

sistant to the Secretary of State until 1974 when he went to Amman as ambassador. Pickering is said to be tough minded and very bright and seems to have made a positive impression on key officials he will be working with, including the President's Science Adviser Frank Press.

Hill observers say that Secretary Vance's choice of Pickering gratifies another constituency. Foreign service regulars were aggrieved at the beginning of the Carter Administration by appoint-

ments of outsiders to a number of top posts in the department. They complained bitterly to Vance that career officers were being cut off from these top jobs with a consequent serious effect on morale. These observers say that Vance more or less committed himself to appointing qualified FSO's when high-level vacancies occurred. The Pickering nomination is seen as making good on that commitment.

The Pickering appointment is a major step in the effort to bolster the position of

OES, but only a step. As a long succession of analysts and advocates have agreed, what is needed is not only astute leadership and stronger resources in OES, but the diffusion of sophistication about science and technology throughout the department (*Science*, 8 April 1977). The troubles of OES have tended to restrict the focus of the discussion to the bureau.

The conversion of FSO's at large into a corps of true believers in the place of science and technology in diplomacy will

New Study of Land-Based Aircraft

In a move that could result in reducing the number of aircraft carriers the Navy needs, the Department of Defense (DOD) is studying the possibility of using land-based instead of sea-based aircraft to counter the Soviet Union in the North Atlantic Ocean.

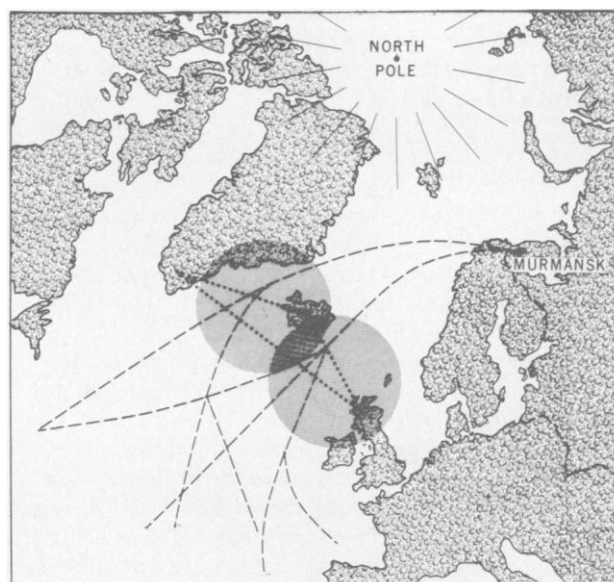
The use of land-based aircraft in ocean warfare has long been a pet notion of some defense analysts, but now the idea seems to be getting high level attention, both in the Office of the Secretary of Defense and on Capitol Hill. The Navy, however, has been lukewarm to the idea, possibly because it could conflict with the service's arguments for maintaining its fleet of aircraft carriers at the present level of 12 through the end of the century.

Recent statements to Congress by Defense Secretary Harold Brown indicate that he is looking with interest at the notion anyway. In a written answer to a question from Senator Sam Nunn (D-Ga.), Brown said that he is studying "longer range, greater endurance aircraft to see when or if they will be a cost-effective means of sea control either to augment or replace some carriers." And, in answer to a question from Senator Barry Goldwater (R-Ariz.), Brown wrote that he was not "satisfied" with present plans for "carriers" against penetration by Soviet aircraft over the seas. "I see the opportunity for land based air to make a significant contribution as a supplement to the sea based air," Brown wrote.

Debate on this issue is expected to heat up in coming weeks, because a major, 500-page report on the subject has begun circulating among defense leaders. The classified report is said by knowledgeable officials to be the most thorough analysis of the military and financial aspects of the problem to date. It was done by the Institute for Defense Analyses (IDA), and was commissioned in late 1976 jointly by the Office of the Director of Defense Research and Engineering* and the Office of Program Analysis and Evaluation in DOD. According to several sources, the report concludes that under some circumstances land-based aircraft can do a more cost-effective job than carriers.

The IDA report and previous studies of the subject have concentrated on the problem of defending convoys plying to and from Europe during a protracted, nonnuclear war against raids from the north by Backfire bombers, which can fly 2500 n.m. out of the Soviets' westernmost military base at Murmansk and back again (see map). Backfire has

become an issue in the strategic arms talks because some people say it can reach the United States from the Soviet Union. Defense analysts disagree on this point, but most agree with the Navy that the Backfire poses a serious threat to Navy and Merchant surface ships. Defense research and engineering official William D. O'Neil expressed a commonly held view when he wrote in the Naval Institute *Proceedings*† that, as of 1976, the Soviets had 80 Backfires and planned to produce 400 of them. A substantial portion of this force, O'Neil wrote, will be devoted to naval missions.



The 1350-n.m.-wide "gap" through which Soviet Backfires must fly (dashed lines). Two AWACS radar planes could watch raid (shaded circles) while interceptors attack (dotted lines).

Present Navy strategy, according to defense officials, calls for "one or more" aircraft carrier groups to be sent up near the Greenland-Iceland-United Kingdom "gap" in the event of war involving Europe; the carrier's own radar and radar planes would "watch" the ocean for a Backfire bomber attack, and its F-14 fighters would be sent out against any Backfires heading southward. But other analysts are concerned that the carriers could be vulnerable in those relatively narrow waters, which, in wartime, could be teeming with Soviet submarines and surface ships,

*Now the Office of the Undersecretary for Defense Research and Engineering.

