraft, containing facilities for troops and marines and their logistics support – the LPH or LHA concepts.

b. They have provided rapid response, direct fixed wing tactical aircraft for:

   (1) reconnaissance

   (2) surface or ground tactical strike, or the threat thereof, in the immediate vicinity of the incident

   (3) conveying a sense of ambiguity of purpose for the deployed force, especially in those incidents involving application of precautionary force.

c. They have provided C3 and JFHQ facilities within a mobile sea base for:

   (1) amphibious operations

   (2) air and sea blockade and sea control operations.

d. The self-sufficient nature of aircraft carriers (particularly as mobile sea bases – LPH or LHA) makes them ideal for contribution to disaster relief.

So it can be said that aircraft carriers have been a 'good thing' in peacetime applications. What is yet to be established is whether there were special reasons for the use of aircraft carriers in these peacetime roles, making them better than alternative means, or whether they were used simply because they were available.

Close and distant crises

A first step towards answering these questions is to consider the geographic distribution of crises to which governments, particularly major and regional powers, have been compelled to respond in peacetime. These fall into 'distant' and 'close' crises. A distant crisis is one that occurs beyond the effective operational radius of land-based aircraft from the involved nation's nearest major secure military air base. The converse describes a close crisis. The effective operational radius is that within which allocated units can accomplish the operational aim. In peacetime acts of force, the operational aim is invariably to provide useful forces (or the threat thereof) at or in the vicinity of the crisis point. This approach takes into account the extent of the crisis and the capacity of the nearest military bases to cope with it. The capacity of a military base to contribute to crisis response is inter alia a function of the number of weapons and weapons platforms it can sustain and operate at short notice, and the distances they have to traverse to reach the crisis area.

In the incidents involving the four main strategies for the use of force in peacetime, the breakdown of incidents taken from Tables 2 to 5 by categories is as follows:

	No. of Incidents	
	Close	Distant
Corrective Force	11	5
Preventative Force	5	6
Precautionary Force	9	10
Demonstrative Force	10	3

It should be intuitively obvious that the difficulties in responding to distant crises will be quite different from those associated with close crises.

The response to distant crises – Land-based air power

The quickest means of responding to a crisis, whether it is distant or close, is by using aircraft for transport or attack, as they represent the fastest means of reinforcement. However, when responding to crises that are outside the operational radius of land-based aircraft, there are likely to be some problems in transporting forces by air to the appropriate area.

Use of bases on foreign soil

Many nations have recognised this fact for years. Consequently, they have attempted to acquire bases for land forces, land-based aircraft and naval squadrons at strategic locations around the world, to facilitate force deployments. This approach reached its zenith during the Cold War when, in 1957, the US, for example, had 119 airbases in other countries. However, with the growth of 'détente' between the super powers, the development of ICBMs, and the increased number of newly independent nations jealous of their autonomy, the availability of bases on foreign soil for global or regional powers has declined dramatically. By 1971, Britain, France and many lesser powers were obliged, for one reason or another, to give up most of their foreign bases. However, despite developments in transport aircraft resulting in significant improvement in their range and payload performance, overseas bases are still required by the major powers for staging purposes.

Furthermore, those host nations that still allow foreign air, sea or land forces to be based on their soil have become far more discriminating in what they will allow the bases to be used for. Thus, the US was obliged not to use any of its European bases for the transfer of A-4 and F-4 aircraft and other supplies to Israel during the Yom Kippur War in October 1973. Its North Atlantic Treaty Organization (NATO) partners were frightened of Arab reprisals against their oil supplies.

Similarly, the US was unable to respond in time to aid the *Pueblo* as, among other reasons, its main strike aircraft in the area (the Marine air wing at Iwakuni, Japan) could not be used. The Japanese and US governments had an understanding that US

bases in Japan would not be used to launch direct military attacks against enemies of the US. The obvious solution was to fly the aircraft first to South Korea, but there was insufficient time.

The danger of ignoring the wishes of the host nation in respect of the use of such bases was amply demonstrated by the '*Mayagüez* Affair' in May 1975. In this case, the US used some of its air bases in Thailand to fly aircraft to interdict Cambodian forces engaged in the seizure of the SS *Mayagüez* and its crew. The Thai Government did not agree with this action, and obliged the US to give up all of its bases in Thailand.

In recent years the US has also had substantial trouble over the use of its air, naval and land bases in Greece, Turkey, the Philippines, Panama, Ethiopia and Spain. Britain has had similar problems with Malta and the USSR with Egypt (and since, Somalia). The result of these developments has been to increase the number of crises that occur beyond the operational radius of land-based aircraft of global or regional powers. This assertion is supported by the information contained in Tables 2 to 5, which indicates that there has been a substantial rise in the proportion of distant crises in recent years.

	Distant Crises	**Close Crises**	**Distant Crises as % of Total Crises**
	Corrective Force		
1945 – 1964	3	5	37
1965 – 1977	2	6	25
	Preventative Force		
1945 – 1964	2	5	29
1965 – 1977	4		100
	Precautionary Force		
1945 – 1964	2	5	29
1965 – 1977	8	4	66
	Demonstrative Force		
1945 – 1964	2	7	22
1965 – 1977	1	3	25

Transit and temporary basing rights

The desirability of responding effectively and quickly to distant crises has not diminished, at least for major and regional powers. Nations, where they have felt compelled to respond, have adopted several methods to overcome the problem described above. The first has consisted of obtaining special transit rights from third party nations to fly transport and combat aircraft through their airspace and possibly to use some of their refuelling facilities en route. The fact that Israel gained permission to land and refuel in Kenya enabled the Entebbe rescue mission (an act of corrective force) to take place on 3 and 4 July 1976. It was not a practical proposition for Israel's capabilities without this support.

Similarly, the US obtained permission from the Portuguese Government to use the Azores as a refuelling stopover for C-5 aircraft during their arms and supply flights to Israel during the Yom Kippur War in October 1973. If this facility had not been available, the C-5s would have had to fly directly to Israel from the US as the European and Arab nations had indicated a strong desire not to cooperate. This would have limited their capacity to 33.5 tons of cargo each. The availability of the Azores airport facilities allowed the C-5s to carry 74.2 tons each, greatly aiding the speed and effectiveness of the resupply effort. The development of a 'stretched' version of the Lockheed C-141 Starlifter, which was given an in-flight refuelling capability, has to some extent been carried out in an attempt to reduce US reliance on foreign staging bases.

Despite the success associated with these two examples, however, the reality is that nations are reluctant to grant such transit rights to the armed forces of other nations. This applies particularly during times of international tension, when the desirability of having such rights is at its highest point. Thus, during the Lebanon crisis of July 1959, the US attempted to gain transit rights for some of its army and air forces in Germany to fly to Lebanon. Three days of delicate and uncertain negotiations were needed to gain overflight permission in a tug-of-war, with communist political pressure applied to each of the nations in the planned flight paths of the transport aircraft. The Lebanese President had requested help within 48 hours, which in this event could not be provided by US ground forces and land-based aircraft.

Another example concerns the Beira Patrol of 1966. In this, the British Government sought permission from the Malagasy Republic [Ed: formerly Madagascar] to base Shackleton maritime patrol aircraft on its soil, to complement an effective naval blockade of Rhodesian oil supplies entering through the Portuguese Port of Beira in Mozambique. This was eventually gained, but only for three aircraft, and these had to operate from an airport with no night flying facilities. This arrangement was not effective, and the British Government sought another means of imposing the blockade. Similar problems faced the Pakistani Government during the suppression of East Pakistan in 1971. The Indian Government refused transit permission for Pakistani military aircraft and transports to fly direct to East Bengal from West Pakistan. This caused major flight diversions around the Indian coast, greatly complicating the Pakistani Army's speed and flexibility of deployment by air.

In-flight refuelling as an option

The alternative to the uncertain wrangle in gaining transit rights for overflights or landings in neutral territory is to extend the range of military aircraft by in-flight refuelling, so that neutral territory and airspace can be avoided and reinforcements can reach their destination quickly. This method was used during the British reinforcement of Belize, British Honduras, in response to the threat of invasion from Guatemala in July 1977. Harrier aircraft were flown in by this means. A-4 and F-4 aircraft being transferred to Israel during the Yom Kippur War also used air-to-air refuelling.

Both of the methods already mentioned for responding to distant crises have two common weaknesses. Both assume that there will be a secure and effective air base at the end of the respective journeys to the crisis zone. A secure air base for the purposes of this study is one that is defended by forces that can at least prevent continuous enemy ground-based disruption of its facilities. To be effective, it must have the equipment and supplies to sustain the type of operations envisaged for a successful land-based aircraft approach.

Another application of in-flight refuelling could obviate the need for a secure and effective terminal air base in the crisis zone. This involves extending the operational radius of attack aircraft by one or more in-flight refuellings, to enable them to reach the crisis zone from their original bases. This is not a solution for the exercise of peacetime acts of force. These are always launched in the expectation that the use of violence will not be necessary. To this end, it is important to present a credible deterrent in the crisis zone, with adequate aircraft availability and flexibility of response to the evolving tactical situation.

Aircraft flying great distances from their bases cannot loiter in the crisis zone for any useful period of time and so have limited deterrent value. They also have very low availability for a standard unit aircraft establishment (UAE) and will face very severe problems of aircrew fatigue. Consequently, this option is usually either unavailable or inadequate. It was not a surprise to the writers that they could find no operational examples of such an option, in response to a distant peacetime crisis, in which a secure terminal air base was unavailable in or near the crisis zone. [Ed: US Navy and Air Force operations in recent times suggest that most of these problems may have been overcome or at least reduced.]

Security of terminal airfields

Sizeable air bases in crisis areas are nearly always key targets for seizure or being rendered ineffective at an early stage of any crisis. They have in fact rarely been secure, as can be seen from the large number of incidents listed in Tables 2 to 4, in which a threat has been posed at the crisis location by regular or irregular ground force elements.

There is only one recent example in which forces have landed by aircraft on a base that was not regarded as secure; the Israeli action at Entebbe airport. Where there has been doubt, aircraft have not landed, as the risks are regarded as too great to accept. This was the case during the Tanganyikan Army mutiny of January 1964. RAF aircraft and troops were present in Uganda and Kenya, but could not be sent immediately into Dar es Salaam (the centre point of the mutiny) as the mutineers controlled the airport and airfields. Similarly, the US Air Force (USAF) abandoned attempts to evacuate civilians by fixed wing aircraft from Phnom Penh and Saigon, during March and April 1975, as soon as there was serious doubt about the security of the respective airports.

The result was that significant numbers of US nationals and sympathisers were cut off and had to be evacuated by other means. Conversely, the British were able to conduct a direct air transit to reinforce British Honduras in July 1977, because they controlled and could protect Belize airport. Similarly, the Israeli Air Force was able to guarantee the security of Lod airport during the Yom Kippur War of October 1973, which allowed US transport and fighter aircraft to land.

Effectiveness of terminal airfields

However, having a secure airport is only one part of the solution. The second is whether the secure airport is capable of being effective. British forces during the Kuwait operation beginning in mid-1961 found that the main airport was not capable of immediately handling the traffic and logistics build up deemed necessary to thwart Iraqi intentions. Until this could be rectified, they had to rely on other means of substantial reinforcement. Similarly, during the Lebanon crisis of July 1958, the USAF began a build up of aircraft at Adana, Turkey, but was initially seriously hindered by the lack of essential stores at the air base. This was particularly revealing in that Adana was a permanent USAF base.

It also underlines the fact that air forces have complicated logistics support systems, which cannot necessarily be expected to operate effectively at short notice even at established bases. This is because there is no way of estimating with reasonable accuracy what kind of crisis will occur and what immediate effort will be required to deal with it. Given time to react, there is little doubt that modern air forces can increase the capacity of most air bases to deal with most peacetime crises, but time is rarely available. It was fortunate for Israel that Lod airport during October 1973 was capable, at short notice, of handling the flood of supplies from US transport aircraft that were necessary for the survival of the Israeli Air Force and Army.

Summary of land-based air responses to distant crises

Whether a nation is a 'power' within a global or regional context depends ultimately on its ability to protect what it regards as its legitimate rights and interests in its sphere of influence. This is largely demonstrated by its ability to respond quickly and adequately to major peacetime crises in this sphere; that is, crises that require acts of corrective,

preventative, precautionary and demonstrative force. Some of these crises will occur beyond the immediate operational radius of the nation's land-based aircraft; these will be distant crises. Attempts to respond to such crises by extending the range of land-based aircraft cannot be guaranteed to succeed for the following reasons:

a. nations are increasingly reluctant to allow foreign air bases on their soil, and are very restrictive in allowing what they can be used for

b. the acquisition of special transit or temporary basing rights for the passage of military aircraft through neutral airspace is nearly always difficult to gain in time to be effective

c. the use of in-flight refuelling to avoid third party airspace is a successful solution only when the terminal air base is adequately secured, and capable of sustaining the level of effort required for a useful and immediate contribution of force in response to the crises. This of course also applies to military aircraft with special transit rights

d. the observed quantitative historical facts are that terminal air bases associated with distant crises are rarely adequately secured, and usually lack the capability immediately to support the level of operations needed to respond to the crises with land-based air forces alone.

The response to distant crises – Sea power

Global and regional powers have evidently found that naval forces have provided the least restricted means of responding to distant crises. The first reason for this is the view, supported by a substantial number of maritime nations, that warships have rights of innocent passage through territorial seas and straits. They also have the freedom of the high seas, which provides access to most nations in the world. Military aircraft have no rights of innocent passage, and so must seek special transit arrangements with individual nations. [Ed: the *Law of the Sea Convention 1982* does provide for archipelagic sea lane passage for aircraft, thereby mitigating, but not entirely eliminating this problem.]

The second reason for the attractiveness of naval forces for response to distant crises is that major naval units are not totally dependent upon bases en route to the crisis area; major warships are designed and manned for prolonged deployment. Put another way, a major warship is very self-contained with respect to basic equipment and logistics support. The nature of operations at sea is such that a warship combines the fighting platform, the means of transport, the crew's living quarters, the principal store for munitions, food and other materiel and an intrinsic self-maintenance capability in one unit.

This of course is quite different to the designs and requirements for land-based aircraft, even if they are as flexible as the C-5 transport. The result is that major naval units

are much more independent, and may be concentrated at distant locations relatively more easily than land-based aircraft. Should operations at sea be unduly prolonged, the naval units can be supported with fuel and ordnance by replenishment vessels. The latter can either accompany the force or rendezvous with it as required, and have at least the same privileges and immunities in freedom of movement as the warships they support.

A corollary of the preceding point is that major naval units have a very high permanent level of performance. This follows logically from the self-contained nature of a warship's logistics support. Land-based aircraft and ground forces rely on a multiplicity of separate support formations, which collectively determine the level of availability and performance of the aircraft and supporting base. Consequently, it is a relatively simple matter to determine what peak effort major warships are capable of meeting at any particular time or place. But it is a much more complex question to answer, at short notice, for aircraft and their logistics support formations operating from distant locations.

The final reason for the attractiveness of naval forces to global and regional powers for responding to distant crises is that warships are easier to withdraw, quickly and unobtrusively, from an operation that may have failed to attain its objective. This is an important quality for preserving national prestige, especially in an age in which the media is extremely quick to publicise incidents of national humiliation involving Western developed countries. The withdrawal of land-based air forces and for that matter ground forces is, by contrast, a much more prolonged affair, largely because of the complicated equipment and logistics support systems that have to be dismantled. Consequently, it is more humiliating and obvious that government policy has failed. The experience of Britain and France at Suez, in November 1956, is an example.

The contribution of the aircraft carrier

So far nothing has been stated explicitly about the contribution of the aircraft carrier in responding to distant crises. It has all the attributes listed above for warships, together with some qualities of its own. These are:

a. the capacity to supply a completely mobile seaborne air base, limited in its movement only by the extent of the oceans, which provide access to nearly all the nations of the world

b. consistent operational availability to its maximum level of performance. That is, the carrier is not reliant on the arrival of particular support units or equipment to attain this status, as these are organic to the aircraft carrier

c. reduced problems with internal security in peacetime crises, as it does not have to face the growing problem of disruption caused by commando or guerrilla attack with rockets and mortars on air bases in crisis localities. [Ed: The appearance of maritime terrorism in recent years does qualify this point.]

The preceding arguments indicate why global and regional powers have relied most on the aircraft carrier for the execution of important corrective, preventative, precautionary and to a lesser extent, demonstrative force operations in response to distant crises. In other words, aircraft carriers have not been used in the performance of these duties just because they were available. There were special reasons that clearly indicated that naval task forces, including aircraft carriers, were the best means (and sometimes the only practical option) for applying peacetime acts of force to distant crises. To illustrate this point more clearly, we shall briefly analyse some of the more prominent distant events concerning use of aircraft carriers from Tables 2 to 5. Some of these events have already been mentioned in earlier parts of this study.

The Tanganyikan Army mutinied against its national government during January 1964. The considerations that led the British Government to choose an aircraft carrier for the operation to quell the mutiny were as follows:

a. RAF and Army Forces in Kenya and Uganda could not reach the centre of the crisis (Dar es Salaam) as the mutineers controlled the airport facilities. Consequently, no secure air base was available

b. an aircraft carrier provided a secure and fully operational air base that could be placed quickly a short distance away from the crisis centre, and support a surprise helicopter assault to capture the main airfields.

This was in fact how the operation was carried out. The light fleet carrier *Centaur*, stationed at Aden, was despatched with 600 Royal Marines, their equipment and extra helicopters, as well as her normal fixed wing air group, and reached the Dar es Salaam area within four days. The mutineers and airfields in the area were captured by helicopter assault, allowing RAF and Army units to be flown in. Any other means of completing the mission would have led to a much prolonged and costly operation.

The considerations that led the British Government to use an aircraft carrier to implement the Beira blockade of March 1966 were as follows:

a. attempts to gain transit and temporary basing rights with the Malagasy Republic for land-based surveillance aircraft were unsatisfactory, resulting in only three aircraft being allowed to operate

b. the effectiveness of the Malagasy assigned air base was poor. It lacked, among other things, a night flying capacity

c. no transit or basing difficulties limited the performance of an aircraft carrier, which could provide a fully operational air base at the centre of the crisis area.

The fleet carrier *Eagle* was ordered to deploy directly from Singapore to the Beira area, which it reached in seven and a half days. What followed, before *Eagle* was eventually

relieved by another aircraft carrier, was a prolonged deployment, which at one stage resulted in the ship staying on station for 71 consecutive days.

The US Government used aircraft carriers in its evacuation of nationals from Phnom Penh and Saigon during March and April 1975. The reasons for this were:

a. friendly forces could no longer maintain the security of the main airports in the respective cities from communist mortar and rocket fire; making it too difficult and dangerous for fixed wing aircraft to operate from them

b. aircraft carriers provided secure and fully effective air bases, which could be placed within helicopter range of the isolated nationals and which obviated reliance on the airports.

