

SECRET

MT.

CABINET TWO

Confidential filing.

1094

Visit of Major-General George J. Keegan Jr
(USAF - retired) to London in March 1980.

SB
831

USA.

February 1980.

Referred to	Date	Referred to	Date	Referred to	Date	Referred to	Date
25.1.80.							
10.3.80							
16.4.80.							
28.5.80							
9.6.80							
PREM 19/382							

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4 eeCO JS

USA

9 June 1980

DIRECTED ENERGY AND PARTICLE BEAM WEAPONS

The Prime Minister has seen your letter to me of 6 June and its enclosures. She is most grateful to the Chief Scientific Adviser and to Dr. Johnson for their assessments.

I am sending a copy of this letter to David Wright (Cabinet Office).

M O'D B ALEXANDER

Brian Norbury, Esq.,
Ministry of Defence.

TWR

SECRET UK EYES A

Covering TOP SECRET UK EYES A

*This is a copy. 3
The original has
been extracted and
retained under S.3(4)*



MINISTRY OF DEFENCE

MAIN BUILDING WHITEHALL LONDON SW1

Telephone 01-~~938 7022~~ 218 2111/3

MO 18/3/8

6th June 1980

*Hardly, or very much
no*

Prime Minister

Dear Michael,

*These are the (somewhat delayed) comments of
the NO.5 on the ideas put to you by General
Keegan. We have just received the film (the SAZT
Syntron) mentioned to you by General Keegan & will
arrange a showing soon.*

DIRECTED ENERGY AND PARTICLE
BEAM WEAPONS

Paul 6/6

I am very sorry not to have been able to write to you before this in response to your earlier request, and in the light of the Prime Minister's earlier meeting with General Keegan.

My Secretary of State has now asked me to let you have for the information of the Prime Minister two assessments, the former prepared by the Chief Scientific Adviser here and the latter by Dr Johnson, the Director of Scientific and Technical Intelligence. I am sending you the latter since, as you have recorded General Keegan, made much in his meeting with the Prime Minister of Soviet Particle Beam capabilities based on his interpretation of available intelligence on a certain Soviet facility.

*Paragraph deleted and retained under Section 3(4)
Wayland, 1 July 2010*

Copies of this letter and the enclosures go to David Wright (Cabinet Office).

*Yours and
Brian Norton*
(B M NORBURY)

M O'D B Alexander Esq

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Covering TOP SECRET UK EYES A

DIRECTED ENERGY WEAPONS: A TECHNICAL APPRECIATION

This Note explores the feasibility of directed energy weapons, i.e. laser or particle beam weapons, discusses the relevant physical and technological principles and comments on their possible defence applications.

2. A wide range of such applications have been suggested. Land, sea and aircraft based beam weapons have been suggested for use in the land battle against men, communications and surveillance equipments, in the maritime role for the defence of ships against cruise missile attack and, in the strategic role, for the defence of point targets, e.g. missile silos. Satellite borne systems have been postulated for anti-ballistic missile defence and for anti-satellite purposes. I examine only the implications for strategic functions and weapons systems.

3. A beam weapon system requires the following capabilities:-

- a. sensors to detect and identify the targets;
- b. a high power beam generator;
- c. a system for target tracking and for beam direction which enables energy to be deposited on the target for a sufficient period of time to produce damage;
- d. a system to assess the damage inflicted;
- e. a command and control arrangement for the management of the engagement.

4. The target detection and identification, and the command and control requirements are not essentially different from those for any more conventional system and deserve no elaboration here.

5. The characteristics of the beam generator are dictated by the need to deliver to the target sufficient energy to cause at least disabling effects. Clearly there are differences in the vulnerabilities of the various targets which could be engaged by a satellite-borne beam system. The softest targets are likely to be the sensors in satellites and the semi-conductor circuits used for satellite and missile guidance and control, and these may be damaged by energy depositions of about 25 joules cm⁻³. The hardest targets are those which could be damaged by disrupting their outer shells e.g. the skins of missiles, melting the guidance/control electronics and/or detonating the high explosive in the warhead of the target. For this purpose, energies up to 7,000 joules cm⁻³ would be required.

