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NUCLEAR MISSILES NEAR CITIES?

Statement of the Chicago Chapter, Federation of American Scientists Nov. 30, 1968

It has recently become apparent that the Army is planning to place a major nuclear missile installation, part of the controversial "Sentinel" antiballistic missile system, in the immediate vicinity of Chicago. Installation of antiballistic missiles (ABMs) near population centers seems contrary to the general plans for the Sentinel program, as presented to Congress by spokesmen for the Department of Defense in the course of the past year. Those spokesmen emphasized that the installations were not intended to protect isolated cities, but to cover large areas, 400 to 600 miles across. Now, with some of the detailed plans being revealed, the intention seems to be that most of the installations are to be in population centers, or very close to them.

There are disadvantages to having such a site in a heavily populated area. The Sentinel missile base could well be a first target in any nuclear attack on the United States. In addition, the possibility of a truly catastrophic accidental explosion, though remote, can never be completely ruled out—especially with the hair-trigger readiness in which the Sentinel missiles must be kept.

The Sentinel system is, of course, an addition to our existing force of intercontinental ballistic missiles (ICBMs) with nuclear warheads, based in

(Continued on page 2)

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FAS Chairman Satterthwaite on TAPPING LATENT SCIENCE TALENT IN THE GHETTO

Of possible interest to FAS members is the following address by FAS Chairman Cameron B. Satterthwaite delivered to the National Youth Conference on the Atom on 23 November 1968.

There are no experts in this field of training ghetto kids to be scientists. In the few instances where it has happened it has been by accident. Since there are no experts, I can speak without embarrassment out of my limited and brief participation in two projects at the University of Illinois.

One of these projects is "Project 500" which is a bold program aimed at educating the culturally disadvantaged—which means ghetto black kids. The

(Continued on page 3)

NEWS ITEMS

The French Government has cut its military budget and cancelled its planned 1969 nuclear tests in the Pacific. This means a significant slowdown in the progress toward a strategic nuclear force. At the same time France also reduced next year's French contribution to the Concord, the British-French super-sonic airliner, another major prestige project of the Gaullist regime. (*New York Times;* 27 November 1968)

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On November 27th, Britain became the first nuclear power to ratify the non-proliferation treaty (NPT). In Washington the British Embassy handed over the British instruments of ratification to William C. Foster the Director of the U.S. Arms Control and Disarmament Agency (ACDA).

The treaty was signed by Britain, the U.S., and Russia last July 1st. Some 80 other nations have since signed it. But the treaty cannot go into effect until it has been ratified by the three major nuclear powers (the U.S., Russia, and Britain) plus forty other nations. Among the other nations so far only Ireland and Nigeria have ratified the treaty.

U.S. ratification has been held up by Senate refusal to act before the Presidential election, and it is now clear that ratification can occur only in the new Congress. Some Senate opposition also stemmed from the Soviet invasion of Czechoslovakia. Russia is not expected to ratify the treaty until U.S. ratification is assured. (*New York Times;* 28 November 1968)

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Every four years since 1960 the Presidential candidate for the party out of power has discovered a "gap" in the strategic balance of power and has gone to the voters in alarm. Kennedy referred to the "missile gap"; Goldwater was concerned with a megatonnage; and Nixon promised in his campaign to do something about the "security gap."

"Gapsmanship" seems to have become entrenched

(Continued on page 6)

FAS COUNCIL MEETING

The FAS Council will meet in New York City in conjunction with the APS meetings. Two sessions will be held, both at 7:30 p.m., in the Beekman Room, New York Hilton Hotel on February 4 and 5.

All Council members and chapter representatives are urged to attend. Members who are not on the Council are welcome to attend as observers.

Nuclear Missiles Near Cities?