Britain met the Kuwait crisis in late June and July 1961, largely by the use of aircraft carriers. The reasons for this were:

a. existing airfields and bases in Kuwait lacked the capability to support necessary land-based air forces without a sustained logistics and support equipment build up

b. these airfields were not secure from Iraqi airborne attack and seizure

c. the use of a commando carrier allowed the airfields to be secured adequately by the sudden influx of a large number of helicopter-transported troops before the Iraqis could react

d. a fleet carrier (*Victorious*) supplied a fully operational and secure air base complete with sophisticated radar and air group, until the land-based air build up was adequate.

During the planning of the British withdrawal from Aden in 1967, the British Government realised that it was most desirable to have considerable air strength on call, to deter any attempts by elements of either or both of the indigenous population and the Yemen to interfere. Aircraft carriers were chosen once again for the following reasons:

a. the available air base (Masirah) did not have the capability to sustain the anticipated air effort, without a great deal of preparation

b. aircraft carriers, being fully operational air bases, could sustain the anticipated effort with none of the delay and waste entailed in building up an air base for just one mission.

During the Yom Kippur War of October 1973, the USSR threatened to fly in paratroopers to assist the Arabs directly against Israel. The US Government chose to discourage this move by using aircraft carriers. The reasons for this were:

a. nearby US land bases (primarily in Turkey) could not be used to threaten or destroy USSR planes flying to Syria or Egypt, for fear of involving Turkey in the conflict with Russia

b. there were grave transit difficulties in flying enough land-based aircraft to these bases anyway

c. aircraft carriers could provide fully operational air bases and air groups, and would suffer no transit difficulties in reaching the optimal interdiction locations.

The US Government chose to use aircraft carriers to respond to the Lebanon crisis of July 1958. The reasons for this were:

a. there were serious transit difficulties delaying US land-based transport and combat aircraft from Germany and America

b. the nearest US air base (Adana, Turkey) did not have the immediate capability to support the necessary level of activity

c. the terminal air base (Beirut airport) was not secure

d. the scattered Sixth Fleet faced no transit difficulties

e. its aircraft carriers were fully mobile operational air bases and could put aircraft over the crisis area within 30 hours, to support a proposed Sixth Fleet and Marine amphibious landing to secure Beirut airport.

Following the threat to US nationals in Uganda posed by the actions of President Amin during March 1977, the US Government chose to respond by sending an aircraft carrier to cruise off the Kenyan coast. The reasons for this were:

a. there were transit difficulties in getting suitable land-based air forces to the area in time. There were also basing complications with Kenya, which would undesirably involve the latter in a dispute that was essentially between Uganda and the US

b. Kenyan air bases were not immediately capable of supporting the type of air operations the US might have to launch.

c. An aircraft carrier had no transit problems in reaching the crisis area, and provided its own air base

d. a carrier could operate and support its air group at full efficiency at very short notice.

The French Government chose to use an aircraft carrier to guard the interests of French citizens in the territories of Afars and Issas [Ed. Currently known as Djibouti] following their achieving independence in April 1977. The reasons for this were:

a. the security of the available air base in Afars and Issas was difficult to guarantee against sabotage and commando attacks, whereas an aircraft carrier was proof against them

b. the cost of building up a base to the level of effectiveness needed to handle conceivable contingencies was too much for one operation, when an aircraft carrier could do the same job, and of course be available at short notice for many other future operations.

It is possible to continue this procession of distant crises until it includes all of those listed in Tables 2 to 5. However, they are very similar in their implications for aircraft carriers, and continued listing of such events would be repetitious. It is obvious that aircraft carriers have not been used to respond to distant crises simply because they were available to world and regional powers and because there was no better task for them. Aircraft carriers have been used consistently to overcome some of the endemic problems confronting the use of land-based air forces in responding with peacetime acts of force to distant crises. Present trends give no sign that these problems will be significantly resolved. On the contrary, they appear to be getting worse.

Summary of sea-based air response to distant crises

Those nations that are, or have been 'powers' in a world or regional context have relied largely on warships, and in particular aircraft carriers, to respond to distant crises involving the exercise of peacetime acts of force – corrective, preventative, precautionary and demonstrative. This has occurred for the following reasons, which largely overcome the problems encountered by land-based air forces in attempting to respond to distant crises:

a. the majority of maritime nations consider that warships, including aircraft carriers, have rights to innocent passage through territorial seas and straits, as well as the freedom of the high seas that give access to most nations in the world

b. major naval units, including aircraft carriers, are not significantly dependent on major bases along a line of transit to a crisis area

c. major naval units, including aircraft carriers, are capable of very high rates of effort at any particular time or place being, by comparison with land-based air formations, largely self-contained for logistics support

d. warships, including aircraft carriers, can be withdrawn more quickly and unobtrusively from an operation that has failed than can land-based air forces

e. warships, including aircraft carriers, have reduced problems of internal security against commando and guerrilla attack in crisis areas.

The response to close crises

Close crises, which occur within the effective radius of action of aircraft operating from the affected nation's nearest major secure air base, should have been the ideal situations for the application of land-based air power. Historically speaking, this has been true for peacetime border crises between adjacent nations. However, there is a proportion of close crises that has involved ocean or sea passages. Land-based air power has not often been used as the critical component for these crises, but aircraft carriers have often been deployed in such missions. The question is, were there special reasons determining the use of aircraft carriers in these events, or were they used just because they were available?

Operational, strategic and tactical, and psychological factors

The above question raises the analytical problem of how to compare the historical performance of land-based and sea-based air power for those situations in which both could reach a crisis zone. The writers chose to examine close crises in terms of relevant strategic, operational, tactical and psychological factors. Most of these will be familiar as they are concepts that have been frequently raised in discussions of the relative merits of land-based and sea-based air power. The factors are:

a. Operational:

   (1) air base mobility – the quality or capability of air forces, which permits them to move from place while retaining the ability to fulfil their primary mission

   (2) availability of aircraft – the number of military aircraft free for use, and the rate at which they can be used against a particular target

   (3) fatigue of aircrews – the rate at which the efficiency of aircrew declines per number of hours flown, or per number of sorties flown

   (4) flexibility of responses – the capacity of armed forces for effective and adaptable reaction to any enemy threat or attack

   (5) reliability of aircraft – the probability that an aircraft will perform its intended mission adequately under the operating conditions expected to be encountered

   (6) sustainability of air base – the length of time that the air base can continue to operate aircraft at maximum rates of effort

   (7) survivability of air base – the degree to which the air base's ability to function normally is reduced by a given amount of combat damage.

b. Strategic and tactical:

   (1) surprise

(2) ambiguity – the ability to pursue dual motives or intention to confuse an opponent.

c. Psychological:

(1) credibility of deterrent – the level of credence in the existence of a threat of unacceptably punishing counter action

(2) image of forces – the regard in which the military reputation of armed forces is held by other parties

(3) visibility of forces – those forces that can be seen most clearly and continuously.

Analysing each strategy of peacetime application of force – corrective, preventative, precautionary and demonstrative – in terms of the above factors, this study found that there was no means of satisfactorily discriminating between the use of land-based aircraft or sea-based aircraft for close crises in respect of the following:

a. reliability of aircraft

b. sustainability of air base

c. survivability of air base

d. surprise

e. image of forces

f. visibility of forces.

The reliability of an aircraft is the probability that it will perform its intended mission adequately under the operating conditions expected to be encountered. It has often been claimed that aircraft carriers can improve the operating conditions expected for their aircraft by sailing around bad weather, thus improving the overall reliability of their aircraft over those situated on land bases (the latter being of course fixed in one place). This study found no instance in which this ability was important to the success of a peacetime application of force. Effectively, the reliability of both sea and land-based aircraft was the same.

The sustainability of an air base is the length of time that it can continue to operate aircraft at maximum rates of effort. This tends to be determined by the efficiency of the support formations, and if the latter are all in position there is no particular reason to assume that supply ships for aircraft carriers can do the job less efficiently than land-based supply units for air bases. However, the aircraft carrier has one disadvantage in that it has to stay mobile at sea, which means that engines, hull and other equipment need periodic maintenance in port. Land bases are fixed and so overall maintenance problems may be simpler. In a prolonged operation this difference could be expected

to become more important the longer the operation continued, as aircraft carriers have to rotate on station.

However, in this study it was found that there was no difference, as no close crisis involving aircraft carriers and land-based aircraft lasted long enough to produce this situation. Indeed there was a considerable 'safety margin' in peacetime maintenance cycles that aircraft carriers could take advantage of if they were prepared for slightly more (but still acceptable) wear and tear to propulsion and other machinery and crew. For example, the *Eagle* stayed on station for 71 days in response to the Beira crisis, and a number of US aircraft carriers during the Vietnam War stayed on station for periods in excess of 60 days, while carrying out continuous air operations.

The survivability of an air base is the degree to which its ability to function normally is reduced by a given amount of combat damage. For an air base this amounts to its ability to operate aircraft effectively. For an aircraft carrier this reflects its ability to float, to move, and to operate aircraft effectively. Theoretically, this puts the aircraft carrier at a considerable disadvantage. The historical facts show, however, that no aircraft carrier engaged in a peacetime act of force has sustained serious damage from attacks of any sort.

To a certain extent this stems from the fact that to be successful, peacetime acts of force (excluding demonstrative force) need to contain sufficient strength to dissuade the opponent from reacting in a hostile manner to the aggressor's intentions. Anything less than this increases the probability that the opponent will try to use force to protect himself. In the instances in which they were used to react to close and distant crises, aircraft carriers have manifested sufficient strength to deter or thwart opponent reactions. Conversely, land-based aircraft based in the vicinity of the crises have frequently been subjected to attack by rockets, mortars or direct sabotage from ground force elements.

The factor of surprise does not seem to have been achieved in peacetime close crises any more frequently by carrier aircraft than by land-based aircraft. The writers can think of no reason to expect anything different. Similarly, there is no evidence as to which aircraft carrier forces or land-based air forces were better regarded by third parties. The writers could think of no theoretical reason why this should be different either.

There is little reason to believe that land-based aircraft are any less visible to the authorities of opponent nations than carriers and their aircraft. Once something has been recognised it is 'visible', and this has nothing to do with how long it can be seen, provided the opponent cannot assume that it has been completely withdrawn. Thus, the fact that aircraft carriers can flaunt themselves off the coast of an opponent nation for extended periods in full view does not in itself mean they are more intimidating for doing this, even though land-based aircraft cannot loiter indefinitely. They are intimidating because their mobility allows them to approach closely to vital targets, gaining for their air groups superior availability of aircraft and flexibility of responses

over land-based aircraft from more distant bases. Once an aircraft carrier has been seen, it is academic to the authorities of an opponent nation if it continues to be seen, as the credibility of its threat rests on the above factors.

Other factors were important in determining differences in effectiveness between sea-based and land-based air forces:

a. mobility

b. availability

c. flexibility

d. fatigue

e. ambiguity

f. credibility.

However, not all the above factors were applicable to all four acts of peacetime force examined. We shall examine each of the latter in turn.

Corrective force

The use of aircraft carriers in the exercise of corrective force in response to close crises has been necessary whenever the following factors have been important:

a. mobility of air base

b. availability of aircraft

c. fatigue of aircrews

d. flexibility of responses

e. credibility of deterrent.

Examination of the relevant events in Table 2 reveals that the aircraft carrier's mobility allowed it to get closer to the crisis centre than available airfields. The shorter operating radius meant that the carrier aircraft were more available through shorter mission times. Thus, for a given period of time for a given unit aircraft establishment, aircraft carriers would, in these circumstances, have more aircraft available than would a similar aircraft establishment based on a more distant airfield. The shorter distances to the crisis centre also tended to reduce the problems of aircrew fatigue in comparison with more distant air bases.

The closer proximity of aircraft carriers to the crises centres also allowed a more flexible response to new tactical situations than for more distant airfields. Command, control and communication coordination problems with the use of aircraft were simplified by the aircraft carriers being in closer physical contact with the tactical situation, which allowed them to respond more quickly and appropriately to changes in the crisis areas.

For example, if an attack threatened to develop against either or both friendly interests or forces in the crisis area, aircraft carriers could respond immediately with all their aircraft if necessary. However, the more distant airfields could only respond with the aircraft they already had on combat air patrol, as, unless reinforcements could expect to arrive in a few minutes, they would be too late to influence the tactical situation.

The credibility of the deterrent value of forces engaged in acts of corrective force in response to close crises was enhanced if the forces were closer to the target or crisis centre. This occurred because such forces were usually more easy to relate to from the opponent's point of view because of their proximity, while a more distant threat was harder to visualise and respond to in the same way. Thus, aircraft carriers were more effective in this respect, whenever they could approach significantly closer to the crisis centre than the location of airfields. The factors of availability and flexibility meant that carrier air groups were potentially more dangerous to the opponent than more distant land-based equivalent air forces. The fact that the aircraft carrier was 'just over the horizon' was more frightening and realistic to an opponent than land-based air forces many miles further away.

The Tachen crisis in February 1955 demonstrated all the points made so far for the exercise of corrective force in response to a close crisis. The requirement was to evacuate 29,000 Nationalist Chinese troops and sympathisers trapped on the Chinese coastal island of Tachen. The situation was complicated by the fact that communist forces dominated the sea and air approaches to the island and were preparing to launch an imminent assault. The only practicable means of evacuating the islanders was by sea, which meant sending US naval units into air and sea space dominated by communist military forces. The adopted solution was to put sufficient US air strength into the area to deter the communist forces from interfering with the naval rescue mission.

The nearest US air bases were 250 miles away in Taiwan and they could not put the number of aircraft considered necessary (400+) on immediate call over the area for the duration of the mission – for the reasons already outlined generally. The use of aircraft carriers in this situation overcame this problem, as they could approach to within 20-50 miles of the crisis centre, with the resultant advantages of greatly improved availability of aircraft, flexibility of response, reduced aircrew fatigue problems and greater credibility.

All this was very important as the tactical situation around Tachen could change suddenly, leaving US rescue ships in very vulnerable situations. The aircraft carriers could prevent this, as they could respond in a few minutes by putting all their aircraft over the crisis area if necessary. None of this was lost on the communist forces, which made no attempt to prevent the evacuation. This is not to say that the US land-based air forces in Taiwan did not make a useful contribution. But their effort was subsidiary to the aircraft carrier effort, because the USAF could not respond to the situation with sufficient aircraft in the short time that could possibly be available.

The airfields could respond only with the aircraft that were already on combat air patrol over the area, as it took too long to fly out more aircraft, even if the need was communicated immediately; an unrealistic assumption in practice as normal control, communication and coordination problems over distances usually conspire to prevent this kind of response. The other solution of keeping over 400 aircraft permanently on combat air patrol over the area would require too large a unit aircraft establishment to sustain.

During the Suez crisis in October 1956, the British and French forces attacking the Canal Zone relied on support from land-based aircraft in Cyprus and Malta. However, there were also six aircraft carriers present to contribute to this effort. Their mobility allowed them to close the battle area so that a large enough proportion of the total aircraft committed to the operation could provide a high rate of availability and flexible response. This, in turn, allowed effective air cover to be given to British and French ground troops; something that could not be extended properly from Malta or Cyprus as the aircraft located there were too far away from the crisis area. Thus, they suffered low availability for a given number of aircraft, poor flexibility of response and serious aircrew fatigue problems. The aircraft carriers also contributed in a similar vein to the air defence of the invasion fleet. Their general presence off the coast of Egypt and the power they presented were thought (correctly or otherwise) by the French and British to have had a useful deterrent effect on the Egyptian will to resist.

The *Mayagüez* incident of May 1975 was a good example of the use of an aircraft carrier in conjunction with land-based air forces. The latter prevented the transfer of the *Mayagüez* to the coast of mainland Cambodia and supported the landing operations on Koh Tang. However, they were not able to provide sufficient support to extricate the marines. The USS *Coral Sea* had by this time closed with Koh Tang and nearby Cambodian mainland port and air facilities, and through the higher availability of her aircraft and superior flexibility of response, was able to cover the withdrawal of the marines and to deter the Cambodians from any naval or aerial attempts to interfere with the evacuation.

Preventative force

The use of aircraft carriers in the exercise of preventative force, in response to close crises, has been necessary whenever the following factors have been important:

a. mobility of air base

b. availability of aircraft

c. fatigue of aircrew

d. flexibility of responses

e. credibility of deterrent.

It should be no surprise that the listed factors are the same as for corrective force, because preventative force is implemented in much the same way, although the intention is different. When considering the incidents of preventative force, including aircraft carriers, in response to close crises, the same facts emerge as for corrective force. As noted earlier, it is a question of timing. The Kinmen Island (Quemoy) crisis of August and September 1958 was superficially the same problem as for Tachen, although here the communist Chinese had not cut the island off, so the US and Nationalist Chinese could move to prevent this occurrence. The distance to Taiwan was 100 miles, which made it difficult for land-based aircraft to give the necessary powerful and instant support for shipping being escorted into the islands. The Chinese mainland air bases from which they could launch a larger effort at shorter notice were closer. The US Government relied on aircraft carriers for this operation for the same basic reasons as they did for the Tachen operation.

The dispatch of the Dutch aircraft carrier HNLMS *Karel Doorman* to Dutch New Guinea in April 1960 was ostensibly to prevent Indonesian attacks on the territory. The aircraft carrier represented a more credible deterrent to the Indonesians than Dutch land-based air forces in New Guinea, as its mobility could place its air group within close range of many vital Indonesian targets. Dutch land-based air forces had to fly considerable distances before they reached worthwhile targets, suffering adversely in comparison to the carrier air group in respect of availability, flexibility and aircrew fatigue.

The Guatemalan and Nicaraguan request for US assistance to prevent the landing of dissidents in November and December 1960 led to the US relying on aircraft carriers for the main task. This occurred because the aircraft carriers, through their mobility, could concentrate their air search just off the coast of Guatemala and Nicaragua at the crisis centre, presenting a difficult cordon for the dissidents to evade. US air bases existed at Guantanamo in Cuba and in the Panama Canal Zone, from which useful efforts could be have been launched. But they could not match the availability and flexibility of the aircraft carriers on the spot, and the consequently more credible deterrent they represented. Aircrew fatigue was another factor affecting land-based aircraft patrols.

The Cuban missile crisis of October and November 1962 led to extensive aircraft carrier and land-based aircraft operations, and it is difficult to say which was the more critical to the outcome of the crisis. Both contributed most importantly to the ‘quarantine’ of Cuba. Most of the air bases of the south-eastern United States were packed with aircraft, ready to strike at nearby Cuba or to support search and ‘shadow’ operations. Eight aircraft carriers were also involved. Three of these were in direct support of the naval and air base of Guantanamo; the main reason being their superior availability of aircraft and flexibility of response. The other aircraft carriers supported US Navy ‘quarantine’ operations for similar reasons, to ward off possible USSR attacks on shipping, and to complement the air and surface cordon.