6. Taking into account the efficiency with which laser radiation can be generated (currently not better than about 10% and unlikely to improve to more than say 25% with development over the next decade or two), it is estimated that a satellite-borne laser beam

/system

system would weigh several hundred tons. As for particle beam generators, current accelerator technology does not offer the possibility of a machine with the required high energy, high current, beam achromaticity and normalised emittance. A compromise accelerator design, with its power source would weigh upwards of 1000 tons. Such large space (exoatmospheric) systems are necessarily vulnerable (vide infra).

7. Even if a practical power source were available, there would remain the problem of directing the beam to impinge on the target and of maintaining it on target for long enough to deliver the requisite energy. Laser systems operated wholly outside the atmosphere do not face the same propagation problems as either laser systems operating over a path within the atmosphere or charged particle beams operating within or outside the atmosphere. The exoatmospheric laser beam merely suffers degradation through imperfections in the beam formation and the tracking and direction accuracy requirement is determined by the geometric relationship between the weapon system and its target. These can be relaxed for an anti-satellite system where intercept ranges can be relatively small. They become stringent for ABM applications especially if the laser system satellite is in geostationary orbit (40,000Km above the earth) when the intercept range would be large. An in-between situation would arise for an ABM laser system satellite in near earth orbit, say at an altitude of 1000Km.

8. On the other hand, exoatmospheric charged particle (electrons or protons) beams are degenerated during propagation by the repulsion between the charged particles. Calculation shows that electrons with energies in the Gev range launched by a beam of 1cm radius would spread to 15 metres radius after travelling 1000Km; for protons of the same energies, the spread would be to 20Km. Further, charged beams are deflected by the earth's magnetic field with a radius of curvature of some 100-200Km; for this reason they are incapable of reaching a target at ranges of 1000Km or more. The effects of the geomagnetic field on charged particle beams could be made even more uncertain if the field were disturbed by nuclear explosions. In short, the 'physics problems' of exoatmospheric charged beams seem insurmountable.

9. Neutral particle (hydrogen atoms, neutrons) beams have been considered as a way of avoiding the propagation problems with charged particles. Of the possibilities hydrogen atom beams appear to be the most promising but accelerator technology is currently inadequate to offer a means of generating a beam with the necessary characteristics. If neutral particle beams become practicable, some way would have to be found of measuring the error in beam direction so that the corrections to obtain an intercept could be applied. This particular requirement is easier with laser or charged particle beam systems.

/The

10. The assessment, under operational conditions, of the damage inflicted by a beam weapon would not be easy. Even if it were possible to estimate the energy delivered to the target, the damage assessment would be highly dependent on the prediction made about the vulnerability of the target to a given level of energy deposition. Direct observation of the inflicted damage would not, in general, be possible. Unlike attacks by explosive warheads, catastrophic destruction of the target would not be produced.

11. From the foregoing, it is apparent that the least unlikely strategic application of directed energy weapons lies in laser systems operating entirely outside the atmosphere in the ABM or anti-satellite role. For this to be open for serious consideration in competition with more conventional solutions to the ABM and anti-satellite problems, we need to:

- a. develop a laser system of adequate power and a multiple shot capability within reasonable size and weight limits;
- b. master the difficult technologies of target tracking, beam direction and damage assessment;
- c. provide adequate protection for the laser weapon satellite so that it is not excessively vulnerable to close intercept by an anti-satellite system with an explosive destruction charge or to satellites dispensing largish numbers of guided munitions;
- d. overcome the countermeasures which could make space targets unprofitable for beam weapons.

If these developments took place, then it would be realistic to examine the operational advantages and disadvantages of a satellite laser system.

