



MINISTRY OF DEFENCE
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14th January 1981

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 Prime Minister

*Sooner or later there will be a breakthrough
 in research on these weapons and it is important
 that we keep track of what is happening. The
 implications for e.g. Trident could be considerable. For
 the moment, however, nothing startling appears to be
 imminent.*

Stan Michael,

You asked for further information about directed energy weapons in the light of recent press reports. We too had noted recent reports indicating that the incoming US Administration was likely to place greater emphasis on the possibilities of developing directed energy weapons and that plans were being prepared to spend more money to this end. For convenience I attach a copy of the report by Reuter's Washington Correspondent in The Times of 7th January and articles in the New Scientist of 1st and 8th January 1981. Our view remains essentially the same as already reported to you and there is little to add by way of detail or comment to the papers included with Brian Norbury's letter of 6th June 1980 and his earlier letter of 28th January. We can well understand why the Americans have become concerned, given the prospect of a Soviet First Strike capability against their Minutemen, and we can expect for some time to come that anyone with ideas on how to counter the Soviet threat will receive some attention, even if the ideas subsequently fail to stand up to examination. (In his letter of 28th January 1980 Brian Norbury has already referred to the important international treaty aspects to the deployment of such weapons, and I will not go over the ground again here).

You also asked for our detailed views on specific points mentioned in your letter of 16th April last year in addition to those already discussed in the earlier correspondence. Allowing for the difficulties of preparing the record which you mentioned, we believe that General Keegan himself may have mixed up some of his facts, especially in relating to accelerators for particle beam weapons. Certainly the description attributed to him of the "self-resonating collective generator" does not make complete sense.

M O'D B Alexander Esq
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It is true that the Lawrence Livermore Laboratory in California has for some time been engaged in accelerator development, first under Navy auspices and more recently using funds provided by the Defence Advanced Research Projects Agency (DARPA). The so-called "Chair-Heritage" programme was aimed at the demonstration of an auto-resonant collective accelerator which made use of a travelling-wave concept but did not embody lasers as a source of carrier waves or in any other way. Another possibility, (which was attributed to the USSR by Aviation Week and Space Technology on 28th July 1980) could be to use a carbon dioxide laser to 'burn a hole' through the atmosphere through which a charged particle beam might be propagated. (This is not, however, the usual concept of a carrier wave.) Other types of accelerator are being investigated at Livermore. They will all depend for their technical success on being able to project a beam of neutral particles and, contrary to General Keegan's view, they are likely to be of use only in outer space or other conditions where there is a very low atmospheric pressure, approaching conditions of vacuum.

At Los Alamos, under a Dr Knapp, research work is continuing on a space-based system. We believe that the energy/density striking a target could conceivably be worked up to values which would cause significant damage, but this would only be after many years of development and the expenditure of much more than the \$50 million quoted by General Keegan.

It is also true that the US Department of Energy has an interest in developing technologies which would be suitable for particle beam weapons and there has indeed been a "task force" (rather than a committee of investigation) under the auspices of the US Department of Defense. The task force was led by a Dr Franken of the University of Arizona with the bulk of its membership drawn from Universities and Research Institutes.

As for the articles in New Scientist and in The Times, the first (in New Scientist dated 1st January) draws on the findings of a team at the Massachusetts Institute of Technology which has in the past examined the prospects for particle beam weapons - and with much the same conclusions as we have already drawn. (The title of the New Scientist article perhaps gives a misleading impression of the substance of the article.) The Times article of 6th January gives only part of the story about the proposed test of a pointing and tracking system for a laser damage weapon using the

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Space Shuttle. If the US is ever to consider seriously deploying laser damage weapons in space, a successful demonstration of pointing and tracking is probably the most important single element. This test has been public knowledge for some time. An article in Aviation Week last summer referred to it and, equally important, explained that the laser to be used was of modest power - certainly not in the class required to destroy a hard target such as a ballistic missile. It is worth noting that the test has now slipped back from 1985/86 to 1986/87. Of more immediate interest is the series of trials due to start this month on an airborne laser mounted in a converted KC135 tanker aircraft.