Precautionary force

The use of aircraft carriers in the exercise of precautionary force in response to close crises has been necessary whenever the following factors have been important:

a. mobility of air base

b. availability of aircraft

c. fatigue of aircrew

d. flexibility of responses

e. ambiguity of presence

f. credibility of deterrent.

The circumstances surrounding most of the factors are by now sufficiently well amplified to render any further exposition by description of actual events repetitious. However, the factor of ambiguity of presence requires some explanation. Ambiguity is defined as the ability to pursue dual motives or the intention to confuse an opponent. This is a useful quality to have when it is not entirely clear what the motivating and controlling influences in the crisis are.

Tactical fixed wing aircraft have not generally proven satisfactory in implementing this strategy and so they are not often used. This is because it is hard to demonstrate intent with aircraft without being rather blatant and therefore running the risk of being provocative. Military aircraft are very direct and specialised weapons of war and this limits the flexibility with which they can be deployed for anything less than this purpose. By contrast, naval units are not in this category; the nature of movement on the sea not necessarily being associated with a hostile intent. This ambiguity is one reason why naval forces have been the main instruments employed on the above duty.

The standard stratagem has been to assemble a naval task force off the coast of the opponent nation. This is an event that is hard for the opponent to overlook, as a naval task force's physical presence is usually substantial. If suitably composed, the task force will be able to protect its interests within the opponent nation if they become seriously threatened. This capacity is enhanced if an aircraft carrier is present. However, the presence of a foreign naval task force off another nation's coast is not in itself regarded internationally as a provocative act. Any naval force is entitled to sail in international waters, and could be there for a variety of reasons not associated with the internal situation within the opponent nation's borders. It is hard to assert convincingly to the world at large that a hostile intent exists unless the naval force takes some obvious action. But lack of hostile activity does not remove the veiled threat of possible action conveyed by this ambiguous and continuous presence. The nature of air power is such that land-based air power is not capable of achieving this subtlety of employment.

All of the close crises listed for precautionary force in Table 4 have involved the use of naval forces (particularly LPH or LHA based task forces) in the manner just described. Sometimes the purpose has been to protect nationals, occasionally to assert the rights of passage through national waterways, and quite frequently to protect economic and associated interests from damage or threat from indigenous political movements. The important point is that the exercise of precautionary force is the method by which governments can react to international situations that may lack obvious direction and purpose. The ambiguity of presence factor is the means by which they can help to keep their options open without necessarily prejudicing their ability to act promptly and effectively in the crisis area.

Demonstrative force

The use of aircraft carriers in the exercise of demonstrative force in response to close crises has been necessary in the majority of such incidents whenever the following factors have been important:

a. mobility of air base

b. availability of aircraft

c. ambiguity of presence

d. credibility of deterrent.

When close crises have required displays of demonstrative force, there has always been an advantage in mounting the demonstration as close to the crisis centre as possible. Land-based aircraft can of course, by definition, reach the area. Nevertheless, in those situations in which it has been judged an advantage to have aircraft as part of the display, the mobility and consequent superior availability of carrier-based aircraft have usually led to their selection. The carrier can move to the crisis area and can then, with its aircraft, loiter in the area indefinitely, in a powerfully symbolic display of force.

It is usual for most displays of demonstrative force to involve the ambiguity of presence factor. This occurs because such actions are meant to be symbolic gestures and not provocative acts towards the nations at which they are directed. The section on precautionary force has already discussed why naval forces are probably those best adapted for the implementation of this. The use of aircraft carriers is of course compatible with this aim. It is perhaps important to mention that the majority of acts of demonstrative force have been carried out by naval forces of some description, for the reasons associated with ambiguity of presence.

The arguments that have already been advanced in dealing with corrective and preventative force for the superiority of a sea-based, as opposed to a land-based air deterrent are also applicable to the exercise of demonstrative force. However, there are some general qualifications to be made to the nature of the necessary credibility of the deterrent value of the forces involved. The credible deterrent factor for

demonstrative force is considerably weaker than it is in corrective force, preventative force and precautionary force. The reason is that no direct action or involvement is being immediately considered by the nominal assailant, and so there is not quite the same pressure to have a force on hand that can obviously achieve its intentions by violence. Because of this there is more room in the exercise of demonstrative force for symbolic gestures (of larger but more remote forces that could be deployed if necessary, for example), and these of course can be much weaker in their immediate credibility and deterrent value than for the exercise of corrective, preventative and precautionary force.

An important example of the constructive use of an aircraft carrier in the exercise of demonstrative force concerns the visit of the *Coral Sea* to Split, Yugoslavia, in September 1952. This occurred at a time when Yugoslavia was under increasing pressure from the Soviet Union to cease its independent line of Marxist-Leninism and to return to the Soviet sphere of interpretation and influence. There were some fears that the Soviet Union might even resort to armed intervention to achieve this end. The main objective of the *Coral Sea*'s visit was to demonstrate the effectiveness and availability of US air power to Yugoslavia and so to encourage the Soviets not to intervene in Yugoslavia. However, this message had to be conveyed to the Soviets in a manner that did not antagonise or push them into the very actions that the US and Yugoslavia wished to avoid. This meant that a public or private warning from the US was not entirely suitable, as it carried with it the suggestion that Yugoslavia was about to collaborate closely with the US and this could precipitate an undesirable Soviet reaction.

The mobility of the aircraft carrier allowed a powerful display of the strength of US air power to be presented close to the crisis centre (Yugoslavia-Warsaw Pact border). This had the effect of demonstrating publicly the credible deterrent value of the US power that could quickly be made available and its possible association with the interests of Yugoslavia. However, the presence of the aircraft carrier in Yugoslavian waters was ambiguous, as it presented by itself no immediate military threat to Soviet interests. It was a symbolic gesture only and was obviously not a permanent commitment; which might not have been the inference if forces of any description had been landed. In this way, the Soviets had been quietly warned of the possible implications if they decided to intervene; but Yugoslavia's independent stance had not been compromised by direct association with the US, as the *Coral Sea* was only on an official courtesy visit. Warships have been making courtesy calls on nations for hundreds of years. Military aircraft rarely do this.

Another important example of the exercise of demonstrative force in response to a close crisis concerned the landing of marines in Bangkok in May 1962, to discourage further communist advances in Laos. This landing was to demonstrate symbolically the general availability of US air and land power in the area, and was launched at the nearest available point to the crisis area – Laos. USS *Valley Forge* (LPH) supported by

other naval units, off-loaded by helicopter 1800 marines, with air support from USS *Hancock*. This did not demonstrate an immediately credible deterrent, but was meant to indicate that the threat of deployment of much stronger forces at short notice was within the US capability. Nevertheless, this action could not have been described as provocative to the situation in Laos. The demonstration was carried out in a third party nation, the size of the force was not very large, and it could have been justified in its actions for a number of reasons other than attempting to intimidate Laotian communists. Thus the US presence was ambiguous.

A further example, in November 1969, involving Spain and Britain demonstrates that the use of aircraft carriers is occasionally determined because they are impressive capital warships and only incidentally aircraft carriers as well. As related earlier, Spain sent her aircraft carrier *Dedalo* (LPH) and 12 other warships to anchor at Algeciras in a gesture of Spanish determination to regain sovereignty over Gibraltar from Britain. The use of *Dedalo* was not related to any Spanish intention to demonstrate Spanish air power, as this could be done more effectively from nearby air bases of the Spanish Air Force. *Dedalo* was the capital ship of the Spanish Navy and consequently drew attention to whatever purpose she was fulfilling. The presence of 12 other warships with her was a hint of the substantial power that Spain could bring to bear if Britain gave no satisfaction to her demands. However, this demonstration was not of itself grossly provocative as it was carried out within Spanish territorial waters, although within sight of Gibraltar, and could have been convincingly justified by the Spaniards for reasons other than the obvious one. In other words, their presence was ambiguous.

The British counter-demonstration also involved aircraft carriers. The use of the *Hermes* and *Eagle* was not determined by a British desire to demonstrate their air power, but rather to up-stage the Spanish use of *Dedalo* – in this case with two fleet aircraft carriers. The presence of the two aircraft carriers in Gibraltar at the time of the arrival of *Dedalo* in Algeciras was of course also ambiguous. It was not unusual to see aircraft carriers at Gibraltar for quite innocent purposes, as it was a major British naval base.

Other examples could be taken from Table 5 for amplification but they would not indicate any aspects that have not already been covered. Further expansion would therefore be repetitious.

Disaster relief

Not many natural disasters occurred beyond the radius of action of land-based aircraft. This is the case because third party nations tend to make their airfields available for such missions, allowing responding nations to stage their aircraft through to the disaster area. Thus, there are minimal transit problems related to national boundaries and fewer logistics problems as the facilities of other nations can be used.

The main difficulty has often been in getting the disaster aid to the affected area. Natural disasters caused by earthquakes, cyclones or floods have often resulted in the

destruction of all forms of communication, including the disruption of airfields. The aircraft carrier has proved to be very useful in these circumstances as its mobility has often enabled it to move close to the affected area. Thus, it has been able to act as a fully operational air base through which to stage the supply of aid and, more importantly, to act as the main distributor of aid to the disaster area with its rotary wing aircraft. In these circumstances, because the aircraft carrier is closer to the disaster area than any other major operational base, the availability of its aircraft to distribute supplies or to render aid will be higher.

Another factor is that the aircraft carrier, like other warships, is largely self-contained for its own supplies and has little need to draw on resources from the community it may be attempting to assist. Indeed, it has many goods that it can hand over immediately from its own reserve stores without any special replenishment. This flexibility cannot be matched by other organisations at short notice as they are much more dependent on external support. The facilities they have to rely on, such as operational airfields, may of course be the very things that have been destroyed in the disaster. Land-based aircraft arriving in the disaster zone with relief personnel must also bring food, water and shelter for these personnel, otherwise they will become an additional drain on strained resources in the disaster zone.

Summary of land and sea-based air responses to close crises

Land-based air power has been the best means of responding to nearby crises involving the use of corrective, preventative, precautionary and demonstrative force – except when the approach to the crisis area has required transit over or near significant seas or oceans and the duration of operations has not been protracted.

Where the sea or protracted operations have been factors for consideration, aircraft carriers have generally been the best means of response to nearby crises for the following reasons:

a. their mobility has allowed them to approach closer to the crisis centre than available airfields

b. this has allowed improved availability of aircraft (for a standard unit aircraft establishment) at the crisis centre because of the shorter distances involved

c. shorter flying distances have reduced the impact of aircrew fatigue during flying operations in the crisis area

d. the placement of the aircraft carrier (the base or airfield) close to the crisis centre increases the flexibility with which it can exercise command and control, and communicate its decisions and responses to sudden developments in the crisis zone

e. the aircraft carrier provides an air base of high operational survivability in peacetime. This analysis shows a preponderance of incidents in which a threat existed at the crisis centre from ground force elements, making it difficult to guarantee survivability of land-based aircraft on the ground at the crisis location

f. as a warship, the aircraft carrier, with its aircraft, is capable of projecting a more ambiguous presence than land-based aircraft flying from airfields

g. the approach of an aircraft carrier closer to a crisis zone than available air bases gives its air group a higher credible deterrent value than for equivalent (but more distant) land-based air formations, because of improved availability and flexibility.

Important capabilities in peacetime acts of force

To the above reasons for the employment of aircraft carriers in preference to land-based aircraft in close crises must be added the definitive capabilities that have been important whenever aircraft carriers were employed in peacetime acts of force. These were:

a. the ability to provide a mobile sea base equipped with rotary wing aircraft, containing facilities for troops or marines and their logistics support – the LPH/LHA concept

b. the provision of rapid response, fixed wing tactical aircraft for:

   (1) reconnaissance

   (2) surface or ground tactical strike or the threat thereof in the immediate vicinity of the incident

   (3) conveying a sense of some ambiguity of purpose surrounding the deployed force, especially in those incidents involving application of precautionary force

c. the provision of command and control and JFHQ facilities afforded with a sea mobile base for:

   (1) amphibious operations

   (2) air or sea blockade and sea control operations.

Chapter 2: Aircraft Carrier Roles in Wartime

Wartime Use of Force

An analysis of the operational experience in the use of aircraft carriers in wartime reveals, not surprisingly, that they have been used primarily in the following four different roles:

a. anti-submarine warfare (ASW)

b. air defence

c. reconnaissance and air strike

d. air-to-ground support.

Anti-submarine warfare

The most intense and recent use of aircraft carriers in the ASW role during wartime occurred during World War II in association with the North Atlantic convoys between North America and Britain for the period 1939–45 and between Britain and Russia during 1941–45. This also corresponds to the last serious direct challenge, up to the time of writing, from this type of warfare. In World War II, aircraft carriers were deployed in two ways to provide ASW protection for convoys. The first was as an integral part of a particular convoy. In this case, the aircraft carrier used its aircraft to reconnoitre the flanks of the convoy and along its route for any submarines, as well as for enemy reconnaissance aircraft that might attempt to locate the convoy and radio its position to hostile submarines. In the event of a submarine contact the carrier aircraft launched an attack or directed surface escorts to the area. The second method of deployment was as part of hunter-killer ASW groups, which consisted also of destroyers and other surface escorts. These groups patrolled convoy routes ahead of convoys, following a wide area search pattern in enemy submarine-infested waters. Alternately, the groups would start as part of the support for a convoy, but would detach to pursue submarine contacts encountered en route.

Initially fleet carriers (see Table 1) were used for ASW activities, but the loss of *Courageous* to submarine attack in September 1939, while engaged in ASW operations, convinced the Admiralty that fleet carriers were too valuable to be risked in this way. They were also required urgently for fleet air defence, and ASW operations maximised the probability of their coming into contact with submarines, which were amongst the most effective weapon systems for sinking aircraft carriers. The Admiralty had to seek a cheaper and more expendable alternative to fleet carriers.

The first solution was the escort carriers. These were cheap and could be produced comparatively quickly; lacking the fleet carrier's more sophisticated design features

and complicated equipments designed to counter air and surface attack. Additionally, the escort carriers could operate only a limited number of fighter and ASW aircraft. The first one began convoy ASW protection in September 1941, although no more followed until April 1943. The second solution, which was adopted in October 1942, was the merchant aircraft carrier (MAC) ships. These were even simpler to make and could operate three or four ASW aircraft. The first MAC ship entered service in May 1943. By the beginning of 1944 most North Atlantic convoys sailed with at least one MAC ship or escort carrier, as well as the usual ASW surface escorts.

Air defence

The most intense use of carrierborne aircraft in the air defence role occurred during World War II. Even though wars have been fought since in which carriers have been used in this role, the aerial opposition has been so weak as to be virtually non-existent, negating the value of such operational experience for the purposes of this study. The most important air defence related operations involving carriers in World War II were the campaigns in the Mediterranean from 1940 to 1942, the Pacific from 1941 to 1945, and for a time the Arctic convoys.

The carrier air defence role has involved the protection of merchant and military convoys, fleet deployments and beachhead lodgments in enemy territory. It has involved all categories of aircraft carrier extensively, depending on the level of air threat. Where this threat has been high, fleet and light fleet carriers were used as much as possible, as they had a higher capacity to absorb damage than escort carriers, and operated larger complements of aircraft.

There have been two methods of extending carrier air defence to convoys and fleets. The first has involved the aircraft carrier or aircraft carrier forces being in close proximity to or actually part of the forces being protected. This method was usually applied to merchant and military convoys and naval forces when they were in transit on the open sea. However, when these journeys were terminated in either a direct surface fleet action or an amphibious landing operation, the aircraft carrier force would usually separate itself by some distance (20-60 miles) from the main force and operate as a detached covering force. But when fighting enemy aircraft carrier forces the tendency was for the aircraft carriers to stay with the remainder of the allied surface forces.

Reconnaissance and air strike

The most well known roles for aircraft carriers have been reconnaissance and air strike. They have fallen into two categories: strategic and tactical.

Strategic reconnaissance and air strike operations have been launched from fleet and light fleet carriers as they could move faster, absorb more damage and carry more aircraft than escort carriers, within enemy dominated sea and air space, and outside the radius of action of friendly land-based aircraft. None have taken place

since World War II, and they occurred infrequently even during that conflict. The most relevant events were:

a. the British attack on Taranto, November 1940

b. the Japanese attack on Pearl Harbor, December 1941

c. the Japanese aircraft carrier foray into the Indian Ocean and attack on Ceylon [Ed: Sri Lanka], April 1942

d. the US aircraft carrier launched attack on Tokyo, April 1942

e. the US aircraft carrier raids on Marshall, Wake and Marcus Islands, from January to March 1942

f. the Japanese attack on the Island of Midway, June 1942

g. the British and US aircraft carrier raid on Surabaya, May 1944.

Tactical reconnaissance and air strike operations have involved fleet, light fleet and escort carriers; the last suffering proportionally higher losses. These operations have taken place in the forward edge of battlefield areas (FEBA), which has usually meant that carrier aircraft have been launched within the radius of action of friendly land-based aircraft. However, during the Pacific War between 1941 and 1945, carrier aircraft were sometimes launched from positions that could not be reached effectively by either friendly or enemy land-based aircraft.

Tactical reconnaissance and air strikes from aircraft carriers have occurred almost continuously from 1939 to the end of the US involvement in the Vietnam War. Some of the more spectacular have been:

a. the operations associated with the Battle of Matapan, March 1941

b. the operations against the *Bismarck*, May 1941

c. the Battle of the Coral Sea, May 1942

d. the Battle of Midway, June 1942

e. the battles of the Solomon Islands, August to November 1942

f. the attacks on *Tirpitz*, April 1944

g. the battle for the Marianas, June 1944

h. the Battle of Leyte Gulf, October 1944

j. the raids on the Yalu River bridges, November 1950

k. the Hwachon Dam raids, April/May 1951

l. the campaign to destroy the North Korean transportation system

m. the campaign to destroy the North Vietnamese transportation system.

Aircraft carrier air-to-ground support

Fleet, light fleet and escort carriers have all been used extensively for air-to-ground support roles. The most usual circumstances have involved the support of troops engaged in amphibious landings. However, aircraft carriers have also been used in this role in support of major land campaigns with flanks resting on long sea coasts. This has often allowed aircraft carriers to approach within the close proximity of substantial parts of the front line, allowing very rapid and responsive air-to-ground support from the aircraft carrier using forward air controllers. The usual preconditions for this type of operation have been more or less secure control of the sea and airspace along the enemy coastlines.