†"Backfire: Long Shadow on the Sea-Lanes," U.S. Naval Institute *Proceedings*, March 1977, pp. 26-35.

not be easy, but recently there have been signs of recognition at State that such a conversion is required. State Department officials have never argued about the importance of science and technology in principle, but now embarrassing and even threatening events are forcing them to take science and technology seriously in practice.

Two major examples make the point. U.S. foreign policy on nuclear matters, particularly as related to proliferation issues in the 1970's, has been woefully in-

ept and inadequate. The State Department appeared to recognize the issue too late to deal with it effectively. Relations with less developed countries are profoundly affected by technology-transfer and economic development issues which have a heavy science-and-technology component. U.S. tardiness in getting preparations under way for the U.N. Conference on Science and Technology for Development, scheduled for next summer, is a characteristic example of U.S. failure to come to grips with a set of

potentially explosive issues highly important to this country's interests.

The Zablocki legislation takes the broad dimensions of the problem into account. The bill says that the government should consult with industry, the universities, and other research institutions concerned with modern technology in formulating and carrying out technological foreign policy. To do this and to assess the opportunities and threats implicit in technological change, the bill authorizes the department to make a va-

Questions Need for Aircraft Carriers

many armed with precision weapons. Moreover, the Soviets might attack the carriers if they moved northward, appearing to loom within striking distance of Soviet territory. As one expert said, "A country that will shoot at a Korean passenger plane straying over it in peacetime is unlikely to sit by while an American carrier comes within striking distance in time of war." Even Secretary Brown has told Congress that the aircraft carriers become more vulnerable as they approach closer to Soviet territory.

Published studies by O'Neil, by Dov Zakheim of the Congressional Budget Office, and allegedly the classified IDA report, all suggest that the United States turn the geography of the Greenland-Iceland-United Kingdom "gap" to advantage by stationing existing giant radar planes, known as Airborne Warning and Control System (AWACS), over the region to "see" any sign of a Backfire raid. The planes would then move south with the raid; they could be equipped with long-range Phoenix missiles to protect themselves.

The radar would keep ground-based intercept planes apprised of the situation, and these ground-based planes, having greater speed than the F-14, could take off and meet the Backfires in half an hour or less. Various studies emphasize different aircraft for the intercept role: O'Neil's articles stress the long-range, giant, all-purpose plane known to friends and detractors as the "Big Mamma"; Zakheim's study suggests groups of F-14's, F-111's, or the Lockheed titanium YF-12A. The IDA report is said by knowledgeable officials to favor the F-12B (another version of which Lockheed built as the SR-71, long range reconnaissance plane which holds world records for speed and range). Lockheed is reported to have a proposal to develop the F-12B for the anti-Backfire role.

According to published sources, an F-12B could fly 2500 n.m. at Mach 3—so could cross from Greenland to Scotland even if Iceland was not available.

According to these studies, Soviet surface vessels and submarines north of the Greenland-Iceland-United Kingdom gap would be attacked by U.S. submarines and existing land-based antisubmarine planes equipped also with anti-ship weapons. So the role remaining to the aircraft carriers would be to stay south guarding the convoys, or go elsewhere on other missions.

It is this last point—the relegation of the carriers to low-threat areas in the open ocean, instead of introducing them into the main battle area off Greenland and Iceland—that may seem most threatening to the Navy. Other documents

from the Office of the Secretary of Defense have also implied the relegation of the carriers to important, but secondary roles. Moreover, if the above logic were applied to the Pacific, and land-based aircraft found to be effective against Backfires coming out of the Kamchatka Peninsula, still fewer aircraft carriers might be needed in the future.

Knowledgeable sources offered the following estimates of cost savings. The land-based air wing (of 50 interceptors, 12 AWACS, and three bases) could cost \$3.2 billion to build, whereas to build two carrier groups could cost \$9.6 billion. If the Navy merely discontinued use of two carriers in the late 1980's and 1990's, the savings of \$17 billion in 15-year operating costs would more than offset the \$6 billion cost to buy and operate the new air wing.

Science requested comments from the Navy about the long-range, land-based aircraft proposals that are on the public record, and about the carrier's ability to fight Backfires, but the Navy declined the request.

It is known, however, that the Navy leaders feel that the vulnerability of its carrier force in high-threat areas, such as near Greenland and Iceland, have been greatly exaggerated, and that by the 1990's, with added defensive measures, carriers will be less, rather than more vulnerable than they are today. And one Navy officer, writing a rebuttal to O'Neil's *Proceedings* article (which had concluded that land-based air looked a promising alternative) has noted that the convoys can be protected other ways (such as by blinding Soviet satellites and hide-and-seek tactics) and that the carrier's F-14's really can meet the Backfire threat.

Critics of the proposal note that the Soviets could rapidly develop an anti-air missile capable of downing the AWACS and the interceptors, and that the Administration has said it would keep the present number of carriers through the 1990's.

Besides its implications for the carrier force, the long-range, land-based aircraft proposal raises another sensitive issue: whether this new task should be carried out by the Air Force instead of the Navy. Air Force witnesses have testified on the potential of long-range aircraft, although, by law, any missions under, on, or above the seas belong to the Navy. But it is also clear that if proposals for long-range, land-based aircraft gain ground in coming months, and if the Navy starts protesting that they cannot or should not be put into effect, someone will start asking whether the Air Force shouldn't do this job instead.

—DEBORAH SHAPLEY