Global Protection Against Limited Strikes (GPALS)

Briefing On The Refocused Strategic Defense Initiative
(Edited Transcript)

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BRIEFING AGENDA

This briefing is comprised of three parts: the changes, particularly during the last twelve months, in the strategic environment in which defenses are viewed; our conclusions regarding consequent changes in the policy framework for SDI, and funding and programmatic implications for the specifics of the SDI program.

On February 12, 1991, in the Pentagon's Press Center, Mr. Hadley discussed the emerging strategic environment and the Bush Administration's new refocused SDI policy which is responsive to that emerging environment. Ambassador Cooper discussed technical funding and programmatic aspects of the refocused SDI program. The following is edited from the transcript of that briefing, which has been broadcast nationwide on CSPAN.
BRIEFING AGENDA

- Emerging Strategic Environment
- New SDI Policy Framework
- Funding / Programmatic Implications
PRESIDENTIAL DIRECTION

In his State of the Union address, the President reflected a decision which he had previously made. He directed that the SDI program be refocused with the principal objective of providing protection from limited ballistic missile strikes, whatever their source. That is an important change. In addition, he emphasized that we are providing protection not only for the United States, but also for our forces and citizens overseas U.S and for our friends and allies.
"... Looking Forward, I Have Directed That The SDI Program Be Refocused On Providing Protection From Limited Ballistic Missile Strikes, Whatever Their Source. Let Us Pursue An SDI Program That Can Deal With Any Future Threat To The United States, To Our Forces Overseas And To Our Friends And Allies."

President George Bush
State Of The Union Address
29 JAN 91
CHANGES IN THE STRATEGIC ENVIRONMENT

That conclusion and redirection of the program reflects an assessment of the changed strategic environment in which we now have to view the issue of defenses. One of the principal changes is the evolution that has occurred in the East-West relationship which has changed somewhat the calculus for defenses.

There are some things which we need to point out which have not changed in that relationship. As Secretary Cheney made clear in recent Congressional testimony, the Soviet Union, even under a START treaty, retains now and will retain for the foreseeable future, large and modern strategic offensive forces. Additionally, the political instabilities in the Soviet Union have, in some measure, increased concern about the potential for Soviet use of ballistic missiles -- and also raised questions about the prospect for accidental or unauthorized use.

That said, it is fair to conclude that the changes we have seen in the East-West relationship have reduced considerably the risk of conventional and nuclear war with the Soviet Union. That remains true, notwithstanding some of the uncertainties we've seen in that relationship recently; the issue of Baltics, the uncertainties in the arms control process and the uncertainties about the internal situation in the Soviet Union. We hope this will continue to be the case in the future and that the East-West relationship will continue to improve.

If the threat and risks associated with the East-West dimension are down, the threat posed by ballistic missile proliferation is up. That is a threat not only to the United States, but also to U.S. forces overseas, U.S. allies and friends. It is also a threat to the Soviet Union, an observation which may offer additional opportunities for future East-West cooperation.

We have begun to see this threat very graphically in terms of U.S. forces and U.S. allies in the Persian Gulf. In summary, what we've seen in the strategic environment is that, while there may be a decrease in the threat rising out of the East-West relationship, the threat of third country attacks is certainly one that is increasing.
• Evolving East - West Relations Changes Calculus
  - Soviet Union Will Retain Large, Modern Strategic Forces
  - Political Instabilities Increase Concern About Soviet Use Of Ballistic Missiles

• Ballistic Missile Proliferation A Growing Threat To U.S.
  - Directly Threatens The Soviet Union

• Threat Of Third Country Attacks Increasing
REGIONAL INSTABILITY

Considering the broad strategic environment, there seems to be a likely continued prospect for regional military conflict. The proliferation of ballistic missile systems has substantially raised the stakes of those conflicts for the participants because ballistic missiles are very effective in delivering weapons over great distances. With a chemical, biological or even nuclear warhead on these missiles, the stakes obviously rise considerably.