The operations that are particularly pertinent to an analysis of the air-to-ground support role for aircraft carriers are as follows:

a. all large scale amphibious landings during World War II

b. the Inchon landing, and most aircraft carrier operations in the Sea of Japan and Yellow Sea during the Korean War

c. all French aircraft carrier operations during the Indo-China War

d. most aircraft carrier operations on 'Dixie Station' during the Vietnamese War.

Wartime Roles in Comparison to Other Means

The preceding paragraphs have detailed a number of incidents from the relevant wartime operational experience, which illustrate that aircraft carriers have been used in four major roles in wartime. What has not been established is the extent to which aircraft carriers have been the important instruments in implementing these roles, as opposed to other weapons systems also employed on the same tasks. These questions will be answered for each of the wartime roles to the degree that the operational experience permits.

ASW roles

The scene of the most intense and most recent wartime ASW activities was the Atlantic convoys between Britain and North America from 1939-45, and between Britain and Russia from 1941-45. The main weapons systems employed to counter the submarine threat in these areas were ASW surface escorts, land-based ASW aircraft, and aircraft carriers of the escort and MAC variety.

The first aim of ASW operations is to deny the enemy the effective use of his submarines against one's own shipping. In this respect the best indicator of relative success of failure of this effort is the number of convoyed ships sunk by enemy submarines. The writers only consider the case of convoyed shipping, as operational experience and operations research proved conclusively during World War II that the convoy system

was the best method of organising shipping to minimise the probability of contact for each ship with an enemy submarine. Ships that sailed independently suffered losses generally twice that of convoyed shipping, and sometimes ten times as high. Figure 1: 'Ocean Trade Convoys in the North Atlantic and Arctic, January 1940 – April 1945' gives the losses to convoyed shipping for each quarter year.

The next step is to plot the ratio of convoyed merchant ships to ASW surface escorts available for convoy duty for each quarter year. Figure 1 shows that the period of the highest ASW surface escort density for convoys coincides with the period of highest convoy losses to submarine attack. This would seem to indicate the relative ineffectiveness of ASW surface escorts in preventing submarine attack. However, by referring to Figure 1 again, it will be seen that the number of operational enemy submarines in the Atlantic and Arctic was also going up, and at a much faster rate than the increase in ASW surface escort density.

In fact, the only way that a significant improvement in ASW escort density per convoy could have been achieved would have been by producing disproportionately larger quantities of ASW surface escorts. Every convoy had to be defended adequately, because the enemy submarines could theoretically pick and choose which convoys they would attack, wreaking disproportionate damage on those that were inadequately protected. This alternative would have trapped the defender into an unfavourable trade-off in the allocation of national resources to neutralise submarines, against what the enemy was investing in building his submarine fleet. The Admiralty was aware that a more cost-effective solution had to be found.

The use of aircraft in ASW was seen as the most cost-effective solution to this problem. Initially land-based aircraft were used, even though they lacked an effective anti-submarine weapon until August 1942. These operations centred on focal areas around British ports, and in conjunction with surface ASW vessels and anti-submarine minefields, the use of these aircraft forced the enemy submarines to retire to safer areas. These lay largely in the mid-Atlantic and also in the Arctic Sea, which could not be covered by land-based aircraft from British and American bases. (See Figure 2: 'Areas in Which Land-based Air Escort to Convoys Were Never or Rarely Provided, August 1942 to May 1943'). The 'Mid-Atlantic Air Gap' became the main scene of conflict, where increasing numbers of operational submarines battled with a much more slowly growing density of ASW surface escorts.

The logical plan was to cover the respective 'air gaps' in the Atlantic and Arctic by using aircraft carriers. As has already been mentioned, the cost-effective solution was to use escort carriers and MAC ships. The first of these vessels to become available for ASW in Atlantic convoy protection were deployed in April 1943. As Figure 1 shows, increasing numbers of them became available from then onwards, and the convoyed shipping losses to submarine attack also dropped dramatically.

To some extent this can also be attributed to the drop in enemy submarine strength, which occurred at the same time (see Figure 1). This had begun to occur partly because of the increasing success of the land-based aircraft and surface warship campaign to intercept and sink enemy submarines in their main transit areas – the Bay of Biscay and Northern Transit Zone – before they reached their operational areas in the mid-Atlantic.

More importantly, improved convoy escorts were sinking more attacking submarines. However, the enemy was not losing submarines at the rate that would explain entirely the dramatic drop in convoyed shipping losses that coincided with the first six months of the introduction of the escort carriers and MAC ships. During the first three months of this period, from April to June 1943, convoyed shipping losses were halved from 105 to 48 ships while the enemy operational submarine fleet lost 14 per cent of its establishment, which at the beginning of this period had stood at 215.

During the next three months of this period, from July to September 1943, convoyed shipping losses were halved again, while the enemy operational submarine fleet had lost 16 per cent of its establishment of 185 submarines. As Figure 1 indicates, the enemy submarine force went on to recover much of its former strength despite the widespread allied operations aimed at sinking as many submarines as possible. However, this did not bring a significant rise in convoyed shipping losses, probably because it coincided with the deployment of increasing numbers of escort carriers and MAC ships with Atlantic and Arctic convoys.

It was clear that in this period the enemy was being denied the effective use of its submarine fleet. Part of this may have been from the loss of experienced crews, even though many still remained. The other explanation is that the submarines were finding fewer attacking opportunities than before. Many technological developments had resulted in the improvement of ASW surface escorts' ability to guard convoys. These undoubtedly made it harder for submarines. However, the decline of the U-boat fleet's effectiveness coincides too closely with the introduction of escort carriers and MAC ships for this to be coincidental. They were the most important element in denying the enemy the effective use of his submarine fleet.

The aircraft that the escort carriers and MAC ships could launch, day or night, prevented the enemy submarines from closing with convoys. This denied them opportunities for attack, except in the face of extreme danger from aircraft and supporting surface vessels. Enemy records show that this was the most significant development in reducing convoyed shipping losses. This is supported by the fact that during the entire war only 20 ships were sunk by submarines while they were in convoy with ASW surface escort and air support overhead. This represents less than one per cent of the total number of ships sunk by submarines during World War II.

Effectiveness of aircraft carriers in the ASW role within range of land-based aircraft

Even though escort carriers and MAC ships had been conceived originally to operate beyond the range of land-based aircraft, it was soon found that they were also useful inside normal land-based aircraft operational radii for ASW operations. An analysis of the operational, strategic and psychological factors associated with wartime ASW operations, within the radius of action of appropriate land-based airforces, indicates that the following were important to the success of such missions:

a. mobility of air base

b. availability of aircraft

c. flexibility of response

d. reliability of aircraft

e. survivability of air base

f. aircrew fatigue

g. surprise

h. credibility of deterrent value of forces.

During World War II, when convoys were protected by land-based ASW aircraft at some distance from an airfield, it was by no means unusual for the aircraft to be detached on other duties at short notice. Aircraft were drawn away, for example, to support a more threatened convoy, to pursue a submarine contact made by surface ships some miles away or, having used up their weapon load, to return to base. In such cases convoys were left unprotected until replacement aircraft could come on task. Since this sometimes took hours, depending on the distance involved, submarines were often able to take advantage of the situation by launching attacks.

With escort carriers or MAC ships guarding the convoy it was a simple matter to launch another aircraft to replace one for whatever reason. The ships' mobility placed them at the centre of a crisis area, and allowed them to make more rapid and flexible responses to changes in the tactical situation. It also guaranteed a high availability of aircraft because of the very short distances involved. Merchant seamen regarded MAC ships and escort carriers as their aircraft cover because this support could not be suddenly withdrawn, but was associated intimately with the convoys and their fortunes. This was to be important for morale.

The reliability of aircraft from the MAC ships and escort carriers was usually comparable to that of land-based ASW aircraft. Bad weather gave convoys concealment from submarines even though aircraft could not always be launched from the escorting aircraft carriers. However, in good weather, the escorting aircraft carriers could always

put up aircraft. This was not necessarily the case for the friendly airfields, which could occasionally be experiencing bad weather while convoys had good weather.

The one big disadvantage for MAC ships and escort carriers was that they could be sunk, while nothing approaching this sort of calamity could occur to airfields. But, in reality the survivability of the escorting carriers was very high. Submarines rarely gained positions from which to attack them as the MAC ships and escort carriers were usually placed in the centre of the convoys they protected. In these circumstances a submarine had to get past the surface ASW escorts to gain a shot at the aircraft carriers. This was dangerous enough in itself, but the probability of submarine survival after the attack was even lower.

Aircrew fatigue, under certain circumstances, became an important problem. For ASW operations, mission length, sortie rate, habitability of aircraft and tranquillity of air base were all important. Mission length mainly affected land-based aircraft as they frequently had to carry out extended ASW patrols, preceded and followed by long transits to and from the patrol station. By contrast, carrier aircraft took very little time to reach station (as the aircraft carrier stayed with or near the convoy) and could be relieved relatively easily at short notice. Because of the longer distances over which they had to operate, land-based ASW aircraft also had to maintain a higher sortie rate for a given number of aircraft. However, for at least the first two years of the war, naval ASW aircraft were inferior to land-based equivalents in their habitability. The aircrew often flew in open cockpits exposed to all weathers. Furthermore the tranquillity of the carrier as an air base was inferior to that of land bases. This stemmed from the comparatively small size of the MAC ships and escort carriers doing most of the sea-based ASW work. This meant that high sea states made landing and take off operations difficult and hazardous and made life in general quite tedious. It is difficult to summarise the overall results, but a safe generalisation would be that during winter months, land-based ASW aircrew suffered less from fatigue problems than naval ASW aircrews, but that this disparity was probably reversed during summer.

The factor of surprise was gained as easily by land-based aircraft as by carrier aircraft. There is no way to distinguish whether either had an advantage. Both types caught numerous enemy submarines on the surface before they could dive.

The credibility of the deterrent value of MAC ships and escort carriers and the aircraft they flew may have been higher than for land-based aircraft. Enemy submarine commanders acknowledged the superior flexibility of response and availability of aircraft from escorting aircraft carriers, and had orders to sink the latter as the first priority of any attack on a convoy. As was mentioned, this was by no means an easy thing to do, but if this was not achieved, enemy submarine attacks against the convoy were likely to be matched by unacceptably high submarine losses. Thus enemy submarines were deterred from attacking such convoys, or obliged to ignore the merchant ships and to attack the escorting aircraft carriers first, which played into the hands of the convoy defence.

ASW — Operational experience and technological change

Many years have passed since the last major anti-submarine war, and during this time-span technology has changed the instruments and weapons available to fight it. Thus, the ASW operational experience from World War II must be reconciled with the major technological developments in ASW that have occurred since then.

One of the main contributions the escort carriers and MAC ships made to the 1939-45 ASW battle was to prevent submarines closing with the convoys they protected. This depended in the end on the submarines' inability to stay submerged for extended periods, or to travel at high speed underwater. Consequently, submarines approached convoys on the surface, submerging only when relatively near. The submarines then had to get within even closer range to have a reasonable chance of a successful attack.

Today, nuclear submarines can stay submerged indefinitely, while modern diesel-electric submarines rarely have to surface, and can remain at snorting depth while recharging batteries, exposing only a very small portion of their snort mast. Opportunities for surface detection are therefore fleeting. Furthermore, the attack capabilities of submarines have been enhanced. They can travel faster underwater than on the surface, and can detect and identify shipping acoustically at longer ranges, easing the problem of closing with ships without detection.

With the advent of under-sea guided weapons, such as long range torpedoes and sub-surface-to-surface guided missiles, submarines no longer have to obtain short-range attack positions. Convoys cannot avoid torpedoes with the prompt issuing of helm orders any longer. Indeed, even warships would probably be unaware of the approach of torpedoes. This has increased the problems of convoy protection. The main detection effort has now to take place below the sea, largely by acoustic methods. This detection effort must also be made much further out from convoys than has occurred up to this time. For instance, a radius of 150–250 nautical miles will be needed to avoid the sub-surface-to-surface guided missiles that submarines may fire. Even in the case of modern long range torpedoes, the submarine preferably should be detected at 40–50 nautical miles, before closing to the firing range of say 15 nautical miles. The acoustic methods, which have to be relied on for detection, vary widely in their effectiveness with variations in water conditions.

Because of the huge detection zones involved, it is not a practical solution to rely exclusively on surface escorts for detection, as an enormous number would be required. Fixed wing and rotary wing aircraft are the cost-effective means of performing this function, supported by surface escorts where necessary. However, an important difference with World War II experience in regard to ASW aircraft is that contemporary aircraft will be much heavier and more specialised because of the more sophisticated ASW equipment they must carry.

Whether the airborne ASW component should in fact be land-based or sea-based (or a combination of both) depends on the circumstances of the most probable geographic locations of ASW operations. Assuming that carrier aircraft and land-based aircraft continue to be developed, this dilemma will be resolved by consideration of the key factors outlined above; mobility of air base, availability of aircraft, flexibility of response, survivability of air base, aircrew fatigue and credibility of deterrent, against the prevailing circumstances. If sea-based aircraft prove to be the best option, it is likely to be on the basis of the employment of modern equivalents of the World War II escort carrier concept.

Air defence role

Aircraft carriers have been used in the air defence role for protection of merchant convoys and naval forces threatened with air attack, as well as for beachhead air defence during the initial stages of amphibious operations, until an airfield could be established. Even though all three tasks have been carried out since World War II, the level of air threat has never been serious enough to test the aircraft carrier in an air defence role. For relevant operational experience of this kind we must turn to events of World War II.

The focal points of interest are the convoys to Malta, from June 1940 when Italy entered the war to September 1942, after which major events elsewhere resulted in the redeployment of Axis aircraft. These convoys consistently sailed through the war's most intense and sustained air attacks on convoys. They passed within very close range of major enemy airfields for extended periods, often fighting off in excess of 500 aircraft attacks. They were protected by Allied carrier aircraft, and land-based aircraft from Malta and North Africa. This allows a very useful comparison of the effectiveness of the two sources of air defence for shipping.

An analysis of the Malta convoys that sailed only with aircraft carrier support, and those which relied only on land-based aircraft for their air defence indicates that losses of shipping from air attack were much higher for the latter. Figure 3, 'Convoy air defence, Malta, June 1940 – September 1942', indicates the difference. Although this result could have been attributed to the aircraft carriers providing more aircraft than were available from the land bases, Figure 3 indicates that in fact the reverse was true. A further possible argument might have been that the number of surface escorts per merchant ship was much higher for aircraft carrier protected convoys, improving the overall air defence and reducing shipping losses. Figure 3 shows that there was in fact little difference in surface escort to merchant ship ratios for carrier or land-based air-protected convoys.

Aircraft carrier-based air defence was clearly more efficient, but why was this so? An analysis of the strategic, operational, tactical and psychological factors associated with fleet and convoy air defence operations indicates that the following factors were important to the achievement of success:

a. air base mobility

b. aircraft availability

c. flexibility of response

d. aircraft reliability

e. air base survivability

f. aircrew fatigue

g. surprise

h. credibility of deterrent value of forces.

The enemy's most effective method of attacking convoys was to launch airborne wave attacks to swamp and divide the airborne and anti-aircraft gun defences of the convoy. The aircraft carrier's mobility could ensure it was with a convoy so that when a wave attack began, it could immediately launch all its fighters at the critical time. To have had the same number of fighters available at these times, the same number of land-based aircraft would have had to be on permanent combat air patrol over the convoy, unless they could reach a convoy from their base in less time than it took the enemy attack to develop from first detection. At any distance from their base in excess of 70 miles, this option needed a UAE significantly larger than that of the carrier's complement of aircraft.

Even this was not foolproof. Enemy fighters would deliberately initiate inconclusive dogfights to encourage protecting land-based fighters to use up their fuel and ammunition prematurely, forcing an early return to base. In the interval between the departure of the friendly aircraft and the arrival of their replacements, a convoy would have little or no overhead air cover, and the enemy bombers would then attack.

This problem was never as acute for carrier aircraft, because they could return quickly to the aircraft carrier, where in time of intense action, the aircraft could be rearmed, refuelled, aircrews briefed, and launched again within 7-15 minutes. Returning almost instantly to the centre of the battle, carrier-based aircraft posed fewer command, control and communications problems because of the carrier's proximity to the battle and consequent possession of timely tactical information.

Thus, the aircraft carrier's mobility gave superior availability for a given number of aircraft, and allowed more flexibility in their efficient deployment against enemy air threats to convoys. Land-based aircraft needed a much larger UAE to achieve the same availability when operating at any distance from their bases, and could never achieve the same flexibility of deployment.

The reliability of aircraft from aircraft carriers engaged in the air defence role was comparable to that of land-based aircraft engaged in the same mission. There were

no important occasions in the Mediterranean when either aircraft carriers or airfields were unable to launch aircraft because of bad weather.

That biggest disadvantage for aircraft carriers in the air defence role was that they had a lower survivability. They could be sunk or put out of action, while nothing approaching this sort of interference was likely to occur to airfields. The risk of this happening was higher when engaged in the air defence role than for ASW, as in the former aircraft carriers had usually to face both air and submarine threats, while in the latter, submarines were usually the only threat. Furthermore, the distraction caused by air attack, or the threat thereof, often created the opportunities for successful submarine attack. The British lost the aircraft carriers *Ark Royal* and *Eagle* in the Mediterranean from these related causes. Two more, *Illustrious* and *Formidable*, were very seriously damaged.

Significantly, however, these four aircraft carriers had collectively carried out in excess of 80 major operations before they were removed from the battle. Many of these operations were critical to the maintenance of the British strategic position in the Mediterranean and North Africa and could not have been carried out by land-based aircraft. On this basis it can probably be said that these carriers had done more than enough to justify the expense of their construction and operation – especially given that two of them returned to operational service in other parts of the world.

There were no major differences relating to aircrew fatigue, except that the aircraft carriers used for air defence were usually either fleet or light fleet carriers, which, being bigger, tended to be affected less by high sea states than either escort carriers or MAC ships. Consequently, the lack of tranquillity (or stability) of the air base was not such a disadvantage to aircraft carriers in the air defence role as it was for carriers engaged in ASW. Additionally, carrier fighter aircraft were comparable in habitability to land-based equivalents. These two factors probably meant that aircrew fatigue problems for naval aircraft were less than for land-based aircraft engaged in the air defence role for convoys, fleets and beachheads.

The surprise factor was gained on station as easily by land-based aircraft as by carrier aircraft and there is no reason to think that either might have an advantage in this respect.

The credibility of the deterrent value of the aircraft carrier may have been, according to enemy reports, much higher than for land-based aircraft. This was probably related to the fact the carriers could put up a continuous stream of aircraft to defend themselves and their convoys at all times, and yet retain the ability to put all their aircraft into the air at once if necessary. This flexibility of response made the air screen much more difficult to penetrate and more dangerous than if land-based aircraft were allocated the task. As has been described in the peacetime roles section above, land-based aircraft did not have this flexibility, except in the close proximity of their base.