(Continued from page 1)

sparsely populated areas or on submarines. In all, we have over one thousand such missiles, each with a war head at least 30 times more powerful than the Hiroshima bomb. This destructive force, aimed at the territory of a potential enemy, is intended to deter a nuclear attack against the United States by the certainty of a devastating retaliation. Soviet Russia has a similar, although smaller, nuclear striking force. Defense Department officials have testified that an ABM defense against the sort of massive attack that Russia or the U.S. is capable of making is not technically feasible.

Description of the Sentinel ABM System

The Sentinel system would consist of about 15 installations in the United States, each one housing an elaborate control computer, a very sophisticated radar system, and one or two kinds of ABMs designed to intercept enemy missiles and disable them with a nuclear explosion. One of these ABMs, the Spartan, is designed to intercept at a few hundred miles from the target. It carries a very powerful (megaton) thermonuclear warhead. The other missile, the Sprint, has a range of perhaps 30 miles, carries a smaller warhead, and is supposed to intercept enemy missiles missed by the Spartans. Both the Spartan and the Sprint have to be ready for firing on a few minutes' notice, since enemy missiles would be sighted perhaps only ten minutes before they reach their target. The Spartans detonate within a minute of being fired, while the Sprints may have to explode within seconds of final aiming.

Could Missile Bases be First Targets for a Nuclear Attack?

Many possible ways in which an enemy could launch a missile attack have been discussed. One possibility is a limited strike against military targets only, in which the enemy would hope to destroy U.S. missile bases, but leave the rest of the country relatively unharmed. The U.S. might simultaneously launch a similar attack. If we have placed military targets in our cities, then an enemy cannot attack those targets without hitting the cities as well. In a different kind of war, where the civilian population was also a target, the enemy could get double duty from some of his limited supply of missiles.

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Chairman ..... Cameron B. Satterthwaite

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Editor: Harriette L. Phelps.

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Sources of information (given in the articles in parentheses) are for further reference. Items reprinted directly from other publications are designated as such in an introductory paragraph.

On the Chances of an Accidental Explosion

The safety of nuclear weapons is difficult to evaluate. The closest one can come to reliable information is in the official Defense Department handbook on *The Effects of Nuclear Weapons,* published by the Atomic Energy Commission. On page 664 it states:

> "Nuclear weapons are designed with great care to explode only when deliberately armed and fired. Nevertheless, there is always a possibility that, as a result of accidental circumstances, an explosion will take place inadvertently. Although all conceivable precautions are taken to prevent them, such accidents might occur where the weapons are assembled and stored, during the course of loading and transportation on the ground, or when actually in the delivery vehicle, e.g., an airplane or a missile."

It is certainly true that no nuclear weapon has exploded accidentally so far. The safety devices which guard against accidental explosions are, of course, highly secret. In manned bombers, the main method for delivering nuclear weapons in the 1950's and still a part of our arsenal, many minutes and even hours are available for final arming of a nuclear warhead. With the very short time in which the Sentinel missiles have to be readied for action, the warhead must be armed in seconds, or, at most a very few minutes. Even though every possible precaution will be taken and extreme care is used in making these warheads safe against accidental detonation, shortening the time must also reduce the safety margin. Even though the safety interlocks are surely the best designed by man, accidents can happen with man-made machinery in unforeseen ways. In recent years a nuclear warhead was accidentally dropped in Spain without an explosion. It was reported that three of the four safety devices on the warhead had been triggered in the accidental drop.

Should one of the Spartan warheads detonate accidentally, the intense radiation from the nuclear explosion would render the surrounding material, steel, concrete, and dirt, radioactive. The fireball from the explosion would vaporize this material and shoot it up in the air. The highly radioactive dust would then be spread over much of metropolitan Chicago causing possibly millions of deaths and many serious injuries. Even if the accident were to occur with the warhead of the Sprint the amount of radioactivity could far exceed that produced in the wartime Hiroshima air burst.