12. Both the Americans and the Russians have major research programmes on directed energy weapons with the former spending between \$100M and \$200M a year. We have a cooperation programme with the US and this allows us, at a low cost, to keep in touch with the scientific and technological developments. The main thrust of this programme, at present, is to study endoatmospheric laser beam interactions with 'soft' targets. Conceptual studies only are concerned with exoatmospheric applications and there is little of coherence, in the research programme, on particle beam systems.

13. Nothing I have heard so far, either formally or informally, suggests then that beam weapons offer a practical alternative to nuclear-armed interceptor missiles for ABM purposes for the foreseeable future. Even if the present technology limitation were overcome so that a satellite-borne beam weapon became feasible, it is by no means clear, particularly because of its vulnerability to countermeasures, both physical and electronic, that it would provide an operationally worthwhile and cost-effective capability.

R.M.



The National Archives

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USA

10 DOWNING STREET

PRIME MINISTER

The American Embassy now have available a 26 minute movie about the American Security Service. I understand that this was promised to you by General Keegan when he saw you on 12 March.

Would you like us to make arrangements to have this shown here or at Chequers?

Hue

mb

MA

28 May 1980

The SALT
Syndrome.
16 min. Sound.

Mr Pattison

I received a telephone call this morning from Lt-Colonel McGauley (from the American Embassy) saying that he had a motion picture (26 minutes running time) about the American Security Service, which had been promised to the Prime Minister when General Keegan was over here on 12 March. (He asked to speak to Mr Peterson but I am sure he meant Mr Pattison.) He said that he can drop it over here whenever it is convenient for you.

He is at the American Embassy 499 9000

x 2737
2739

Appointments
28/5

Suzanne

2



SECRET
MINISTRY OF DEFENCE

MAIN BUILDING WHITEHALL LONDON SW1A 2HB

Telephone 01-218 2111/3 (Direct Dialling)

01-218 9000 (Switchboard)

MO 18/3/8

24th April 1980

Dear Michael,

kg
[Signature]

MAJOR GENERAL KEEGAN

Thank you for your letter of 16th April which arrived just as I was about to send you, on the instructions of my Secretary of State, a paper which has been prepared by the Chief Scientific Adviser here on directed energy weapons.

I have asked Professor Mason (who is in the US this week) to look at your report so that, when I send you the paper, I can add any covering comment that may be helpful. I would hope to be able to write to you again early next week.

[Signature]
Bacon

(B M NORBURY)

M O'D B Alexander Esq

SECRET

2

43 /



25 APR 1980

RECEIVED

Faint, illegible text, likely bleed-through from the reverse side of the page.



10 DOWNING STREET

From the Private Secretary

16 April 1980

Dear Brian,

MAJOR GENERAL KEEGAN

Major General George Keegan called on the Prime Minister on the evening of Wednesday 12 March. As I have told you on the telephone, I have not hitherto sent you a letter about the conversation because General Keegan agreed to let the Prime Minister have a written account of the points he had put to her. Moreover, the Prime Minister had asked that I should not take a note during the discussion. However, a month has now elapsed without anything having been received from General Keegan. I understand that, in view of the Prime Minister's continuing interest in some of the points made by General Keegan, you are having a paper produced on the subject. You may therefore find it useful to have a summary account of the principal arguments advanced by General Keegan.

General Keegan was not on this occasion principally concerned with the effort to demonstrate that Soviet capability in the field of high energy particle beams and lasers is significantly more advanced than the military establishments in the West are prepared to admit. His argument was rather that scepticism about the feasibility of energy beam weapons had begun to collapse in the US and that there was a real chance that one or two such weapons would be developed there within the foreseeable future - with all that this would imply for other more conventional weapons systems.

General Keegan claimed that a technical breakthrough had been achieved with the demonstration of a "self-resonating collective accelerator". This made it possible to use a chemically generated proton beam which would probably be conducted to its target in a laser carrier beam - thereby obviating problems with aiming and atmospheric resistance. The basic research work was being carried out at two locations. A research programme at Livermore (the Cher-Heritage (?) programme) was investigating an aircraft carrier based system designed to defeat cruise missile attacks and had already demonstrated the feasibility of the system. A research programme at Los Alamos (under Dr. Kraft) was developing a satellite

/system

system designed to defeat a ballistic missile attack. The same system would have a ground attack capability: General Keegan referred to experiments which suggested that the system's pulse beam would release energy on impact equivalent to some 3 megatons. According to General Keegan, the system could be deployed within two years of authorisation and at a very low cost. He mentioned a figure of \$50 million!