As for the second New Scientist article (of 8th January) you might note the references to strategic risks and to pulling together the High Energy Laser research effort in the US Department of Defense. (You might also note, in the context of his role on the Congressional Sub-Committee on Science, Technology and Space, that Senator Harrison Schmitt has Los Alamos within his state).

Finally, I should tell you that Dr Richard Airey, a co-ordinator of a significant part of the US Department of Defense Laser Damage Weapon programme, visited the Ministry of Defence last October. He announced that no application had yet been found for laser damage weapons, although all the US Armed Services - the Navy and the Air Forces especially - continue to be very interested. For our part we continue to have an exchange of information with the United States on laser damage weapons technology. This excludes formal access to strategic considerations but we do from time to time pick up information which is valuable to us on an informal basis. Perhaps we could keep you posted of significant developments in this field.

I am copying this letter to David Wright (Cabinet Office).

Yours sincerely
J D S Dawson

(J D S DAWSON)
Private Secretary

US space shuttle to test laser weapons

From Christopher Hanson
Reuter Correspondent
Washington, Jan. 6

An early mission for the United States space shuttle will be testing an aiming device for a space-based laser weapon that could be used to destroy Soviet nuclear missiles, sources close to the project said today.

Under a project code named "Talon Gold", the shuttle—a reusable space ship—will test a "pointing and tracking" system vital for the development of laser weapons in space.

The laser test is only one example of the military role for the shuttle, scheduled to make its first flight in March, informed congressional sources said.

The Defence Department wants to speed up research and development on space lasers after concluding that the Soviet Union is striving to perfect such weapons.

Congressional sources said President-elect Ronald Reagan's defence aides wanted even quicker deployment of the lasers. The sources said lasers appealed to Mr Reagan because they would give defence against a Soviet attack designed to knock out United States nuclear missiles before they get off the ground.

Tests on a "pointing and tracking" system were vital, according to technical literature on the subject, because the space-based laser must be able to attack missiles hundreds or thousands of miles distant. The laser ray would in theory bore a hole into a missile's hull, causing it to disintegrate in flight.

The Russians and the Americans are already testing laser weapons in the earth's atmosphere, according to government officials. But United States specialists were recently ordered to focus on laser deployment in space.

Some defence analysts believe that later versions of the stubby-winged shuttle, roughly the size of a DC9 airliner, will be armed with laser weapons to enable them to attack satellites or to engage in space battle.

The shuttle could also be used to construct laser-armed space battle platforms to protect satellites from enemy attack.

The Pentagon denies that the shuttle would be used against Soviet satellites.

Some defence analysts are worried that laser deployment could result in an attack on a surveillance satellite being misread as the prelude to a nuclear missile attack and lead to an all-out nuclear war.

National Aeronautics and Space Administration (Nasa) officials are also concerned that the military is anxious to wrest control of the shuttle from the civilian administration.

Nasa sources said they were concerned at recent statements by defence officials criticizing Nasa for delays in the shuttle launch and suggestions that another government body should take over the shuttle.

The first space shuttle was removed from its storage hangar last week and moved to a launch pad at Cape Canaveral, Florida.

It is scheduled to blast into space with the aid of booster rockets, and reenter the earth's atmosphere piloted by astronauts who will land it on a runway.

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This week

No future for laser weapons in space

Satellites blasting each other out of existence with high-energy lasers may be fine for *Star Wars*—but, says a report published just before Christmas, they are not technically feasible in the real world. The report—by M. Callaham and K. Tsipis from MIT—pours cold water on the idea that laser weapons on satellites could be a valuable addition to the armouries of the world's superpowers. However, the report is more sanguine about the chances of laser weapons mounted in aircraft or on the ground—even though these are likely to be very expensive and likely to go wrong.

According to Callaham and Tsipis, the US is spending \$200 million a year on developing high-energy lasers as weapons. The USSR is also making substantial efforts in this area. They say that technical progress on several fronts—lasers, the optics needed to guide laser beams, tracking devices to follow targets and cheap space transport to launch the satellites—make laser weapons theoretically possible.