For fleet air defence in the Mediterranean during the same period as the Malta convoys (the time of most intense air threat) the British Mediterranean Fleet suffered proportionally higher losses when operating only with land-based air protection, than when it relied on carrier air defence, sometimes supplemented by land-based air support. The Italian Fleet suffered proportionally higher losses because it relied only on its own land-based air forces to provide cover from British carrier aircraft. In both cases the explanation is again related to the aircraft carrier's superior mobility and efficiency, for a given number of aircraft, relative to the factors of availability and flexibility.

The other events of World War II that are relevant to air defence of naval forces are the Pacific naval battles, and the Arctic convoys to Russia. In the first case, the main adversaries, the US and Japan, relied primarily on aircraft carriers for their fleet air defence. There are only a few incidents, as yet identified, in which it could be said that a naval force during the Pacific War relied mainly on land-based aircraft for air defence. This makes any general comparison between land-based and carrier aircraft fleet air defence operations such as was carried out for the Mediterranean more or less impossible. However, it is worth mentioning that the main incident in which reliance was placed on land-based aircraft concerns the sinking of *Prince of Wales* and *Repulse*. Land-based air defence was expected from Singapore, but when the British task force began to be attacked by Japanese bombers, the aircraft could not respond quickly enough to have any impact on the battle, and arrived shortly after the ships had been sunk. The Arctic convoys to Russia allowed no comparison, as British land-based aircraft could not cover most of the convoy routes.

There is little to be said about beachhead air defence except that aircraft carriers were always included even when land-based aircraft could also reach the area. The reasons are familiar. Aircraft carriers could provide higher availability for a given number of aircraft by being on the spot, through their mobility, and could also provide superior flexibility of response.

Convoy and fleet air defence — Operational experience and technological change

Many years have passed since the last major battle for air defence of shipping, and predictably, technology has changed the instruments and weapons with which to fight one. Thus, as with the ASW role, direct analogies with World War II experience must be carefully qualified.

The main difference is that attacking aircraft can use a more accurate, reliable and longer-ranging set of weapons than the free-fall bombs or straight-running torpedoes of World War II. Air-to-surface missiles can be launched at much greater distances from merchant ships or naval forces than earlier weapons; greatly expanding the area

of battle. But the defence of such shipping or naval forces has kept pace with these developments with the introduction of surface-to-air missiles.

World War II showed conclusively that combined shipborne and airborne defence was the most effective means of protection for shipping, especially if the defending aircraft were carrierborne. Protection of merchant shipping or naval forces in a modern environment is still in most cases (when facing a sophisticated air threat) best achieved by a combined shipborne and airborne defence; mainly because of the more complex weapons mix, which presents an airborne enemy with a more difficult attack solution. Whether the airborne component should be carrierborne or land-based (or a combination of both) is another matter and depends on the geographic situation in which the merchant shipping or naval force air defence is to be employed. Assuming that suitable carrier and land-based aircraft continue to be developed, this dilemma will be resolved by consideration of the key factors isolated above. They are: air base mobility, aircraft availability, flexibility of response, airbase survivability, aircrew fatigue and credibility of deterrent.

Reconnaissance and strike role

The most singular employment of aircraft carriers has been on strategic reconnaissance and air strike missions against targets outside of the radius of action of land-based aircraft. In such cases, the carrier aircraft were launched from within enemy dominated sea and air space and no other existing weapons system could attack such targets. In this role carrier aviation has been used to menace and destroy targets that the enemy had considered safe and thus left poorly defended. The strikes not only damaged exposed vital targets, but were a blow to the morale of an enemy that then had to spread its resources to protect all vital targets against the threat of similar strikes. This of course reduced the capacity of enemy air defences in the FEBA to defend against tactical air strikes from either land-based or carrier aircraft.

Most carrier-based strategic reconnaissance and air strikes have conformed to this pattern. The British attack on Taranto, in November 1940, was launched from within Italian dominated air and sea space, 170 miles from the Italian mainland and outside the effective range of British land-based air power. Apart from the damage inflicted, the attack resulted in the remainder of the Italian battleships being transferred further north to Naples and other ports, where they could no longer menace British sea convoys. It also caused more extensive defences to be erected in all potential ports and other vital targets.

Similarly, after the strategic reconnaissance and strike by the Japanese on Pearl Harbor, on 7 December 1941, the US sent all surviving capital ships to sea or to the west coast of America until the defences of the naval base could be strengthened. As late as September 1942, the USN periodically retained an aircraft carrier at Pearl Harbour, despite desperate needs elsewhere, for fear of further surprise Japanese

strategic strikes. The British carried out similar measures following the Japanese carrier foray into the Indian Ocean and attack on Ceylon in April 1942. After heavy losses, all remaining major British naval units were ordered to withdraw to the East Coast of Africa. Many months passed before the Royal Navy returned to Indian anchorages and resumed operations in the Bay of Bengal. This occurred only after the British strengthened the defences of all naval bases and increased the number of land-based aircraft.

The Japanese reacted in a similar fashion following the US carrier-launched 'Doolittle' bombing raid on Tokyo in April 1942. They reinforced the long range ocean picket line, pushed it further out into the Pacific Ocean and strengthened home anti-aircraft defences. These measures were taken despite the fact that the raid had not proved to be materially very damaging; a reflection of its effect on morale.

There were only about ten strategic reconnaissance and air strike missions launched from aircraft carriers during World War II, and there have been none since [Ed. at the time of writing in 1978]. The reason for the small number is the reliance on surprise, which if lost leaves the attackers very exposed and vulnerable, deep within enemy controlled sea and air space. Thus, there is considerable risk in such missions, even though the rewards usually have been very worthwhile.

An example of an aircraft carrier-launched strategic reconnaissance and air strike which failed is the Japanese attempt to seize the Island of Midway in June 1942. This was stimulated by the series of US aircraft carrier-launched strategic reconnaissance and air strikes against the Marshall, Wake and Marcus Islands from January to March 1942. These were part of an overall US strategy of avoiding a general confrontation with the Japanese fleet, except on very favourable terms and involved carrier-launched surprise attacks along the Pacific perimeter of the Japanese conquests. The very long flanks and great expanses of ocean along them provided unique opportunities for hit-and-run raids.

The Japanese had the option of reinforcing all these areas to reduce the effectiveness of the strikes, but this would have meant the loss of much of their strategic offensive flexibility by dispersing resources. Another option was to capture, by surprise, an island from which a vital US base could be menaced, forcing the US aircraft carriers to defend it and thereby bringing them to action with the superior Japanese fleet. The capture of Midway would have fulfilled this requirement, as from that location Japanese land-based air forces and naval units could directly menace Pearl Harbour and its supply routes. However, the US discovered the Japanese plans by breaking the main Japanese signal code, and the US aircraft carriers and land-based air forces on Midway were waiting for the attack when it began in early June.

The Japanese did not know about the presence of a concentrated force of US aircraft carriers near Midway, which although inferior in numbers to the Japanese, was able

to compensate for this by surprising their enemy. It was this element, more than anything else, that led to the Japanese losing the battle. The loss of strategic surprise to the US stripped away the main cover and protection the Japanese had relied on for the initial success of their mission. It also contributed in large measure to the heavy losses they suffered.

Strategic reconnaissance and air strike — Operational experience and technological change

Surprise was the most important factor in the success of carrier-based strategic reconnaissance and strike attacks during World War II. This is more difficult to gain today because of the widespread development and use of sophisticated radar and other monitoring devices by most nations and partially explains the lack of such strikes in more recent conflict. Furthermore, satellite surveillance information, which could be made available to third parties by the US or [Ed: the former] USSR, further reduces the possibility of gaining surprise.

Also, the development of other long range weapons since World War II has negated the advantage formerly represented by strategic carrier air strikes. In other words, the advance of technology has made the probability of future carrierborne strategic reconnaissance and air strikes even less likely than it was in World War II. However, the availability to an enemy of satellite or other means of surveillance need not necessarily render the aircraft carrier completely ineffective in this role. It is sufficient to state here that the assumed reliability and accuracy of satellite solutions can be questioned seriously in the light of their known and expected capabilities, and various countermeasures that could be adopted.

The effectiveness of aircraft carriers in the tactical strike role compared with other weapons systems

Carrierborne tactical reconnaissance and air strike has been much more commonly used than the strategic equivalent. Tactical reconnaissance and air strike took place in the FEBA, nearly always within the operational radius of friendly land-based aircraft – the main operational alternative to an aircraft carrier in this role. An analysis of the strategic, operational, tactical and psychological factors associated with this role indicates that the following were important to the success of such missions:

a. air base mobility

b. aircraft availability

c. flexibility of response

d. aircraft reliability

e. air base survivability

f. aircrew fatigue

g. ambiguity of deployment

h. surprise

i. credibility of deterrent value of forces.

The aircraft carrier's mobility not only made it more difficult for the enemy to locate and to retaliate against, but by shortening operational distances to the tactical target it increased the flexibility of response and availability of aircraft. Because the interrelationship has already been explored in Chapter 1, in the discussion of the application of corrective force, only one or two additional examples will be given here.

Despite some important reconnaissance assistance from land-based aircraft, the *Bismarck* was stopped by carrierborne tactical air strike; the mobile aircraft carrier having been more intimately aware of the evolving tactical situation, and being closer to it than were land-based aircraft. It could launch multiple aircraft wave attacks by turning the naval aircraft round quickly. Similarly, despite some minor assistance from the RAF, the carrier aircraft of the British Mediterranean Fleet were able for the above reasons to launch several decisive attacks against the Italian Fleet at the Battle of Matapan. These resulted in the sinking of three enemy heavy cruisers and two destroyers, as well as leaving one battleship seriously damaged.

Land-based aircraft were involved in the Battle of the Coral Sea, but failed to perform an adequate reconnaissance role and could not keep track of the development of the battle. They lacked the aircraft carrier's flexibility of response, based on the simplified command, control and communications associated with close contact with the scene of action. The aircraft carrier's mobility, flexibility of response and availability of aircraft were also superior to land-based aircraft during the Battles of Midway, Solomon Islands, Marianas and Leyte Gulf.

The reliability of carrier aircraft was usually comparable with that of land-based aircraft. At times carrier aircraft had a slight advantage as the aircraft carrier could sail round bad weather and thus suffer little interference with its operations. However, airfields did not have this option. This was an important factor during the first week of the Korean War.

The biggest disadvantage for aircraft carriers in the tactical reconnaissance and strike role was that they had a lower survivability than airfields. Aircraft carriers could be sunk or seriously damaged, thereby removing them from action permanently or for long periods, while airfields could remain in operation almost as long as they were manned properly. Nevertheless, no aircraft carrier has been sunk since the end of World War II, the most recent conflict in which there was serious military opposition to aircraft carrier operations. [Ed: There was such opposition in the Falklands War of

1982, but again no carriers were lost or damaged by enemy action.] Many were sunk or seriously damaged because of enemy action during that conflict.

The third most effective cause of loss or damage to aircraft carriers engaged in tactical reconnaissance and air strike operations was land-based aircraft, which sank only 'two and a half' and damaged seriously eight more carriers. This comparative lack of success arose from the fact that except in exceptional circumstances, aircraft carriers only ventured into range of enemy land-based aircraft on their own terms; when by swift sudden movements they could surprise the enemy, or knew that their air strength was superior to that of the enemy in the threatened area.

The second most effective cause of loss or serious damage to aircraft carriers engaged in tactical reconnaissance and strike operations was from submarines, which sank 'five and a half' aircraft carriers and seriously damaged two more. Most of these cases of loss or damage resulted from aircraft carriers, for whatever reason, operating in a particular location for extended periods; allowing enemy submarines to concentrate against them. US aircraft carrier operations in support of the Guadalcanal campaign were of this type and resulted in the *Wasp* being sunk and the *Saratoga* being seriously damaged.

On the other hand, Allied intelligence became particularly good at locating which of the main Japanese Fleet anchorages were being used by the main fleet. When the latter stayed for any time at any one anchorage – which became more frequent as oil became scarce – US submarines often flocked to the general area, particularly to patrol likely approach routes towards pending US amphibious operations. Three Japanese aircraft carriers were sunk mainly as a direct consequence of this. The balance of submarine aircraft carrier kills were the direct result of aircraft carriers already being immobilised by carrier air attacks, thus providing excellent targets for any enemy submarines in the area. The US aircraft carrier *Yorktown* and the Japanese aircraft carrier *Soryu* were lost in this way.

Attack by other carrier aircraft was the biggest cause of loss or serious damage to aircraft carriers while engaged in tactical reconnaissance and air strikes and resulted in 'ten and a half' aircraft carriers being sunk and eight more being seriously damaged. Most of these were the direct result of the respective aircraft carrier forces deliberately seeking battle with each other. In the circumstances it was probably not surprising that quite a few were sunk. In short, aircraft carriers were most frequently sunk by other aircraft carriers, or as the result of consistent deployment to particular areas that allowed submarines to guess where they would be with a high degree of accuracy.

Where it was possible for aircraft carriers to position themselves significantly closer to the target than the location of air bases, the earlier comments on aircrew fatigue

are largely applicable to the tactical reconnaissance and air strike role. Fleet and light fleet carriers were mainly used in this role.

The use of aircraft carriers within the range of land-based aircraft for tactical reconnaissance and strike missions was also encouraged because of the ambiguity of their deployment. The mobility of aircraft carriers could frequently place them in positions to menace many different targets at once, whereas there was little of this ambiguity surrounding the use of land-based aircraft, as they flew from known fixed bases. So, provided the enemy knew what types of aircraft were stationed there, he would know what range of targets could be menaced and attempt to take adequate precautions.

For this reason carrier air strikes, considering the relatively small numbers of aircraft involved, were the most feared by both of the warring sides during the 1939-45 conflict. Not only could many targets be menaced simultaneously, thus splitting the enemy defences, but aircraft carriers could also increase the number of targets by launching their aircraft on the fringe of the friendly land-based aircraft radius of action, extending the range of aircraft attacks, and menacing many more targets. Furthermore, retaliatory action against the aircraft carriers by the enemy was difficult, as they were frequently hard to locate even though known to be in a particular area. There was no way that the position of an airfield could be similarly hidden.

The above reasons partly explain why aircraft carriers could achieve surprise more easily than could land-based aircraft. The ambiguity of their deployment increased the possibility of surprising the enemy at any one of the many targets they could menace. The Japanese aircraft carrier raids on Darwin during February 1942 conformed to this pattern, as did many of the US aircraft carrier raids on Japanese-held islands during April and May 1942, and subsequently during the Pacific War. The early carrier strikes against North Korea at the beginning of the Korean War, in June 1950, before adequate airfields could be established within the Pusan Perimeter, conformed to the same general pattern, along with the early carrier strikes against North Vietnam.

The credibility of the deterrent value of aircraft carrier forces may have been higher than for land-based aircraft during World War II, the French Indo-China War and the Korean War (at least in the minds of the enemy). This may have been mainly for the above reasons, but it may also have been related to the greater attacking precision that seems to have accompanied carrier-based tactical air strikes. However, the writers do not believe that this fact is intrinsically related to the aircraft being land-based or sea-based, but rather to the attention placed by the various navies and air forces on different aspects of training and equipment. Given the correct amount of attention to these aspects there seems to be no sound reason why land-based and sea-based aircraft should not be as good as one another in the accuracy and effectiveness of their tactical strikes. Indeed this appears to have been the case during the second Vietnam War.

Tactical reconnaissance and air strike – Operational experience and technological change

Because the operational experience associated with tactical reconnaissance and air strike has been almost continuous to the present day, it is to be expected that the analysis of the strategic, operational, tactical and psychological factors will not be altered significantly by the impact of technological change. The main development has been that reconnaissance and strike aircraft can travel faster, can carry more sophisticated and accurate surveillance equipment, and can deliver heavier and more accurate attack weapons, including 'smart' bombs, which can be launched further from target. This has meant that fewer aircraft are required for effective reconnaissance and strike missions, and that the attack weapons can be released under less threat from defence weapons.

Defence weapons to counter tactical reconnaissance and air strikes have generally kept pace with the above developments, with an increasing array of specialised missiles and anti-aircraft gun defences. However, these weapons are expensive, and consequently cannot be spread in quantity to cover all potential targets. Tactical reconnaissance and air strike operations that continue to exploit the factors of ambiguity and surprise in their target selection, backed up with suitable electronic counter measures (ECM) to confuse the defence further, are likely to retain the initiative in the contest, as they have to date. In commenting upon the exploitation of surprise, probably the most significant development in defensive sensors is that of satellite and other means of surveillance. However, as stated earlier, their effectiveness in restricting aircraft carrier strike operations may have been overestimated.

Geography will determine whether tactical reconnaissance and air strike operations should be carried out by land-based or sea-based aircraft (or both). Assuming that suitable carrier and land-based aircraft continue to be developed, this matter will be resolved by consideration of the key factors already outlined: air base mobility, aircraft availability, flexibility of response, air base survivability, aircrew fatigue, ambiguity of employment, surprise and deterrent credibility.

Aircraft carriers have been used in the wartime air-to-ground support role whenever land-based aircraft have not been able to reach the operational area (typically for amphibious landings) or when land-based air-to-ground support has had to be supplemented. The first situation represents another unique carrier aviation role, assuming that air-to-ground support remains a desirable adjunct to amphibious operations. Many amphibious operations during and subsequent to World War II required considerable air-to-ground support to overcome strong ground resistance directed against the amphibious forces, and thus to ensure the success of the operations. Aircraft carriers in their various forms were the only means of supplying this and were used extensively in all such operations.

The effectiveness of the aircraft carrier in the air-to-ground support role compared with other weapons systems

Aircraft carriers were also used in all other major amphibious operations during and subsequent to World War II, which were carried out within the operational radius of land-based aircraft. This included operations where, for particular reasons, land-based air power had to be supplemented by carrier-based air power. Thus, aircraft carriers were rushed in to support US and South Korean troops in the early weeks of the Korean War, during the battle for the Pusan Perimeter. The main US land-based air forces were located in Japan and could not supply the level of effort needed to save the desperate ground situation. The combination of the aircraft carriers and land-based air forces was just enough to save the UN Command position. Aircraft carriers were also used in this way on 'Dixie Station' in Vietnam between April 1965 and June 1966, before the major airfields were built and made secure.

An analysis of the strategic, operational, tactical and psychological factors associated with this role indicates that the same factors evident in earlier analyses were important to the success of these missions. These were: air base mobility, aircraft availability, flexibility of response, aircraft reliability, airbase survivability, aircrew fatigue, surprise and deterrent credibility.