According to General Keegan, Congress had voted \$315 million to fund continued research into relevant areas. The programme was under the general direction of Dr. Ruth Davies and had recently been transferred from the Department of Defense to the Department of Energy. There were a number of signs that people in positions of authority were taking the matter more seriously. A committee of investigation had been established (I do not recall at whose instigation but it would presumably be the responsibility of the Department of Defense) under the Chairmanship of a Dr. Frank. General Keegan claimed that it was largely staffed with academic experts who were hostile to the idea that particle beam weapons had a military application. RCA were seriously considering involving themselves in the field.

Finally, General Keegan said that the campaign to alert American public opinion to the threat posed by the Soviet acquisition of a new generation of weapons had made considerable progress recently. This was in part because a number of distinguished military figures, including Admirals Moorer and Zumwalt and General Stillwell, had joined in.

I apologise for any inaccuracies or solecisms in the foregoing. My unfamiliarity with the concepts and names is complete!

I am sending a copy of this letter to David Wright (Cabinet Office).

Yours sincerely

Michael Alexander

Brian Norbury, Esq.,
Ministry of Defence.

KRB



USA

Foreign and Commonwealth Office

London SW1A 2AH

10 March 1980

Dear Michael,

Prime Minister's Meeting with
General Keegan - 12 March

Thank you for your letter of 25 February.

We assume that no general briefing is
/ required for this call. I attach notes
on two specific points which General Keegan
may raise.

Yours etc

Paul

(P Lever)
Private Secretary

For
Paul

Michael Alexander Esq
No 10 Downing Street
London



PRIME MINISTER'S MEETING WITH MAJOR GENERAL KEEGAN:
12 MARCH AT 7.00 PM

POINTS TO MAKE

1 The UK is monitoring closely developments in the field of high energy particle beams. But we do not feel that particle beam weapons (PBW) will be a practical proposition during the next two decades, if ever. Other directed energy beam weapons have promise but the technology remains very difficult (and expensive).

2 [If raised] We doubt whether Anti Ballistic Missile (ABM) systems would be a better or cheaper solution to the ICBM vulnerability problem than mobile basing. Any renegotiation of the ABM Treaty would create serious uncertainty and could even affect the viability of the UK (and French) deterrents.

ESSENTIAL FACTS

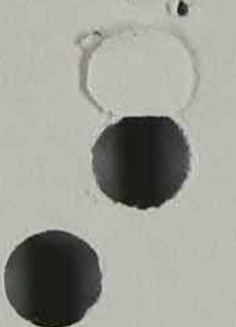
1 Major General Keegan retired from the United States Air Force in 1977, his final post being Chief of USAF Intelligence for five years. He is at present Executive Vice President of the US Strategic Institute in Washington.

2 He has been in the news recently for his views on particle beam weapons (PBW). He believes that the Russians have reached an advanced stage in the research and development of a PBW for use as an anti ballistic missile (ABM) system, and that such a weapon system is being tested. The instantaneous propagation of a high energy particle beam over a long distance for use as a weapon involves many problems (vast power requirement, difficulties in pointing and tracking, and lack of range in the atmosphere) which have yet to be overcome and may never be. The US Department of Defence has sought funds in the FY81 budget to explore more fully the feasibility of PBW.

3 General Keegan may raise the future of ABMs in general, a subject on which there is renewed interest in Washington. The US Administration are concerned about the vulnerability of their ICBM force to Soviet pre-emptive attack. This has led them to decide to deploy a mobile ICBM (MX). But this solution assumes that the number of Soviet ICBM warheads will be limited by SALT II. If SALT II is not ratified, there may be a case for using Anti Ballistic Missile defences for the ICBMs instead. This would require abrogation or renegotiation of the current ABM Treaty between the US/USSR with far-reaching implications for our own deterrent.