The Congressional Debate on the Sentinel Program

In September 1967, Secretary of Defense McNamara announced the Sentinel ABM program at a cost of $5 billion. It was made clear that this large sum of money would not buy any sort of protection against large missile attacks, but was in-

tended to provide a "thin" shield against a small-scale attack of primitive missiles, such as Communist China might be capable of launching in the next five to ten years. The assumption was that Chinese technology would not be capable of equipping these missiles with so-called penetration aids, which both the United States and Russia are thought to be developing. Since these aids are probably simple compared to the vast technological problem of manufacturing the missiles and warheads, the assumption is not necessarily correct.

The Sentinel program was opposed in Congress on several grounds. One argument was that the Chinese were not, in fact, so irrational as to risk the destruction of their country by a nuclear attack on the United States. Thus there was concern that the proposed system was in reality a first step towards a larger deployment against a Russian threat —in disregard of authoritative opinion that no ABM system could be effective against a massive attack. Some in Congress argued that an ABM system would be an escalation of the nuclear arms race, causing the Russians to build more offensive missiles, and not offering real protection to the U.S. against a Russian attack. Others felt that the Chinese threat was not so immediate that the Sentinel system should be deployed before its effectiveness was established. The matter came to a vote several times, and in one case supporters of the Sentinel system had a majority by a margin of only three votes. The Sentinel was opposed by both Democrats and Republicans, Illinois Senator Charles Percy among them.

Summary

In putting the Sentinel plans before Congress, the Defense Department stressed that this was a plan for the defense of the whole United States and not for individual cities. Now, with detailed plans being revealed, it seems that a number of installations are planned in the most thickly populated centers of the nation. The Army may be trying to get double duty from the short-range Sprint missiles by eventually including these centers under the Sprint missile's dubious umbrella. This was not the intention of the plans authorized by Congress. (The effectiveness of the Sprint program is debatable even in offering protection against a small-scale Chinese attack.) If we want to offer such protection to cities, then perhaps it should be done by adding Sprint installations and keeping the more powerful, longer-range Spartans that attract enemy fire, out of populated areas. Since special protection for cities was not a part of the authorized Army program, this question has not been explored in detail before Congress. Having the full Sentinel base located in thickly populated areas may well be a false economy, with possible grave consequences for the civilian population. *This question deserves careful exploration and discussion before Congressional Committees and is not a matter for a classified administrative decision of the Pentagon.*

Tapping Latent Science Talent in the Ghetto

(Continued from page 1)

other is a project in our Physics Department to seek out and train potential black physicists—it doesn't have a name.

"Project 500" may well be the most ambitious effort of its kind presently being undertaken anywhere in the country. And to my knowledge our program in the Physics Department is the only one of its kind in any major physics department.

Both of these programs are worth describing to you, and I shall describe them; but first I would like to consider some questions.

1. Why in a population of some 15,000 Ph.D. physicists in this country are there only 25-50 blacks —probably nearer the former than the latter, say .2%—when the black population in the country is about 12%?

2. Why out of about 900 black students on the U of I campus are there only two physics majors when out of an equal number of white students chosen at random we would find 15 or 20?

3. Even for those few black students who do start out in physics, why is the prospect of finishing with a B.S. in physics so poor?

4. What—in short—do white kids have that black kids don't have?

I'm sure there is no argument that to succeed in physics a young person must have some intellectual talent. The inherent ability to grasp mathematical logic and to think of natural phenomena in terms of quantitative physical laws is essential. He must be able to unify his own knowledge and understanding of the universe into a few simple physical concepts. And he must be able to recognize the diverse applicability of these concepts.

The question has been raised whether the black population is somehow not up to the challenge of the more intellectually demanding pursuits. In fact, I suspect that there are many in the black community who believe that most of their black brothers and sisters don't have what it takes to make the grade in something like physics. Fortunately this attatude is changing among the younger blacks.

