cue. The President pledged to ensure the "continuity of the collection of Landsat-type data" and sent an amendment to Capitol Hill in July seeking full-year funding for Landsat in 1990. Quayle put together a task force to study the problem and resolve the interdepartmental squabble. The aim was to decide who would build and manage the next machine (Landsat 7) and determine how its costs and benefits should be allocated. The report was meant to be done by the end of summer, but has been delayed.

Meanwhile, Landsat's immediate prospects grew dim. The 1989 fiscal year has ended, and the program is technically out of money. It is alive only by grace of the congressional continuing resolution, which keeps all federal programs going while decisions are made on the 1990 appropriations bill. The House and Senate are about to begin talks to resolve their differences on the bill, but even the best outcome may not be great for Landsat.

The House has offered to spend no money at all on the Landsats now in orbit (the aging editions 4 and 5). And it has slashed the Administration's proposal for completing the partially built successor, Landsat 6, from $36.9 million to $20.4 million. The Senate's offer was a little better: it proposed half a year's funding for the old satellites ($9.5 million) and almost full funding ($34.9 million) for Landsat 6. Says Thomas Pyke, NOAA associate administrator who heads the program: "We are hopeful that the House-Senate conference will resolve it in our favor."

In the halls of Congress, Landsat fans have been sending notes to Representative Neal Smith (D–IA), chairman of the appropriations subcommittee for NOAA and leader of the House negotiating team in the conference. Five members of the Science, Space and Technology Committee, including chairman Robert Roe (D–NJ), wrote to Smith on 2 October recommending that he seek full support for all the Landsats. Smith, according to one Hill staffer, believes firmly that users of government services should pay for them, a rule he wants to apply to Landsat's biggest user, the Pentagon.

But Pentagon chiefs do not want to increase their support for Landsat without gaining more control. Yet at the same time, according to congressional aides, they object to other cost-sharing ideas such as NOAA's proposal earlier this year to form a joint venture with France, which runs the highly successful SPOT satellite. On this controversy, the National Space Council has no comment. Spokesperson Elizabeth Prestridge says simply that policies on the future of Landsat are "still under review."

■ ELIOT MARSHALL

B-2 Comes Up Short

A leak of classified information about the comparative ranges of the Air Force's newest strategic bombers suggests that the B-2 "flying wing" may come up short against the more conventional B-1.

The range data, which were leaked to *The Washington Post* by an unnamed source, indicate that the current estimate of the B-2's unrefueled range is 6000 miles, while the B-1's stands at 6400 miles. "I'm surprised at that," said House Armed Services Committee chairman Les Aspin, who has been privy to the supersecret B-2 for most of its development period. "They've been advertising the B-2 as having better range."

But it is no surprise to Joseph V. Foa, an emeritus professor of engineering at George Washington University. Last spring, Foa warned in a memorandum circulated among scientific organizations and members of Congress that the B-2 would inevitably prove to have a range inferior to traditional wing-fuselage aircraft such as the B-1 (*Science*, 12 May, p. 650).

In the 1940s, Foa had uncovered an embarrassing error in research performed for a secret Air Force study by William R. Sears, then Northrop's chief aerodynamicist. During those years when Northrop was building the experimental XB-35 and YB-49 all-wing strategic bombers, Sears had claimed to prove mathematically that the exotic shape imparted maximum range to jet-propelled aircraft. But Foa, then engaged in parallel research at the Cornell Aeronautical Laboratory, had found that Sears' formulas instead showed the exact opposite—the flying wing configuration would produce minimal range. After the YB-49 program was scotched in 1949, the Air Force told Congress that the plane's range was indeed deficient. Sears acknowledged the old mistake, but never agreed with Foa's disparagement of flying wings, declaring that modern versions would demonstrate clear advantages.

"I find it kind of hard to believe," Sears told *Science* after the latest revelation about the B-2's range. "I am surprised."

"It would be interesting to know if the figures are for similar payloads and flight paths," said Foa of the leaked data, "not only because this might confirm the analytical prediction. If the B-2's range is even just somewhat lower than the B-1's under similar conditions, then flight tests are going to reveal more significant deficiencies in cruising speed."

Unfortunately, the new information reveals nothing about such mission factors as payload, flight path, or speed. According to a long-time Aspin aide, the B-1 and B-2 range figures were contained in two separate reports submitted to Congress by the Air Force. "It's not clear whether they are oranges-oranges comparisons," he said, pointing out that the B-1's typical attack profile has been changing to include more and more low-level flight, which would drastically cut the bomber's range. The stealthy B-2, on the other hand, would most likely attack at high altitudes, not needing to duck under the sweep of enemy radars. "The real surprise may be that the B-1's range is so low, not that the B-2's isn't as high as we thought."

Some light was shed on the mission picture last March, when the Strategic Air Command replied to questions posed by Senator J. James Exon (D–NE). According to SAC, the B-2's unrefueled range varies from 4250 miles to 7500 miles, with a payload between 40,000 pounds and 75,000 pounds. SAC reported that although the B-2 carries less fuel than the B-1, it has "an equivalent unrefueled range" because of its low wing-loading and high-altitude subsonic cruising speed. General Bernard Randolph of Air Force Systems Command said later that the B-2 could carry a 50,000-pound payload for 6000 miles without refueling, a range that corresponds to the recently leaked figure.

The 6400-mile figure for the B-1 would be about 1000 miles less than the "maximum unrefueled range" of 7455 miles listed for the past several years in *Jane's All the World's Aircraft*, a standard reference.

Though of crucial interest to technically minded observers, all these numbers are evidently irrelevant to the lawmakers now trying to decide whether to buy the B-2. "The debate so far hasn't been about capabilities, but about bucks," Aspin's aide said with a shrug. "Besides, B-2 capabilities are still on paper. Next year we'll start talking capabilities."

■ WAYNE BIDDLE

Wayne Biddle is a journalist who is writing a book about the aerospace weapons industry.