Aircraft carriers were used because of their superior flexibility of response and aircraft availability, enhanced by their mobility, which allowed them to approach closer to target areas than the nearest air bases. Thus, aircraft carriers supported amphibious operations such as Operation OVERLORD, which was also heavily supported by land-based aircraft. During OVERLORD, carrier aircraft lost little or no time transiting to and from the battle area. By contrast, land-based aircraft, having delivered their ordnance, were out of the battle until they had flown at least 100 miles back to Britain, refuelled, rearmed and then returned to Normandy.

Similarly, in circumstances like Korea, where insufficient land-based air forces were available (as they were all based initially in Japan) aircraft carriers had an impact on the battle out of proportion to the relatively small number of aircraft they deployed. They were able to approach to within a few score miles of the main battle front, providing superior aircraft availability and greater flexibility.

The reliability of aircraft was very important for amphibious as well as general aircraft carrier support operations. For example, weather conditions were more likely to disrupt air support if it came from more distant bases. Aircraft carriers had the advantage of being close to the battle area, and bad weather that prevented them from flying aircraft was almost certainly also going to prevent most major ground operations. This factor proved to be most important in the early weeks of the Korean War.

The advantages of having a certain percentage of total aircraft committed to such operations embarked in carriers in the centre of the battle had to be measured against

their survivability in the face of either or both of enemy aircraft and submarine attack. In fact, very few were sunk while engaged in such operations, primarily because the local air strength of the enemy had usually been greatly reduced as a necessary prelude to the amphibious or support operation. Submarines were more difficult to control, but ASW defences had to be able to protect the multiplicity of transports involved in an amphibious operation. If ASW defences could not be maintained at a suitable level, this kind of operation was in danger of failure. General support operations were more dangerous for aircraft carriers facing a submarine threat, especially if the carriers operated in the same general area for extended periods.

Where carriers could position themselves significantly closer to targets than the nearest air bases, the comments on aircrew fatigue above are largely applicable to the air-to-ground support role for which fleet, light fleet and escort carriers were mainly used.

Tactical surprise was extremely useful in air-to-ground operations, especially if supported by ground attacks. There is plenty of evidence that enemy actions were constantly disrupted by the unexpected arrival of ground support aircraft during amphibious and support operations. There is no way of telling, however, whether land-based or sea-based aircraft were better at gaining such surprise.

The credibility of the deterrent value of aircraft carrier forces engaged in the air-to-ground support role was generally higher than for land-based aircraft during World War II, the French Indo-China War and the Korean War. This was related to the greater attacking precision, which accompanied carrierborne air-to-ground support missions. However, the writers do not believe that this was intrinsically because the aircraft were land-based or carrier-based, but rather because of the attention placed by the various navies and air forces on different aspects of training and equipment. Given the necessary attention to these issues, there seems no sound reason why land-based and carrier-based aircraft should not be as accurate and effective as one another in their air-to-ground support operations. Indeed this appears to have been the case during the Vietnam War.

Air-to-ground support – Operational experience and technological change

Air-to-ground support operations have been conducted almost continuously to the present day. This means that the analysis of the strategic, operational, tactical and psychological factors will not be altered significantly by the impact of technological change. The main development has been that defence against air-to-ground support operations has continued to improve. Defensive weapons such as missiles and anti-aircraft guns used in the Yom Kippur War proved to be extremely effective against ground attack aircraft. The problem for the defence against the elusive tactical reconnaissance and strike aircraft is thus solved as most air-to-ground attack operations take place on the FEBA, against predictable targets. Mixed air defence systems provide

ground attack aircraft with a complicated and increasingly dangerous environment, despite the advantages conferred by increasing use of so-called 'smart' weapons.

Whether air-to-ground support operations should be carried out by land-based or carrier-based aircraft (or both), depends on the most likely locations for the above operations. Assuming that suitable carrier and land-based aircraft continue to be developed, this problem will be resolved by consideration of the key factors already outlined; air base mobility, aircraft availability, flexibility of responses, aircraft reliability, air base survivability and aircrew fatigue.

Chapter 3: Conclusions

Introduction

Before we proceed with the conclusions to Chapter 1 and 2 of this study, the reader is reminded that the authors' conclusions are drawn from the operational experience of aircraft carriers and the types and numbers of aircraft borne in their air groups, in the form in which they have existed until the time of writing. Similarly, comparison with land-based aircraft has been conducted by examining those aircraft in service until the time of writing. Hence, studies extrapolating to new equipment and technology must use the true capability and key factors as a yardstick. For example, a cruiser equipped with four small helicopters could be defined as an aircraft carrier, but it would not replace the entire capability of an existing conventional fleet aircraft carrier. On the other hand, projected air defence technologies may render some elements of land-based air power incapable of carrying out specific tasks.

We have identified eight major (and one minor) peacetime and wartime roles in which aircraft carriers have been involved. They were:

a. corrective force

b. preventative force

c. precautionary force

d. demonstrative force

e. disaster relief

f. ASW

g. air defence

h. strategic/tactical reconnaissance and strike

i air-to-ground support.

Distant peacetime crises

The aircraft carrier has been the most important weapon system in the employment of peacetime acts of force in response to distant crises because:

a. it is a major warship and thus:

   (1) it has rights of innocent passage through territorial seas and straits, as well as the freedom of the high seas, which together guarantee access to most nations in the world

(2) it is designed and manned for prolonged deployment and is largely independent of bases for its operations

(3) because it is designed to be self-contained, it is also capable of a very high level of permanent performance

(4) it can be withdrawn more quickly and unobtrusively from operations that have failed, causing minimum embarrassment to its government

b. the aircraft carrier is also an air base that is:

(1) fully mobile

(2) operational to its maximum level of performance on arrival at its destination

(3) largely secure from ground based interruptions and guerrilla attacks.

By contrast, the main alternative weapon systems – land-based aircraft – are usually unable to respond to distant peacetime crises because:

a. they are reliant to a significant degree on bases for transit and operations

b. nations are increasingly reluctant to allow foreign air bases on their soil and very restrictive as to their use

c. military aircraft enjoy no rights of innocent passage and permission for transit over or basing rights in neutral territory is in practice difficult to obtain in time to be effective

d. the use of in-flight refuelling to avoid third party air space is successful only when the terminal air base in the crisis area is secured

e. the observed historical fact is that terminal air bases associated with distant crises are rarely secured, and usually lack the capability to support immediately the level of operations needed for crisis response

f. land-based aircraft are not self-contained and require elaborate logistics support before they can reach satisfactory levels of performance. This is largely a function of the level of operations that the terminal air base can sustain at short notice.

Close peacetime crises

The aircraft carrier has been the best weapons system for employment in peacetime acts of force in response to near crises, whenever the approach to the crisis area has required transit over or near significant areas of sea. The reasons for this are:

a. the aircraft carrier's mobility has allowed it to approach closer to the crisis centre than available air bases

b. this mobility has generated improved aircraft availability (for a standard UAE) at the crisis centre because of the shorter distances involved

c. shorter flying distances have reduced the impact of aircrew fatigue on flying operations in the crisis area

d. the placement of the aircraft carrier (the mobile airfield) close to the crisis centre has improved the flexibility with which it can command, control and communicate its decisions and responses relating to sudden developments in the crisis zone

e. the aircraft carrier as a warship is capable of a more ambiguous presence than land-based aircraft flying from airfields

f. the approach of an aircraft carrier nearer to a crisis zone than airfields gives its air group a credible deterrent value higher than for equivalent (but more distant) land-based air formations, because of improved availability and flexibility.

Important capabilities in peacetime acts of force

To the above reasons for the employment of carriers in near crises in preference to land-based aircraft must be added the definite qualities and capabilities that have been important whenever carriers were employed in peacetime acts of force. These were:

a. the ability to provide a mobile sea base equipped with rotary wing aircraft containing facilities for troops or marines and their logistics support – the LPH/LHA concept

b. the provision of rapid response, fixed wing tactical aircraft for:

   (1) reconnaissance

   (2) surface or ground tactical strike, or the threat thereof, in the immediate vicinity of the location of the incident

   (3) conveying a sense of ambiguity of purpose to the deployed force, especially in those incidents involving application of precautionary force

c. the provision of C3 and JFHQ facilities afforded by a mobile sea base for:

   (1) amphibious operations

   (2) air or sea blockade and sea control operations.

Peacetime disaster relief

The aircraft carrier has proved to be the most effective means of response for disaster relief whenever there has been significant interference with airfields and other means of communications in the disaster areas. This has been because:

a. the carrier's mobility has often allowed it to move close to the affected area and to provide a fully operational air base from which to distribute supplies

b. this mobility has often brought the carrier closer than any other air base, giving its air group higher aircraft availability for operations

c. as a largely self-sufficient warship, the aircraft carrier does not have to draw on resources from the disaster area and the immediate hinterland, and indeed has considerable flexibility to supply stores and other supplies from its own reserves at short notice.

Wartime ASW

For the wartime ASW role the aircraft carrier – principally the escort carrier – was the most important weapons system in defeating the last serious submarine campaign on surface shipping in World War II. This was because:

a. the escort carrier could give continuous ASW air cover to convoys beyond the range of friendly land-based aircraft

b. within the range of friendly land-based aircraft the escort carrier could deliver to the convoy or fleet

   (1) superior aircraft availability for a standard UAE, as its mobility could place it with the convoy, reducing flying distance to ASW patrol stations for the convoy or fleet

   (2) superior flexibility of response, as its mobility placed the carrier at the centre of the tactical situation simplifying command, control and communications

   (3) aircrews with a reduced rate of fatigue (vis-a-vis land-based aircrews) when the weather was not too rough

   (4) an air base with a high operational survivability (although not as high as for land air bases)

   (5) a more credible deterrent as a consequence of the above points.

Fixed wing aircraft, supplemented by helicopters, will continue to be vital to present and future ASW operations because of the very large defence zones that have to be adopted for convoy and fleet defence against the enhanced capability of modern submarines. Where such operations are centred beyond the effective radius of action of land-based aircraft, the aircraft carrier (or the modern equivalent of an escort carrier) represents the only means of supplying the critical fixed wing ASW support. When these operations occur within the radius of action of land-based aircraft, the respective value of the aircraft carrier and its air group, or land-based aircraft (assuming that suitable carrier and land-based aircraft continue to be developed) will be related to the

distance separating each from the convoy or fleet they are protecting and the impact that these distances have in determining the value of the critical factors:

a. aircraft availability

b. flexibility of response

c. aircrew fatigue

d. air base survivability

e. credibility of deterrent.

Wartime air defence

Aircraft carriers were the most important weapons systems for the air defence of convoys, fleets and beach heads during the last serious air defence conflict at sea: World War II. This depended on the following points:

a. the aircraft carrier could give continuous air defence beyond the range of friendly land-based aircraft

b. within the range of friendly land-based aircraft the aircraft carrier could deliver to the convoy, fleet or beachhead:

   (1) superior aircraft availability for a standard UAE as its mobility could place the carrier with the convoy of fleet, or near the beachhead, reducing overall flying distance to reach the critical area

   (2) superior flexibility of response, as the carrier's mobility placed it at the centre of the tactical situation simplifying command, control and communications

   (3) aircrews with reduced fatigue levels

   (4) an air base with high operational survivability (although not as high as for airfields)

   (5) a more credible deterrent, largely as a consequence of the points above.

Fixed wing aircraft will continue to be vital to the present and future air defence operations associated with sea convoys, naval forces and beach heads, because of the flexibility they confer in complementing shipboard and ground defences. Where such operations are centred beyond the effective radius of action of friendly land-based aircraft, the aircraft carrier represents the only means of supplying the critical fixed wing support. When these operations occur within the radius of action of land-based aircraft, the respective value of an aircraft carrier (and its air group) and land-based aircraft (assuming that carrier and land-based aircraft are broadly of comparable performance) will depend on the distance separating each from the sea convoy,

naval force or beachhead they are defending, and the impact these distances have in determining the value of the critical factors:

a. aircraft availability

b. flexibility of response

c. aircrew fatigue

d. air base survivability

e. credibility of deterrent.

Wartime strategic reconnaissance and air strike

In World War II, the aircraft carrier was the only weapons system capable of menacing enemy targets that lay beyond the radius of action of friendly land-based aircraft; vital targets that the enemy had consequently considered safe and had left poorly defended. Only a small number of such strikes were actually launched (about 10) because of the high risks to attacking forces associated with launching the air strikes from within enemy-dominated air and sea space. Provided surprise was achieved, the impact on the enemy tended to be out of all proportion to the attacking forces committed. No carrier strategic reconnaissance and air strike missions have been launched since World War II.

The probability of conditions in the future favouring a successful carrier strategic reconnaissance and air strike is low, because:

a. the increasing radius of action of land-based aircraft has steadily reduced the areas that can be reached only by carrier air strikes

b. it is becoming increasingly difficult to gain a sufficient measure of surprise in the launching of such attacks, with the widespread development and use of sophisticated radars and other monitoring systems, including satellite surveillance.

Wartime tactical reconnaissance and air strike

The aircraft carrier was generally the best weapons system for wartime tactical reconnaissance and air strike whenever the target could be approached primarily by sea. The reasons were:

a. the aircraft carrier's mobility allowed it to approach closer to the target than land bases

b. this allowed improved aircraft availability (for a standard UAE) over the target because of the shorter distances involved

c. shorter flying distances reduced the impact of aircrew fatigue on flying operations over the target

d. the placement of the aircraft carrier close to the centre of operations improved the flexibility with which it could command, control and communicate its decisions and responses to sudden developments in the target area

e. the aircraft carrier provided an air base of high survivability (although not as high as for airfields)

f. the aircraft carrier, as a warship, was capable of a more ambiguous presence than land-based aircraft flying from airfields

g. as a consequence of its ambiguous presence, the carrier could also achieve surprise more easily than land-based aircraft

h. the approach of an aircraft carrier closer to a crisis zone than airfields gave the carrier air group a more credible deterrent than equivalent (but more distant) land-based air formations, because of improved availability and flexibility.

Carrier tactical reconnaissance and air strike operations have been conducted almost continuously to the time of writing. Despite the increasingly sophisticated array of defensive weapons, such operations are likely to remain important, because improved defensive weapons are very costly and cannot cover all potential air targets in quantity. Tactical reconnaissance and air strike operations that continue to exploit ambiguity and surprise in their target selection, backed up with suitable ECM to confuse the defence further, are likely to retain the initiative in this contest, particularly with the advent of 'smart' weapons that improve greatly the accuracy of ordnance delivery.

Where such operations are directed against targets beyond the effective radius of action of friendly land-based aircraft, the aircraft carrier will remain the main weapons system capable of reaching them (excluding ballistic missiles) [Ed: and in our time, cruise missiles]. When these operations occur within the radius of action of land-based aircraft, the relative values of the carrier and its air group and land-based aircraft will depend on the distance separating each from the potential targets, and the impact these distances have in determining the value of the critical factors:

a. aircraft availability

b. flexibility of response

c. aircrew fatigue

d. airfield survivability

e. ambiguity of presence (of forces)

f. use of surprise

g. credibility of deterrent.

The aircraft carrier is the weapon system that has supplied most of the air-to-ground support for the amphibious operations that have been conducted around the world since 1939. Where such operations have been carried out beyond the radius of action of friendly land-based aircraft, the aircraft carrier has been the only means of delivering such support. It has still remained the critical component when amphibious operations have been conducted within the operational radius of friendly land-based aircraft, for the following reasons:

a. the aircraft carrier's mobility has allowed it to approach closer to beach head areas than airfields

b. this mobility has allowed improved availability of aircraft for the carrier (for a standard UAE) over the beachhead, because of the shorter distances involved

c. shorter flying distances have tended to reduce the impact of aircrew fatigue on air to ground support operations over the beachhead

d. the placement of the aircraft carrier close to the centre of operations improved the flexibility with which it could exercise command and control, and communicate its decisions and responses to sudden tactical developments

e. the aircraft carrier has supplied an air base of high survivability (although not as high as for airfields)

f. carrier aircraft have been more reliable.

Aircraft carriers have also been used extensively to complement and supplement land-based aircraft in air-to-ground operations against enemies with flanks exposed to the sea.

TABLES AND FIGURES

Table 1: Types of Aircraft Carrier

Fleet Carrier

These are aircraft carriers designed for operations with the main battle fleet or naval force. As such, most displaced more than 20,000 tons, were specially designed to withstand much battle damage, to fly many aircraft, and to travel at high speed with the fleet. They provided the air defence and main striking element of the fleet.

Light Fleet Carrier

These are a smaller version of the fleet carrier, displacing between 10,000 and 20,000 tons and carrying fewer aircraft. Their main advantage was that they could be built more quickly than fleet carriers [Ed: and more cheaply].

Escort Carrier

These were converted merchant ships, or modified merchant ship designs, and rarely displaced more than 10,000 tons. They were also slower than fleet or light fleet carriers. Their speed was determined by the need to operate with shipping convoys rather than battle fleets and they could not absorb much battle damage. They had a reduced capacity for aircraft, but could be built quickly and cheaply. Their main role was to provide aerial ASW protection to merchant and naval convoys and a limited amount of air defence. They were also used widely to support amphibious operations with air-to-ground support as well as air defence.

Merchant Aircraft Carrier (MAC) Ships

Merchant aircraft carrier ships were oil tankers or grain carrying vessels that had a flight deck placed above their upper decks. They operated between three to five aircraft, which were left on deck and serviced there at all times, in all weather. The space below the flight deck was filled with the vessel's cargo; oil, for example. These vessels were very cheap and easy to modify, and were only meant to provide aerial ASW protection to the merchant convoys with which they sailed.

Landing Platform Helicopter (LPH)

Landing platform helicopters were usually former fleet or light fleet carriers modified to operate helicopters and to accommodate a large contingent of marines or soldiers. Their main role was usually as an amphibious assault ship and sometimes as an ASW support vessel.

Anti-Submarine Warfare Carrier (CVS)

These support aircraft carriers were usually former fleet or light fleet carriers, modified to operate mainly in an ASW role.

Amphibious Assault Ship (LHA or LHD)

Amphibious assault ships are usually large warships specially designed to combine the functions of a helicopter carrier and an amphibious landing ship.