If we are to be intellectually honest we must admit that there are undoubtedly different distributions of talent among different populations. But we haven't the information to determine what these differences are. The opportunities and incentives in the black community are so different from the white that no comparison can be made. No tests have yet been devised that can measure sheer intelligence without being considerably influenced by environment.

In view of the successes of the black population in the arts, literature, medicine and law in recent years, we would do well to assume that there is a wealth of talent for science also in that community that can be tapped.

Dr. John T. Wilson—a black scientist—who is head of the Biological Sciences Research Laboratory

(Continued on page 4)

Tapping Latent Science Talent in the Ghetto

(Continued from page 3)

of Lockheed, in the May 12 issue of Scientific Research, answered the question of "why so few Black scientists" in this way:

> Science has not been presented to the Negro as something he should reasonably aspire to. I don't recall in elementary school that the instructors presented a science career as something I should try to achieve. I think the same condition prevails today among Negro youth. They are told they can become athletes, song and dance men, lawyers, maybe, and physicians, maybe—but *maybe*.
>
> I didn't have barriers put in my way, but I didn't have a great Negro scientist presented to me as a model of someone to look up to. Instead, Negro athletes were held up to us—Joe Louis and Jesse Owens were big then. Negro scientists were not mentioned in textbooks and the teachers didn't know there were any Negro scientists. They would rather deny that any existed.
>
> I think the poem about the purple cow. It begins "I never saw a purple cow / I didn't know there was one." Well, I never saw a Negro scientist / I didn't know there was one.
>
> You have to know the route if you're going anywhere. You can't go anywhere without knowing the road.

By way of contrast the white youngster—particularly if he comes from the upper middle class—has been watched carefully for any sign of scientific talent and if it is detected he is encouraged by parents, teachers and friends to develop it. He gains the admiration of his adult acquaintances by solving mathematical and scientific puzzles. He is given scientific toys, his daddy may set him up with a home electronics shop. He is encouraged to enter science fairs and so on.

It would be revealing, I'm sure, if we had some statistics on a batch of physics majors, say the June 1968 graduates in physics:

- % whose fathers were physicists
- % whose fathers were other kinds of scientists or engineers
- % whose fathers were on University faculties
- % who had done science projects — science fairs, etc.
- % who had home laboratories or electronics shops
- % who had close family friends who were scientists or engineers.

All of these would be high, relative to a similar sample of the total graduating class. Very few black kids have the benefit of this kind of association or this kind of experience.

In addition to these advantages, the white student has the image of Newton, Maxwell, Faraday, Michelson, Fermi, Einstein and younger men in physics today, younger by my standards—in their 30s or 40s like Schwinger, Feynmann and Gell-Mann—an image of prestige—very high prestige—and it is a white image. If he happens to be Jewish the image is even stronger—Einstein, Feynmann, Schwinger and Gell-Mann are not only white—they are also Jewish.—It gives one confidence.

The black kids have no such image and no such source of confidence. I would say that a bright black kid can do no greater service to his race than to win a Nobel prize in physics. I would put it on a par with becoming President of the United States. That image of a guy you can emulate is very important.

I admit to sounding provincial or chauvinistic about physics but what I have said about physics would apply similarly to the other sciences and engineering and to a greater or lesser extent to other academic pursuits. The question is whether these deficiencies in background and environment can be overcome. More specifically, from our point of view, the question is whether they can be overcome starting with the freshman year in college. We're simply not in the business of training prior to that.

The two programs at the University of Illinois are set up to do it if it can be done. Five years from now we hope to have a lot more information on the extent to which it can be done and how to do it.

Let me describe these programs.

The University of Illinois—like most big schools—has been predominantly white middle class with, of course, a few blacks and a few foreign students to make us a little more cosmopolitan. Until this year the percentage of black students was about 1% —1.2% last year.

Since the Negro population in the State is 12-14%, this tokenism bothered some of the faculty and administration. Therefore some effort was made to change it and a program was started to bring in 200 new black students for the 1968-69 school year. The Black Student Association on campus said, "That isn't enough—we want 500."