4 More generally the Major General can be expected to take a gloomy view of US defence preparedness.

10 MAR 1980





With the Compliments of

the

Assistant Defense Attache for Security Assistance

Lt Col McGauley

UNITED STATES EMBASSY
GROSVENOR SQUARE
LONDON W1A 1AE, ENGLAND

Telephone:
01 - 499 9000
Ext: 737/739

12 April

BIOGRAPHICAL SKETCH

MAJOR GENERAL GEORGE J. KEEGAN, JR., USAF (Retired)

Present Position: Retired General Officer

Birthplace and Date: Houlton, Maine, 4 July 1921.

Education: B.A., Harvard University, 1947; M.A., International Affairs, George Washington University, 1965; National War College, 1965.

Military Background: B-25 pilot in South Pacific, 1944-1945; Air Force Reserve, 1945-47; B-29 pilot and Intelligence Staff Officer, Guam, Okinawa and Japan, 1947-1950; Chief of Combat Intelligence, Hq TAC, 1950-53; Chief, Special Studies Group, Directorate of Intelligence, Hq USAF, 1953-1957; B-47 Aircraft Commander and Commander, 359th and 360th Bombardment Squadrons, 1957-1961; Chief, Air Estimates Division, Directorate of Intelligence, Hq SAC, 1961-64; Deputy Assistant for Joint and National Security Matters, DCS Plans and Operations, Hq USAF, 1965-1966; Special Assistant for Joint Matters to the Director, Joint Staff, Organization of the JCS, 1966-1967; DCS Intelligence, Hq 7AF, Vietnam, 1967-1969; DCS Intelligence, Hq PACOM, 1969-1970; DCS Plans and Operations, Hq AFLC, 1970-1972; Asst Ch of Stf and Comdr, AF Intel Svc, 1972-76; Executive Vice President, United States Strategic Institute, 1977.

Decorations: Distinguished Svc Medal; Legion of Merit w/3 OLCs; Air Medal w/2 OLCs; Republic of Vietnam Distinguished Service Cross.

vb

BIF 10-3-80

25 February 1980

I am enclosing a copy of a letter we have received from Colonel McGauley of the American Embassy, enquiring whether the Prime Minister would be prepared to see Major-General Keegan. She has agreed to do this at 1900 on Wednesday 12 March for half an hour at No. 10 and I would be grateful if you would let us have a brief by close of play on Monday 10 March.

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

CAROLINE STEPEHNE

Malcolm Adams, Esq.,
Foreign and Commonwealth Office.

RC

25 February 1980

Thank you for your letter of 20 February. The Prime Minister was very pleased to hear that Major-General George Keegan will be paying a visit to this country.

Mrs Thatcher would welcome a meeting with him and may I please suggest 1900 hours on the evening of Wednesday 12 March here at 10 Downing Street? Due to her already overcrowded diary the meeting will only last half an hour.

Perhaps you would be kind enough to confirm that this time is convenient to the General. My number is 930 4433.

C.S.

Lieutenant-Colonel Gerald M. McGauley

TCR



10 DOWNING STREET

PRIME MINISTER

Can I please send your regrets to Major-General Keegan?

It is an appalling week and I attach the diary. Above all you are making the Party Political Broadcast.