	EVENTS	INTEREST THREATENED	THREAT POSED	FRIENDLY TASK FORCE KEY CAPABILITIES
26 July 1954 (distant) Hainan Island	A British civil airliner, containing some US nationals, was destroyed in international airspace (off Hainan Island) by Communist Chinese fighter aircraft. To discourage any further attempts to threaten and disrupt Western civil air traffic in this area and to threaten retaliation, the US Government dispatched a naval task force (including the aircraft carriers *Philippine Sea* and *Hornet*) to the site of the crash to prevent further attacks. Two Chinese fighter planes were shot down after attacks in international airspace on US carrier aircraft. No further actions by the Chinese were attempted and the US naval force eventually dispersed.	Safety of US nationals and airspace transit rights	Air elements	Fixed wing aircraft (in action)
6-13 February 1955 (close) Tachen Islands	Twenty nine thousand Nationalists, Chinese troops and sympathisers were cut off by Communist Chinese air and sea blockade of the Tachen Islands pending an amphibious assault by the latter. US Seventh Fleet (including aircraft carriers *Yorktown*, *Kearsarge*, *Essex*, *Wasp* and *Midway*) broke the blockade and evacuated all islanders plus stores.	Nationalist Chinese Forces and safety of indigenous population	Naval elements Air elements Ground elements	Marines (available) Rotary wing aircraft (available) Fixed wing aircraft (in action)
October 1956 (close) Suez	Britain and France used armed force to attempt to reverse the Egyptian nationalisation of the Suez Canal. The Allies conducted extensive air and amphibious operations to capture the Canal. Fleet aircraft carriers involved were *Eagle*, *Albion*, and *Bulwark*. Light fleet carriers were *Arromanches*, *Theseus* and *Ocean*. The objective was not attained.	UK/French commercial interest and safety of nationals	Ground element Air element Naval elements	Marines/troops (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)

31 October 1956 (close) Egypt	US nationals were trapped in Egypt and other Middle East countries as a result of the fighting between Britain/France/Israel and Egypt. US Sixth Fleet (including the aircraft carriers *Coral Sea*, *Randolph* and *Antietam*) landed marines, and supplied air cover for the successful evacuation by sea or USAF air transport of these people and other nationals.	Safety of US and other nationals	Ground elements Air attack	Marines (inserted) Rotary wing aircraft (available) Fixed wing aircraft (available)
24 October 1958 (close) Cuba	US nationals were trapped in Cuba by the Castro revolt. USN destroyer evacuated them, covered by the aircraft carrier *Franklin D. Roosevelt*.	Safety of US nationals	Ground elements	Rotary and fixed wing aircraft (available)
21 July 1961 (close) Bizerta	French naval units (including the aircraft carrier *Arromanches*) and troops forced the entrance to Lake Bizerta, to break the Tunisian blockade of the French naval base located there.	French naval forces	Ground elements	Marines (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)
25 January 1964 (distant) Tanganyika	Tanganyikan Army mutinied against its government and seized control of key installations throughout the country. Royal Marines landed by helicopter from the fleet carrier *Centaur* successfully suppressed the mutiny and disarmed hostile troops.	Tanganyikan Government and safety of indigenous population	Ground elements	Marines (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)
5 August 1964 (distant) Gulf of Tonkin	Aircraft from the aircraft carriers *Ticonderoga* and *Constellation* attacked North Vietnamese patrol facilities to stop motor torpedo boat attacks on ships of the US Seventh Fleet patrolling off the coast of North Vietnam in international waters. Operation was reasonably successful as no further attacks occurred.	US naval elements	Motor torpedo boats	Fixed wing aircraft (in action)

28 April 1965 (close) Dominican Republic	As the Civil War in the Dominican Republic spread, threatening the safety of US nationals, the US Government ordered a naval task force, including the *Boxer* (LPH), to stand off the coast, and to land marines. Over 1000 US nationals were evacuated by helicopter to the naval task force.	Safety of US nationals	Ground elements	Marines (inserted) Rotary wing aircraft (in action)
August 1967 (close) Hong Kong	The aircraft carrier *Hermes* aided the civil power in Hong Kong, by using its helicopters to land 120 police and army troops on the tops of the skyscrapers, which had been taken over by rioters inspired by the Chinese Cultural Revolution. The raid was a complete surprise and succeeded in evicting the communists.	Safety of UK nationals and indigenous population	Ground elements	Troops (inserted) Rotary wing aircraft (in action)
25 January 1968 (close) North Korea	In response to the North Korean seizure of the *Pueblo*, the US Government ordered a US naval task force (including initially the aircraft carrier *Enterprise* and later *Kitty Hawk*) to assemble in the Sea of Japan to discourage any further attempts to seize US Navy ships, and to intimidate the North Koreans into returning the ship and crew. No further attempts were made to seize US naval ships, but North Korea did not return the *Pueblo*.	US naval elements	Naval elements Air elements	Rotary wing aircraft (available) Fixed wing aircraft (in action)
April 1969 (close) North Korea	Following the destruction by North Korea of a US surveillance aircraft in international airspace, the US Government ordered a naval task force including the aircraft carriers *Enterprise*, *Hornet*, *Ticonderoga* and *Ranger* to concentrate off the coast of North Korea (Sea of Japan) with the purpose of discouraging any further actions. No further acts occurred.	US naval elements	Naval elements Air elements	Rotary wing aircraft (available) Fixed wing aircraft (in action)

July – September 1974 (close) Cyprus	During the coup d'etat by the Greek National Guard and the ensuing Turkish invasion, a British Fleet was stationed off Cyprus to evacuate refugees and British nationals. It included the commando carrier *Hermes*. Many hundreds of people cut off by the fighting were evacuated by the RN. Many also reached RAF bases in Cyprus.	Safety of British nationals and others	Ground elements Naval elements Air elements	Rotary wing aircraft (operational)
March – April 1975 (distant) Phnom Penh	With the neutralisation of the airport, Khmer Rouge forces trapped remaining US nationals in Phnom Penh during the final collapse of the non-communist forces. The aircraft carrier *Hancock* and LPH *Okinawa* evacuated all US nationals by helicopters and fixed wing aircraft from the *Hancock*.	Safety of US nationals and others	Ground elements	Marines (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)
April 1975 (distant) Saigon	US nationals were isolated in Saigon following Viet Cong military successes in and around the city, which resulted in the closing down of Saigon airport and imminent collapse of the non-communist government. US Seventh Fleet carriers (including *Enterprise*, *Midway* and *Coral Sea*) evacuate all US nationals by helicopter to the carriers in the South China Sea. Marines and fixed wing aircraft from the carriers covered the withdrawal.	Safety of US nationals and others	Ground elements	Marines (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)
12 May 1975 (close) Gulf of Siam	SS *Mayagüez* was seized by the Khmer Rouge. US forces, including the aircraft carrier *Coral Sea*, recaptured the ship and forced the communists to return the crew.	SS *Mayagüez* and crew	Naval elements Ground elements	Marines (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)

Table 3: Aircraft Carriers and the Exercise of Preventative Force

	EVENTS	INTEREST THREATENED	THREAT POSED	FRIENDLY TASK FORCE KEY CAPABILITIES
27 June 1950 (distant) Taiwan	Following the outbreak of the Korean War, and the evident preparations of the Communist Chinese to attack Taiwan, the US Seventh Fleet (with the carrier *Valley Forge*) was ordered to patrol the Taiwan Straits to prevent the foreshadowed invasion. This action was successful, as the Chinese ceased preparations, and made no attempt to cross.	Nationalist Chinese Government	Naval elements Air elements Ground elements	Fixed wing aircraft (in action)
July 1958 (close) Lebanon and Jordan	At the request of the Lebanese Government, the US Sixth Fleet landed Marines in Beirut to discourage Syria and Egypt from mounting a left-wing coup d'etat and to prevent fighting amongst the warring civil factions in control of parts of the country. The Marines' landing was covered by aircraft from the aircraft carrier *Essex*, which was later joined by the *Hornet* and *Saratoga*. Meanwhile, the British Government prevented similar Syrian or Egyptian moves against Jordan, by concentrating naval forces (including the aircraft carrier *Eagle* and commando carrier *Albion*), in the East Mediterranean, and by landing two battalions of troops at Agaba from the commando carrier *Bulwark*. Egypt and Syria ceased their clandestine involvement, and the situation in Jordan and Lebanon eventually returned to normal.	Lebanese and Jordanian governments	Ground elements	Marines and troops (inserted) Rotary wing aircraft (in action) Fixed wing aircraft (in action)

August – September 1958 (close) Kinmen Islands	Chinese Communist forces began to shell the Nationalist Chinese Kinmen Islands complex just off the coast of China. The US Seventh Fleet (with the aircraft carriers *Shangri-La*, *Lexington*, *Midway*, *Essex*, *Bennington* and *Princeton*) initially assumed a defensive perimeter around Taiwan, and then begin to give air cover to US vessels escorting Nationalist Chinese convoys to within three miles of the Kinmen Islands, to prevent the Chinese Communist Navy from mounting an effective blockade of the islands. The operation was successful, and Nationalist Chinese retained control of the Kinmen Islands.	Nationalist Chinese Forces and indigenous population	Ground elements Naval elements Air elements	Fixed wing aircraft (in action)
5 April 1960 (close) Dutch New Guinea	The Dutch Government despatched its aircraft carrier *Karel Doorman* plus two destroyers to Dutch New Guinea, to prevent threatened serious attacks on the territory by Indonesia. This operation was successful and no attacks eventuated. However, Indonesia retaliated against Dutch interests in Indonesia.	Dutch Colonial Administration and indigenous population	Ground elements Naval elements Air elements	Fixed wing aircraft (operational)
18 November – 10 December 1960 (close) Guatemala and Nicaragua	After an internal armed uprising allegedly inspired by Castro, the governments of Guatemala and Nicaragua requested the USN to patrol by sea and air to prevent landings of other dissidents and arms from Cuba. The US carriers *Shangri-La* and *Wasp* plus some destroyers patrolled the Caribbean coasts of the two nations. The operation was successful in that no dissidents were able to land.	Guatemalan and Nicaraguan governments and indigenous population	Sea infiltration of ground elements	Fixed wing aircraft (operational)

29 June 1961 (distant) Kuwait	Following Iraqi claims to the Sheikdom of Kuwait, and clearly stated threats of invasion by the Iraqi Prime Minister, the British Government began a very rapid build-up of forces within the protectorate to prevent the implementation of the Iraqi Government's policy. The commando carrier *Bulwark* and the fleet carriers *Centaur* and *Victorious* covered the initial build-up of forces until Army and RAF units were established. The operation was successful in that the Iraqi were deterred from invading Kuwait.	Kuwaiti Government and indigenous population	Naval elements Air elements Ground elements	Fixed wing aircraft (operational) Marines and troops (inserted)
22 October – 20 November 1962 (close) Cuba	Realising that the USSR was attempting to establish a system of nuclear missiles in Cuba for use against the US, the US Navy was ordered to impose a quarantine on Cuba, to prevent the further importation of materials and equipment for the system. Eight US aircraft carriers were involved in the operation (including the *Enterprise*, *Essex* and *Independence*, which gave air support to the Naval Base Guantanamo, in Cuba), and provided (in conjunction with the USAF) air surveillance and air cover to other USN units. The operation was successful and the USSR withdrew all its existing nuclear strike equipment from Cuba.	US sovereignty	Naval elements Air elements	Fixed wing aircraft (operational)

15 March 1966 (distant) Beira	Following the Unilateral Declaration of Independence by Rhodesia, the British Government attempted to destroy the effectiveness of the new Rhodesian Government by imposing an oil blockade. To this end it ordered the aircraft carrier *Eagle* to join the patrol off the port of Beira to provide air surveillance of approaching oil tankers. Because most oil tankers were turned away and virtually no oil passed from Beira to Rhodesia, the operation can be considered a success. However, Rhodesia developed new routes and continued to receive sufficient oil to enable it to survive.	UK sovereignty	Sea movement of prohibited imports (oil)	Fixed wing aircraft (operational)
7 November 1967 (distant) Aden	A British fleet with the aircraft carriers *Eagle, Hermes, Bulwark, Albion* and assault ships *Fearless* and *Intrepid* covered the withdrawal of British forces from Aden, to prevent or deter any attempts by hostile indigenous and external groups to interfere.	UK forces withdrawing	Ground elements	Rotary wing aircraft (operational) Fixed wing aircraft (operational) Marines and troops (inserted)
January and February 1972 (distant) British Honduras	Following Guatemalan troop concentrations on the border of British Honduras, the British government ordered the deployment of a substantial British naval force including the fleet carrier *Ark Royal* in British Honduran waters. This was supported by RAF transportation of over 3000 army troops to the territory. The threat subsided quickly.	British Honduras administration and indigenous population	Ground elements Air elements	Rotary and fixed wing aircraft (available)

	EVENTS	INTEREST THREATENED	THREAT POSED	FRIENDLY TASK FORCE KEY CAPABILITIES
26 and 27 July 1950 (close) Egypt	Following a coup d'etat in Egypt, a large British naval force, including two aircraft carriers, assembled off the Egyptian coast to discourage any actions against British interests (including the Suez Canal Zone) and nationals. The new Egyptian Government made no attempt to interfere, and the naval force was dispersed.	UK interests in Egypt, including the Suez Canal	Ground elements	Rotary and fixed wing aircraft (available) Marines and troops (available)
20 April 1957 (distant) Lebanon	In the aftermath of an attempted coup d'etat against King Hussein of Jordan (inspired by Egypt and Syria), the US Government ordered naval transports carrying 1800 marines to anchor off Beirut, and ordered the remainder of the Sixth Fleet (including the aircraft carriers *Forrestal* and *Lake Champlain*) to carry out manoeuvres in the Eastern Mediterranean to discourage any further actions by Syria and Egypt. Hussein regained control and Syria and Egypt made no moves to interfere.	Security of Jordanian Government and indigenous population	Ground elements	Rotary and fixed wing aircraft (available) Marines (available)
May 1958 (close) Venezuela	In response to anti-American riots in Venezuela, stimulated by the arrival of Vice President Nixon, the US Government ordered a naval task force (containing an aircraft carrier) to proceed from Guantanamo to positions off Venezuela, so as to be capable of rescuing either or both Nixon and other US nationals. The force was also to exert pressure on the Venezuelan Government to take more vigorous steps to control the rioting. Riots subsided after Nixon's departure.	Safety of US Vice President and US nationals	Ground elements	Rotary and fixed wing aircraft (available) Marines (available)

July and August 1960 (distant) Congo (offshore)	Following the deterioration of internal control within the former territory of the Belgian Congo, the US Government ordered the aircraft carrier *Wasp* to stand off the coast, ready to protect or possibly evacuate US nationals. The situation eventually settled.	Safety of US nationals	Ground elements	Rotary and fixed wing aircraft (available)
November and December 1961 (close) Dominican Republic	On the news of an imminent coup d'etat by the followers of the slain dictator Trujillo against the Government of the Dominican Republic, the US Government ordered a concentration of USN forces off the coast, including the aircraft carrier *Franklin D. Roosevelt* and 1800 marines on board the LPH *Valley Forge*. This was to discourage any such action, and to strengthen the authority of the US representative. The latter and the government of the Dominican Republic managed to expel the Trujillo followers and create more stable governing conditions.	Security of the Dominican Republic Government	Ground elements	Marines (available) Rotary wing aircraft (available) Fixed wing aircraft (available)
February 1963 (close) Dominican Republic	The US Government ordered the LPH *Boxer* to anchor off Santo Domingo, Dominican Republic, to discourage civil disorder during the visit of Vice President Johnson, and to rescue him if necessary. The situation remained calm.	Safety of US Vice President	Ground elements	Marines (available) Rotary wing aircraft (available)
27 April 1963 (close) Haiti	The US Government ordered a naval task force, including the LPH *Boxer* and 2000 marines, to stand off the coast of Haiti, ready to protect or evacuate US nationals threatened by conflict between Haiti and the Dominican Republic and by the possible collapse of the Haitian Government. The situation calmed down.	Safety of US nationals	Ground elements	Marines (available) Rotary wing aircraft (available)

May 1967 (close) Straits of Tiran	In an attempt to persuade the Egyptian Government to abandon its blockade of the international waterway of the Strait of Tiran, the US and British governments concentrated naval forces, including the aircraft carriers *America*, *Saratoga*, *Essex* and *Victorious* in the Eastern Mediterranean, and the *Hermes* in the Red Sea. The situation was resolved by the Israeli victory over Egypt in the Six Day War.	Security of US and other commercial shipping	Naval elements Air elements	
May 1967 (close) Hong Kong	The British Government ordered the commando carrier *Bulwark* to proceed to Hong Kong with the 40th Commando on board, to discourage civil disorder and anti-British riots that had taken place as a consequence of the Chinese Cultural Revolution. The carrier anchored in full view of the city centre and conducted an exercise involving the placement of some 200 troops, by landing barge and helicopter, on an island 10 miles distant. The situation soon returned to normal.	Security of Hong Kong administration and safety of UK nationals	Ground elements	Rotary wing aircraft (available) Marines and troops (available)
December 1967 – January 1968 (distant) Aden	Following the British military withdrawal from Aden, a large naval task force, including the aircraft carriers *Eagle* and *Hermes* and commando carriers *Albion* and *Bulwark*, continued to stand off Aden to discourage any moves against British nationals, and to be able to prevent any attempts from Yemen to interfere with the new nation.	Security of government and safety of British nationals	Ground elements Air elements	Marines and troops (available) Rotary wing aircraft (available)

September 1968 (distant) Sulu Sea	Ships of the British Far East Fleet, including the commando carrier *Albion* and Australian warships, bound from the South China Sea for an exercise in the Coral Sea, were denied transit of the Sulu Sea by the Philippines Government. Taking the view that this was an international waterway and not having sought permission anyway, the force ignored the Philippines objection and sailed through by way of Balabac Strait and Sibutu Passage.	Assumed rights of passage	Naval elements Air elements	Rotary wing aircraft (available)
April 1970 (close) Trinidad	In the wake of serious riots in Trinidad, the US Government ordered a naval task force, including the LPH *Guadalcanal*, to deploy off the coast in preparation for the protection or evacuation of 3000 US nationals. The Trinidad Government re-established order, however, and the task force was withdrawn.	Safety of US nationals	Ground elements	Marines (available) Rotary wing aircraft (available)
18 September 1970 (distant) Eastern Mediterranean	With the beginning of the Jordanian Government's 'crack down' on the Palestinian guerrilla movement in its country, the US Government ordered a naval task force, including the aircraft carriers *Saratoga*, *John F. Kennedy*, *Independence* and the LPH *Guam*, to cruise in the Eastern Mediterranean, ready to support King Hussein (against Syrian intervention) if necessary, to evacuate 450 US nationals threatened by the fighting, and to counter a USSR naval presence in the area. The Jordanian Government needed no assistance, and the US nationals remained safe in Jordan.	Security of Jordanian Government and safety of US nationals	Ground elements	Marines (available) Rotary and fixed wing aircraft (available)