It is a credit to the administration (and perhaps administration should be read Chancellor Peltason) that they said "OK help us recruit them and we'll do what we have to to educate them." This was 500 in addition to the anticipated and budgeted for enrollment, so it was indeed a bold commitment on the part of the administration.

To help raise money for the program and to rally the support of the University community, a fund drive was conducted on the campus and other sources of funds were sought. Special courses were set up in math, chemistry and rhetoric for students whose background preparation was under par. Volunteer tutors were sought in many areas to give individual help.

The entrance requirements were not appreciably altered. The University normally accepts students from the upper 50% of the high school class and

(Continued on page 5)

Tapping Latent Science Talent in the Ghetto

(Continued from page 4)

this criterion was used for the "500," though these students mostly from ghetto high schools scored more poorly on standard tests than the upper 50% of suburban and small city schools.

The students in project "500" were advised to take no more than 12 semester hours during the first year, some of them as few as 8 or 9. Also the rules for removal of academic probation have been somewhat relaxed. A student (and this applies to all students—not just the 500) has three semesters to bring his grades up rather than one as had been the previous requirement.

"Project 500" actually involves more than 500 students (565 by latest figures). The recruiters were much more successful than had been anticipated. Also, since the recruiting wasn't started until last summer, we missed the students who had made earlier plans to go to college and academically would probably have helped the average. Needless to say, this number strained the resources of the University both academic and financial.

In spite of the fact that the project was hastily conceived and hastily executed we are now more than half way through the first semester. I believe that from midterm evaluation the prospect is that the drop-out and flunk-out rate for the 500 will be no higher than that for the student body as a whole.

"Project 500" is an exciting and challenging program on our campus and it is the chief topic of cocktail conversation. But it is not without its problems, the greatest of which resulted from a mass demonstration that occurred even before school started. And if you have heard of the project at all, you have probably heard of this incident.

In short, near the end of a two-week orientation period before school started, the students in the project held a meeting to air grievances about housing and financial aid. They met in the Union and were encouraged by some of the more militant black student leaders to stay until they got answers to some of their questions from the administration.

The administration was either unable or unwilling to accede to their demands and the result was a sit-in at the Union. There was some vandalism resulting in some damage to the furnishings of one of the lounges and the local police were called in. 244 arrests were made and those arrested were charged with mob action. I should note that most of the 244 were not involved in the damage—were not even in the same room. The damage resulted from the actions of a very few who may not even have been students.

The students were released on the cognizance of some local people who stepped forward and arrangements were made for those involved to proceed with their education.

This incident has caused some problems for the disciplinary machinery at the University and it has raised some questions about our disciplinary procedures. It has also caused some unfavorable reaction to the program throughout the State.

This incident and its repercussions are only obliquely related to my story, but they are illustrations of the problems that can arise out of the suspicions within the black community and the incomplete acceptance of programs of this kind by the white community.

In spite of these difficulties I believe optimism is justified about the program as a whole. The students in the program with whom I have had contact are genuinely determined to get themselves a college degree.

The program in the Physics Department is of a somewhat different nature but is complementary to the "500 project" and in fact it was conceived before the project 500" was launched.

Our aim is to recruit at both the undergraduate and graduate levels, Negro students who appear to be capable of completing the course in physics. Our ultimate goal at the undergraduate level is to find qualified Negroes to make up about 10% of the majors in physics. We would like to recruit 10 for the next academic year and approximately 20 in succeeding years. We make no bones about the fact that we would like to attract the 10 best qualified Negro kids in the country. We are selfish.

One of the reasons, I'm sure, that black physics majors have a tough time is that they haven't been given the opportunities and individual attention to make up for the deficiencies in background and self-confidence that Dr. Wilson referred to. We are prepared to give them special attention in early tutoring and guidance. The University Administration has granted our request for additional staff to do this. Fortunately some of our very best young faculty are interested in taking this on as part of their responsibility to the department.