But the report is sceptical about the chances of laser weapons on satellites being deployed in the next few decades. "Many of the required systems are not technologically available now, nor would they be accessible in the next decade or two," say Callaham and Tsipis. "Even if eventually they could be developed, the cost of emplacing and supplying and maintaining them would be prohibitive, they would be fatally vulnerable during their embryonic stage, and even if emplaced and operational, most probably they could be defeated by the active and passive countermeasures and tactics of a determined opponent".

These frailties arise mainly because a country would have to lift huge amounts of equipment into space to

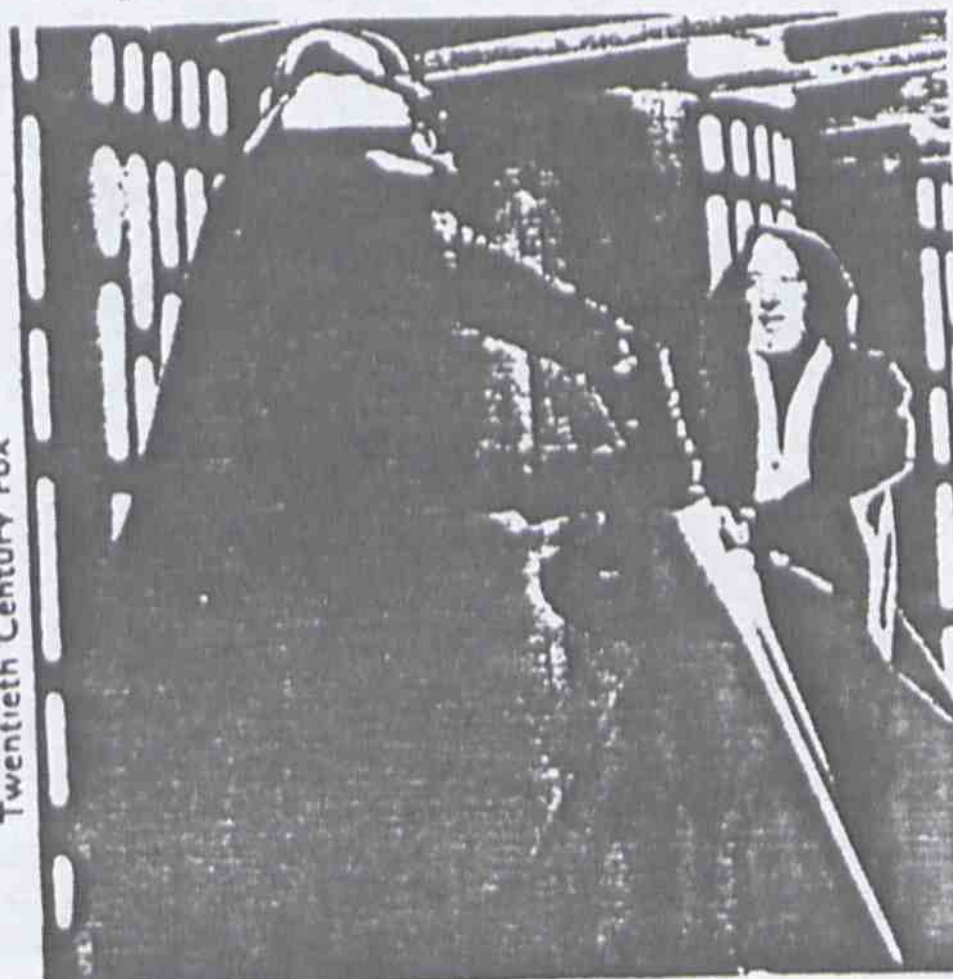
build satellites carrying laser weapons. Vehicles similar to the space shuttle would have to carry at least 100 tonnes of equipment into space for each laser satellite. And any country serious about laser weapons would have to build several hundred such satellites. (Each satellite would cost as much as \$12 000 million.) It is hardly likely that adversaries would not spot all this activity and do something about it.

Once in orbit, laser weapons could easily be jammed—for example, by blinding them with beams of laser light or by transmitting false instructions to them, telling them to fire at the wrong time or the wrong target.