22 February 1980

Living 7
Wed. 12th 7
say 7p-8p
had an hour
nd

Sun / 9 March

Early evening to London

Monday 10 March

		No. 10
0830	Hair	No. 10
1000	Media	No. 10
1015	Chief Whip	No. 10
1045	Home Secretary, Chief Whip and Chairman	
1200	Open Exhibition on Work of Community Service Volunteers - Upper Waiting Hall,	H/C
1300 for		No. 10
1315	Lunch for Ministers + IG	
2000	Finchley AGM + DT, St Mary's Hall	

Tuesday 11 March

		No. 10
0930	Messrs Howe, Gow, Ingham and Sanders	No. 10
1200	Mr. van Straubenzee and Officers of Education Committee + Mr. Carlisle	No. 10
1300	Lunch and Questions Briefing	H/C
1515	Questions	
1830	Audience Buckingham Palace Keep free for Party Political broadcast	

Wednesday 12 March

0900	Dentist 5 Devonshire Place Keep free for Party Political Broadcast S/S Northern Ireland Keep free	
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Thursday 13 March

		No. 10
0830	Hair	No. 10
0900	Chancellor of Exchequer	No. 10
0930	Messrs Howe, Gow, Ingham and Sanders	No. 10
1030	Cabinet	No. 10
1300	Lunch and Questions Briefing	H/C
1515	Questions Depart for tour	

Friday 14 March

Tour of Yorkshire area + DT

Saturday 15 March

1000	Mrs Scrimgeour	Cheque
------	----------------	--------

Monday 17 March

		No. 10
0830	Hair	No. 10
1000	Media	No. 10
1015	Chief Whip	No. 10
1045	Home Secretary, Chief Whip and Chairman	
1300 for		
1315	Lunch with Lord Boyd-Carpenter and members of Carlton Club	No. 10
1800-1930	CPA Reception + DT	

Tuesday 18 March

		No. 10
0930	Messrs Howe, Gow, Ingham and Sanders	No. 10
1200	Mr. Tony Durant and Officers of Environment Committee + Mr. Heseltine	No. 10
1300	Lunch and Questions briefing	H/C
1515	Questions	
1830	Audience Buckingham Palace	

Wednesday 19 March

		No. 10
0930	Media	No. 10
0945	Tim Lankester for Birmingham C/C Speech	
1600	Visit to Cabinet Office S/S Northern Ireland	

BRITISH-AMERICAN FORCES
DINING CLUB
London, England

24 Grosvenor Square
London W1A 1AE
20 February 1980

Dear Sir:

R21

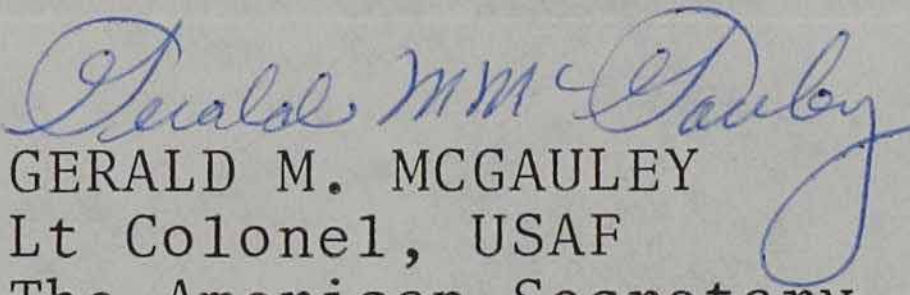
I am pleased to inform you of the visit of a close friend of the Prime Minister, Major General George J. Keegan Jr., USAF (Retired). He is visiting as a private citizen and not as a spokesman for any agency of the United States Government. The General will be in London from the 9th through the morning of the 13th of March, 1980.

General Keegan will be the Guest of Honor at the 180th British American Forces Dining Club Dinner on the 10th of March at the Royal Commonwealth Society. He will also address the Institute of Soviet Studies at Oxford University on 11th March, as well as being the guest speaker at the Old Crows Association on the 12th of March.

I am advising you of the General's visit in the event the Prime Minister would wish to have a brief visit with an old friend. Of course, the General realizes that affairs of state may render any meeting difficult or impossible. Therefore, I stand ready to assist in any efforts you might initiate to satisfy any request the Prime Minister might have for seeing General Keegan.

Please feel free to call the undersigned at 493 3411 for any assistance I can provide.

Sincerely,


GERALD M. MCGAULEY
Lt Colonel, USAF
The American Secretary
BAFDC

The Private Secretary
10, Downing Street
London, S.W.1