Another reason why black students have trouble —again as pointed out by Dr. Wilson—is that they generally face a totally white faculty. We have done something about that too. We were able to hire this fall a Negro assistant professor who is both well regarded by his colleagues and has a personality that will attract students to him. The fact that we had already committed the department to this program was a key factor in attracting him. The students at Illinois will know there is a Negro physicist—they can see one!

If we are successful in this program the Negro physics major will find himself one of ten or more in our department instead of one of one, two or three in most big physics departments. And he will have at least one black ally on the faculty and a department interested in his success. Illinois should stand out as the school where a black kid can learn to be a physicist.

And now for the commercial. You teachers represent a pretty good cross section of the schools in the country where students are best prepared to go

(Continued on page 6)

NEWS ITEMS — Continued from page 1

in the modern political concept. Politics notwithstanding, the Russians have undoubtedly reduced the quantitative lead in strategic missiles long held by the United States. Today the Russians have, perhaps, 900 missiles and are believed to be installing at least 200 more. This may put them slightly ahead in the land-based missile category sometime next year. But when Polaris submarines and long range bombers are added to the scales the United States still leads in both total numbers of warheads and bombs and, probably, in the accuracy and reliability of delivery systems.

Both sides are working to introduce cluster warheads containing so-called multiple independent targetable reentry vehicles (MIRV's) into their ICBM forces. This will multiply the number of accurately deliverable warheads in existing missile forces several-fold.

Furthermore, the Russians have deployed, and the United States will soon deploy, limited anti-missile defenses. (William Beecher in the *New York Times;* 3 November 1968)

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"To say that men are not yet doing enough to limit their numbers could be the understatement of all time", according to William S. Gaud. The head of the United States Foreign Aid program asserted that the U.S. is "doing badly" in helping developing countries meet their critical food and population problems. However, though Mr. Gaud deplored the shrinking foreign aid program, he said he does not share C. P. Snow's despair for the future of mankind. (*New York Times;* 21 November 1968)

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"Antihope" is the direction the world is taking, C. P. Snow said in a lecture on world problems at Westminster College. "Nearer to despair this year, 1968, than ever in my life," the 63-year-old British author and statesman said that "in 1967 one could feel it in the air" but that "this year one can see it." There is very little hope that the richer countries will ever cooperate with each other sufficiently to head off collision between soaring population and a limited world food supply with staggering famine the result.

Referring to the complexities and horrors of the modern world, Lord Snow predicted a "sea of famine" engulfing the rich countries by century's end unless three steps are taken. They are: a concentrated effort by the rich countries to assist the poor; an effort by the poor countries to revolutionize their food production and a reduction in population increase throughout the world.

Three alternatives are predicted thirty years hence by Lord Snow. Gloomiest is continuation of the super-powers' arms race. Second depends on agricultural science giving mankind a generation's breathing space to think things over. Most unlikely, he said, is for the world to break out of the "seige" and make the sacrifices necessary to avert disaster. (*New York Times;* 13 November 1968)

Tapping Latent Science Talent in the Ghetto

(Continued from page 5)

into science. We at Illinois are interested in attracting good students period. Bue we are particularly interested in attracting good Negro students. Perhaps you can help us in our recruiting. We can guarantee a financial aid package that will be attractive and an opportunity to get acquainted with physicists while they are learning, and to see what goes on in a physics laboratory.

I might point out that we are also actively recruiting Negro graduate students in physics.

Finally, with this emphasis, in both of these programs, on educating black kids you may ask—are we neglecting the whites. The kind of individual attention that we are, in a sense, forcing on the Negro kids is available to the white kids also if they avail themselves of it.

I suspect that we will find that the things we have to do for the black kids in these programs to help them succeed are things that we should have been doing all along for a good fraction of our white students. I think the whole educational process will profit from what we learn in these programs.

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