The traditional deterrence calculation, which has been the centerpiece of the East-West nuclear equation, may be very inappropriate for these kinds of ballistic missile threats in a regional environment. We may not in such a context be dealing with a traditional rational actor for whom traditional deterrence theory is valid. Saddam Hussein has demonstrated that he is willing to subject his countrymen to a major war for territorial gain. He has used Scud missiles which are really missiles of terror rather than military utility -- and used them against populations that are not even part of the coalition arrayed against him. Indeed, rather than deterrence of retaliation having any inhibiting effect, he has been seeking to provoke retaliation from Israel.

We have seen the effect that the availability of the Patriot defenses for Israel and Saudi Arabia have made to this equation. There has been much debate about the kinds of tough choices that would be involved for the U.S. in deciding how to respond if Saddam Hussein were to use chemical warheads, for example. One of the important things about ballistic missile defenses is that they offer the prospect of relieving us of those tough choices, to give an option to respond to that kind of threat with defenses rather than by retaliation.
• Continued Prospect For Regional Military Conflict

• Rapid Proliferation Substantially Raises Stakes Of Regional Conflicts

• Traditional Deterrence May Be Inappropriate For Regional Conflict
THE CURRENT THIRD COUNTRY BALLISTIC MISSILE CAPABILITY

This is an indication of the current third country ballistic missile capability which we now face, including countries which have these systems and their ranges. Many countries have ballistic missile systems now, and the number is likely to grow since a number of countries have been very willing to export these systems. Additionally, countries are increasingly developing an indigenous production capability, which means that proliferation is increasingly difficult to stop by export controls.

These systems also provide threats to some of our most important allies, and would threaten areas of the world in which United States forces need to be able to travel unhindered. This threat is more real to the Soviet Union today. That fact may provide an incentive to work a common problem which applies to both the United States and the Soviet Union.
THE EMERGING TREND IN BALLISTIC MISSILE PROLIFERATION

The number of countries with this capability is substantial and is growing.
(Numbers Approximate)

<table>
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<th>Number of Nations</th>
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<tr>
<td>Current Ballistic Missile Capability</td>
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<td>Ballistic Missile Capability By The Year 2000</td>
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PROGRAM FOCUS

The preceding analysis has led us to a new focus for the SDI program and for our effort regarding ballistic missile defenses. We now seek a system that will protect against ballistic missile attacks on United States forces overseas and United States friends and allies. This is a new focus -- SDI is not simply about defending the United States.

Secondly, this focus also leads to a narrower program, one which is seeking protection against accidental or unauthorized, limited ballistic missile attacks on the United States as well as our friends, allies and forces overseas.

The acronym for this new revised approach is GPALS, which stands for Global Protection Against Limited Strikes. The essence of the program is to provide global protection -- not only to protect the continental United States, but protection of the entire United States as well as our forces overseas, our friends and allies. It is global, it provides protection, and it is against limited strikes.
Objective

- Protect Against

  - Ballistic Missile Attacks On U.S. Forces Overseas And U.S. Friends / Allies

  - Soviet And Third Country Accidental, Unauthorized And / Or Limited Ballistic Missile Attacks On The United States

Global Protection Against Limited Strikes

GPALS
THEATER MISSILE DEFENSE

One of the key elements of this refocusing is an increased priority for the theater missile defense programs. The experience with the Patriot missile in the Persian Gulf will undoubtedly focus even more attention on this priority.

Congress has supported and appropriated additional funds for this area last year. One of the objectives of the program is to focus on near-term deployment of improved theater missile defense systems. This is also an area in which we could potentially expand our current degree of cooperation on ballistic missile defense with our allies.
THEATER MISSILE DEFENSE

- Increasing U.S. Priority On TMD Programs
  - Congress Appropriated Funds To Accelerate TMD
  - U.S. Plans To Deploy TMD Systems In Near Term

- We Seek To Expand Current Cooperation With Allies
  - Build On Ongoing Cooperation
    - Theater Architecture Studies
    - Computer-based TMD Test Beds
    - Interceptor Research
  - Open To Other Avenues Of Cooperation

- If An Ally Chooses To Deploy TMD, U.S. Envisions Autonomous Systems Potentially Capable Of Interoperability With U.S. Defenses
WHY NOT GROUND-BASED ONLY?