10 December 1971 (distant) Bay of Bengal	The outbreak of war between India and Pakistan led the US Government to order a naval task force, including the aircraft carrier *Enterprise* and *Tripoli* (LPH) and other amphibious ships, to proceed from Vietnamese waters to the Bay of Bengal to protect or evacuate US nationals at Dacca [Ed: now Dhaka], and to exert a moderating influence on the course of the conflict. Some US nationals were evacuated by British C130 aircraft, but most remained safe in Dacca. The Indian Government was greatly offended by the presence of the US task force.	Safety of US nationals and US interests	Ground elements Naval elements Air elements	Marines (available) Rotary and fixed wing aircraft (available)
December 1971 (distant) Bay of Bengal	With the outbreak of war between India and Pakistan, the British Government ordered the commando carrier *Albion* to the Bay of Bengal to evacuate British nationals by helicopter from East Bengal. In the end, *Albion* was not needed as Dacca's airport was repaired, allowing RAF transport aircraft to land and carry out the evacuation.	Safety of British nationals	Ground elements Naval elements Air elements	Marines and troops (available) Rotary wing aircraft (available)
January – March 1972 (distant) Malta	The commando carrier *Bulwark* and other naval forces were sent to Malta to assist in the withdrawal of British forces, and to discourage any attempt by local groups to interfere. The withdrawal was eventually completed quietly, with *Bulwark* embarking the 41st Commando.	Security of British forces and safety of British nationals	Ground elements	Marines and troops (available) Rotary wing aircraft (available)

19 August 1974 (close) Cyprus	Following the Turkish landing on Cyprus, the US Government ordered a naval task force, including the carriers *Forrestal* and *Independence*, to the Eastern Mediterranean. The aims were to limit the extent of the Turkish advance and to protect US nationals. US nationals remained largely unthreatened, and the Turks did halt their advance.	Safety of US nationals, status quo of Cyprus governing administration	Ground elements Naval elements Air elements	Marines (available) Rotary and fixed wing aircraft (available)
March 1977 (distant) Uganda and Kenya (offshore)	President Amin, for apparently sinister reasons, ordered all US nationals in Uganda to be brought together. Fearing for their safety, the US Government ordered a naval task force, including the carrier *Enterprise*, to the Kenyan coast, ready to intervene if necessary and to exert diplomatic pressure for the early release of the US nationals. They were released quickly.	Safety of US nationals	Ground elements	Marines (available) Rotary and fixed wing aircraft (available)
April - August 1977 (distant) Afars and Issas	With the forthcoming independence of the French territory of Afars and Issas, the French Government ordered the aircraft carrier *Clemenceau* to stand off the coast, ready to protect French nationals and interests, and to help a smooth transition of power by deterring overt Somali involvement. In June, *Clemenceau* was replaced by the carrier *Foch* in the French surveillance of the newly independent territory. The territory remained calm.	Security of Government of Afars and Issas, safety of French nationals	Ground elements	Troops (available) Rotary and fixed wing aircraft (available)

Table 5: Aircraft Carriers and the Exercise of Demonstrative Force

	EVENTS
18 March 1947 Greece (close)	Following the British statement of the imminent withdrawal of their forces assisting the Greek Government's attempt to defeat the indigenous communist rebellion, President Truman sought Congressional authorisation for US aid to Greece. He ordered a strong naval squadron to visit Greek ports as a show of US support for the Greek struggle, and as a warning to Yugoslavia and Bulgaria, who were aiding the rebels. The naval force included the aircraft carrier *Leyte Gulf*.
September 1947 Greece (close)	The US Government ordered the aircraft carrier *Franklin D. Roosevelt* and naval escorts to visit Greek ports, to demonstrate continued US support of the Greek right to self-determination, in the face of continued Yugoslavian and Bulgarian pressure in support of the Greek communist rebellion.
14 August 1950 Lebanon (distant)	With the beginning of a US commitment of forces to Korea, the US Government ordered the aircraft carriers *Midway* and *Leyte Gulf* (plus escorts) to visit Beirut to demonstrate to the Arabs (vis-a-vis Israel) that despite increasing US involvement in Asia, it still had a strong presence in the East Mediterranean. The two carriers performed an aircraft firepower demonstration during their stay to emphasise the impression.
12 September 1952 Yugoslavia (close)	Following the increasing Russian pressure on Yugoslavia to conform to Stalin's concepts of Marxist–Leninism, and the threat of possible intervention, the US Government despatched the aircraft carrier *Coral Sea* to Split, Yugoslavia, as a gesture of support for President Tito and to indicate the force that could be brought to Yugoslavia's support at short notice if required.
October 1956 Suez (close)	The US Sixth Fleet harassed British and French warships engaged in the invasion of Suez, to indicate the US Government's displeasure with the Anglo-French initiative. Aircraft from the carriers *Coral Sea*, *Antietam* and *Randolph* were involved.
August - October 1959 Laos (close)	With the increase in communist insurgent activity in Laos, the US Government ordered a carrier task force to deploy to the South China Sea, and the loading of some amphibious forces in the area, in a demonstration of the US power that could be projected if communist activity did not decline. The situation gradually abated.
15 -19 February 1960 Pacific (close)	Sixty senior Asian military leaders cruised in units of the Seventh Fleet for a weapons demonstration of US naval strike power in the Pacific. The carriers involved were *Bremerton*, *Kearsarge*, *Midway* and *Hancock*. Similar exercises were repeated.

April/May 1962 Gulf of Siam (close)	To discourage the communists from exploiting recent military successes in Laos, the US Government ordered the aircraft carriers *Valley Forge* (LPH) and *Hancock* to mount a demonstration of US power in the Gulf of Siam. Covered by carrier fighter aircraft, 1800 Marines were off-loaded by helicopter to Bangkok.
April/May 1964 Indian Ocean (distant)	To counter the growth of communist influence in the littoral states of the Indian Ocean, the US Government dispatched the aircraft carrier *Bon Homme Richard* (and escorts) to perform a series of courtesy visits to several nations.
29 November 1969 Gibraltar I (close)	To discredit international speculation that as a consequence of some changes of personnel in the Spanish Government, the latter would no longer press vigorously for the return of Gibraltar, the Spanish Government ordered *Dedalo* (LPH) and 12 other warships to visit Algeciras Bay, and to anchor in sight of 'the Rock'.
29 November 1969 Gibraltar II (close)	The British Government, having been forewarned of the above gesture, arranged to have the aircraft carriers *Hermes* and *Eagle* in Gibraltar to demonstrate British determination to retain 'the Rock' when *Dedalo* arrived in Algeciras.
January/February 1970 Gibraltar III (close)	*Dedalo* carried out another demonstration off Gibraltar.
July 1976 Kenya (distant)	In the aftermath of the Israeli/Kenyan collusion in the 'Entebbe Raid', Uganda fell behind in payments to Kenya for the transport of goods and fuel oil from Mombasa. Kenya eventually insisted on payment in advance in Kenyan currency or threatened to halt the supply. President Amin threatened invasion and the Ugandan Army began to concentrate on the border with Kenya. The US Government ordered two P-3 aircraft and the frigate *Donald B. Beary* to visit Kenya as a gesture of US support. These moves were distantly supported by the entry of the aircraft carrier *Ranger* and support ships into the Indian Ocean from the 7th Fleet in the Pacific, and by their movement in the general direction of Mombasa. The tension abated.

Table 6: Aircraft Carriers and the Exercise of Disaster Relief

	EVENTS
October 1954	USS *Saipan* operation off the coast of Haiti extended relief and aid to the victims of Hurricane Hazel.
October 1955	USS *Saipan* and USS *Siboney* assisted with flood relief operations in Mexico for 19 days, evacuating 5439 people by helicopter.
2–6 January 1958	USS *Princeton* plus two destroyers took part in flood relief operations in Ceylon.
September 1958	USS *Lake Champlain* helicopters aided in locating, feeding and rescuing victims of floods in Valencia, Spain.
14–20 August 1959	USS *Thetis Bay* (LPH) conducted flood relief operations in central Taiwan, flying 897 missions.
October 1959	USS *Kearsarge* conducted relief operations at Nagoya, Japan, after Typhoon Vera.
14 September 1961	In the wake of heavy damage to Texas by Hurricane Carla, US Task Force 135 arrived off the coast. It included the carriers *Antietam* and *Shangri-La*.
November 1961	A US fleet, headed by USS *Antietam*, provided disaster relief to Belize, British Honduras, following Hurricane Hattie.
16 October 1963	Following the damage caused by Hurricane Flora, the USN through the carriers *Lake Champlain* (CVS) and *Thetis Bay* (LPH) supplied aid to Haiti.
29 August 1964	USS *Boxer* (LPH) and other ships arrived off the coast of Hispaniola to give medical aid to and conduct helicopter evacuations for people in areas of Haiti and the Dominican Republic, which had been badly damaged by Hurricane Cleo.
11–25 June 1970	USS *Guam* (LPH) arrived off the coast of Peru to join relief operations following a major earthquake. Marine helicopters ferried medical teams and 55 tons of supplies to isolated mountain towns.
21 July 1972	USS *Tripoli* (LPH) was ordered off the Vietnam station to give disaster aid to flood victims in the Philippines.
December 1974 – January 1975	HMAS *Melbourne* was ordered to Darwin in the wake of Cyclone Tracy.

Figure 1: Ocean trade convoys in the North Atlantic and Arctic, January 1940 – April 1945

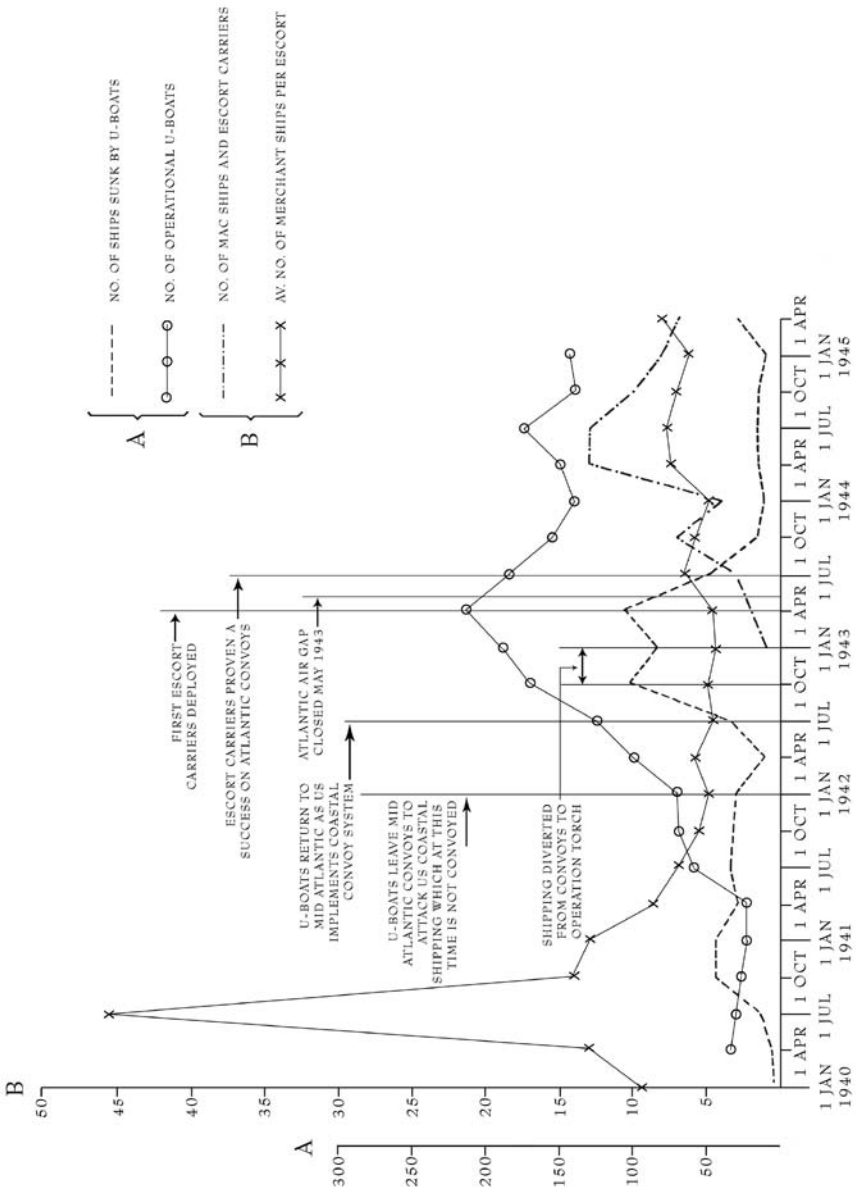


Figure 2: Areas in which land-based air escort to convoys were never or rarely provided, August 1942 – May 1943

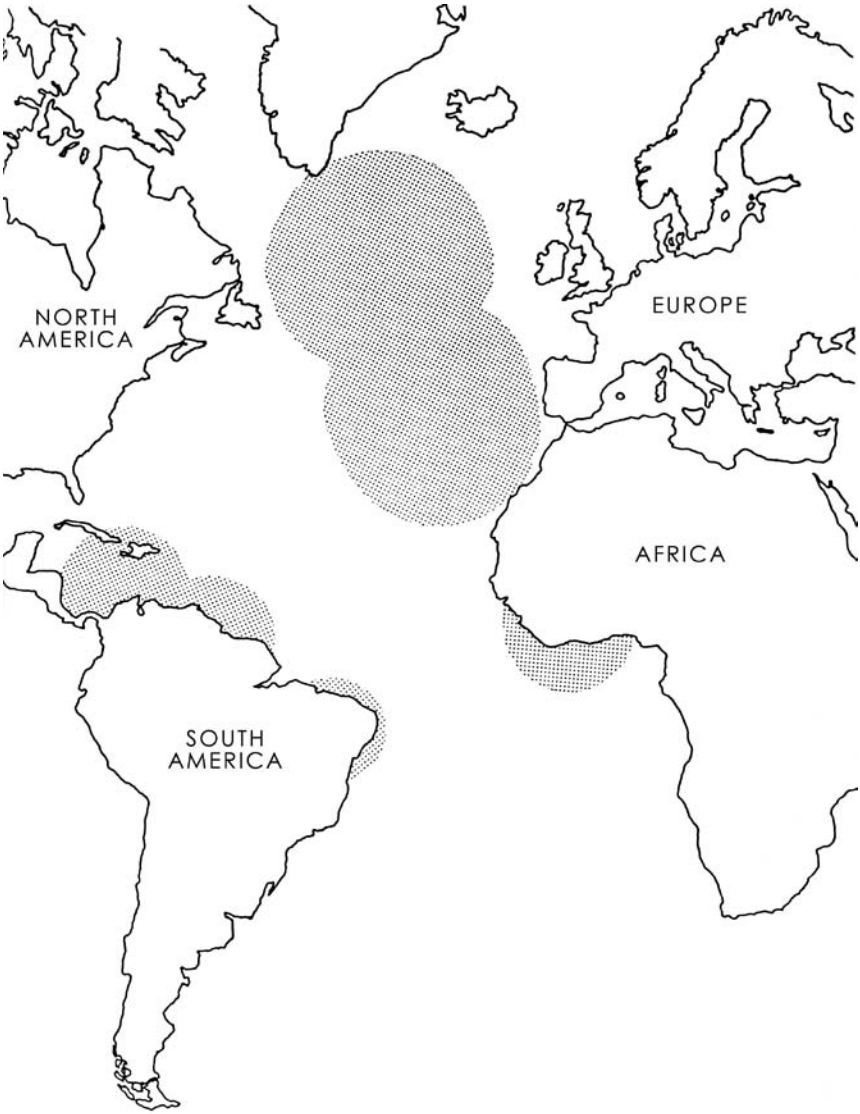
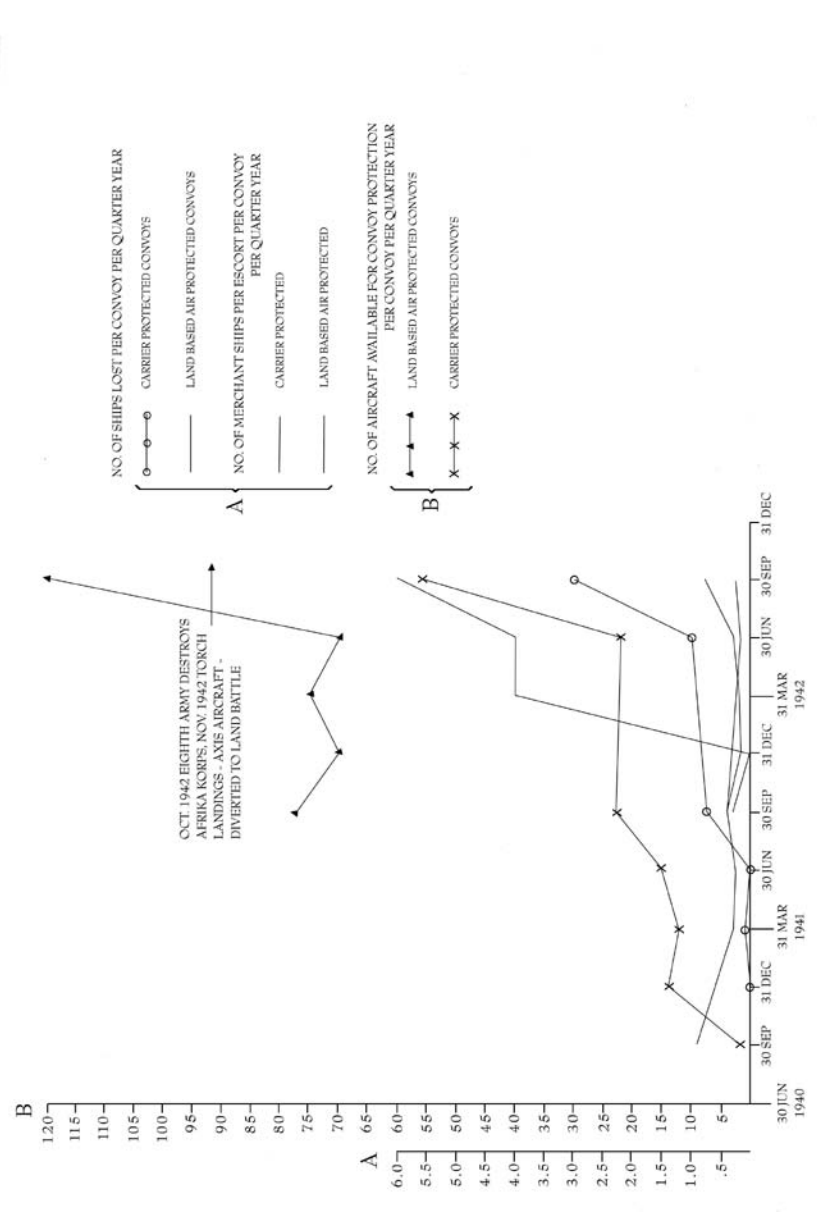


Figure 3: Convoy air defence, Malta, June 1940 – September 1942



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