Lasers on the ground and mounted in aircraft are, however, different propositions. Lasers mounted on aircraft for shooting down enemy aeroplanes would be easier to develop because their targets are relatively slow moving. There are, however, two problems. Such lasers would be very expensive—more than \$20 million each—and equipment for tracking targets is not yet good enough to be used with lasers.

Lasers fired from the ground—either at aircraft or missiles—could be relied on only in good weather. Clouds, dust or other molecules in the atmosphere deflect laser beams and make them unreliable over long distances. On the other hand, laser weapons on the ground are fairly secure from attack and easy to maintain and supply.

But the report points out that such



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weapons would be favoured by countries that want to attack without provocation—because only they can wait for good weather before striking. Thus: "The motives of those who advocate weather-dependent weapon systems should be questioned".

Laser weapons in space would, Callaham and Tsipis say, threaten the peaceful exploitation of space. For example, future solar power satellites, which would beam vast amounts of energy from the Sun to Earth (possibly by turning this energy into laser beams), may involve similar technologies to laser weapons. If the USSR feels that the US is investigating laser weapons, it will insist on inspecting peaceful space projects. □

This week

US report calls for research on laser weapons

Christopher Joyce, Washington DC

The United States should aggressively accelerate its research into the sizzling new realm of high-energy laser weaponry, according to science and defence analysts in Congress. Recent press accounts suggest that incoming President Ronald Reagan is all for the idea.

After compiling testimony from 27 scientists and military specialists, the Senate Commerce and Transportation Committee has concluded that lasers could move the superpowers into a "post-nuclear" era and dramatically shift the balance of power. But it adds in a brief but straightforward report that the US government isn't doing enough to bring "Buck Rogers" weaponry down to Earth. This report comes hot on the heels of a report from the Massachusetts Institute of Technology (MIT) claiming that laser weapons have no future in space (*New Scientist*, 1 January, p 3).

Low-power (less than 20 kW output) laser research since 1960 has contributed more than any other field to improving military hardware, the committee's report states. Low-energy lasers are now used for weapons guidance, laser radar, chemical and exhaust detection, and communications, to name just a few applications. But attention to high-power laser (more than 20 kW output) weaponry—that commonly and fancifully associated with duelling spaceships and crackling ray-guns—has lagged, in large part because the scientific community can't agree on whether such weapons are, first, feasible, and, secondly, worth the billions they undoubtedly will cost to develop.

Analysts on the committee's staff argue that no scientific principles stand in the way of lasers that can stop an ICBM, tactical missile, plane or satellite in its tracks. All that is needed is ►

► enough money. The report notes that the US government is now spending less than \$200 million a year on designing high-energy laser weapons, while the Soviet Union is reportedly spending three to five times that much.

According to press reports, President-elect Reagan has already expressed to Senator Harrison Schmitt a "strong interest" in developing a laser anti-ballistic system. Schmitt, a New Mexico Republican and former astronaut, will soon take control of the strategic congressional subcommittee on science, technology and space, and he joined in gathering the data for the committee's laser report.

Past laser research efforts have been fragmented among the typically competitive branches of the armed services and the defence advanced projects agency, with no cohesive research and development strategy, says the report. It recommends doubling the budget for research on high-energy laser systems by 1983, establishing a single office with the defence establishment for laser weapons, and pursuing the technology at an "unrelenting" pace. The report observes that "the future strategic posture of the nation hangs in the balance. High-energy laser technology development and weaponisation could tip the balance in our favour."

Though given short shrift in the committee's report, satellites carrying lasers capable of shooting at other satellites or down at ICBM's are another part of the Defense Department's blueprint for space-age weaponry.

Deployment in space, however, raises strategic risks that might not be worth taking, according to the recent MIT study. The MIT report observes that a satellite laser system could cost up to \$100 billion and would be a sucker for "decoy" launchings of ballistic missiles. It would probably also be subject to immediate attack, and might provoke an all-out-war should it be seen as an offensive weapon. □

Los Alamos is in N.M.
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