This question regarding SDI refocusing is one which will be a matter of much debate. Why isn't Patriot enough? Why doesn't it provide the solution? Why must you go into space?

It should be clear that the issue is not space versus ground. Even with emphasis on ground systems, you need space elements, at a minimum space-based sensors, to make those systems as effective as we need and want them. So, the issue is not whether or not we will be in space. We will be in space, certainly with sensors. The issue is whether we will be in space with space-based weapons. There are some real advantages to these systems, particularly as the threat matures and improves over time.

Space-based weapons would always be in position. They could protect and offer defense against threats to forces arriving in theater before theater commanders have been able to establish their own organic theater defense capabilities. Space offers broad area coverage to protect a wide array of assets from a system based in space rather than having to protect each of those assets with their own individual ground-based systems.

Space-based weapons and the capability to deploy space-based weapons still are a key hedge against a resurgent Soviet threat and also provide incentives for the Soviets to "de-MIRV" their ballistic missiles, a longstanding United States arms control objective.
WHY NOT GROUND-BASED ONLY?

- Space-based Sensors Essential For Effective Defenses -- Even Ground-based Only

- Global Protection Against Limited Threats Requires Space-based Weapons
  - Always In Position
    - Protects Ports / Airfields For Arrival Of Forces
  - Broad Area Coverage
    - Protects Many Targets At Once
    - Equivalent Cannot Be Done Affordably From The Ground
  - Protection Of Friends / Allies Consistent With Coalition Approach To Security Threats

- Space-based Weapons – The Key Hedge Against Resurgent Soviet Strategic Threat, And Provides Incentive For De-MIRVing
WHAT IF IRAQ HAD A LONGER RANGE MISSILE?

Now, this is a notional chart, constructed to explore how we could dramatize in some measure the contribution a space-based system could make to solving potential regional conflicts. This chart is to shed light on the following question: Given what we've seen the political effect of Iraqi Scuds in the attacks on Israel and Saudi Arabia, how would the dynamics of the current coalition opposing Iraq in the Gulf, and the dynamics of the current conflict, change if, at this point in time, Iraq had a ballistic missile of, say, 4500 kilometer range?

This kind of target expansion would permit Saddam Hussein to use ballistic missiles as essentially a political weapon of enormous consequences. You can see that a number of the capitals of our coalition allies would come at risk.

The point to be made is that for Patriot missiles to defend all these potential targets would be a very daunting and expensive task. However, a space-based system allows a much less expensive opportunity to protect against ballistic missiles without having ground-based interceptors to defend each of these cities -- and many others.

The political significance of this ought to be clear. If Saddam Hussein could use ballistic missiles not simply against Tel Aviv and Riyadh but against this host of relatively undefended cities, that would have an enormous impact on the current coalition arranged against him.
WHAT IF IRAQ HAD A LONGER RANGE MISSILE?
AVIATION WEEK INTERVIEW OF LT GEN HORNER

This lesson was recently elaborated by Lieutenant General Charles A. Horner, Central Command's air component commander, as quoted in a recent issue of Aviation Week and Space Technology. This is a validation of the direction we have taken in refocusing the SDI program on providing global protection against limited strikes.
"I underestimated The Political Impact Of the Scud... A Lousy Weapon, A Terror Weapon"... A Miscalculation... Defused Only By The Success Of Patriot... Patriot Success Also has Exposed A Hole In The Allied Arsenal, Patriot Is A Point Defense Weapon, Areas To Be Defended In Saudi Arabia Are Concentrated In A Few, Small Clusters. If The Allied Military Targets Had Been Spread Out, There "Wouldn't Be Enough Patriots In The World To Defend" Them All.


Lt Gen Charles A. Horner,
Commander, U.S. Central Command
Tactical Air Forces
Aviation Week And Space Technology
11 Feb 1991
GPALS

The GPALS focus for the SDI program is a focus that reflects the changes in the strategic environment which we've outlined here. It is also more affordable; we believe it will be sustained by the public; and, hopefully, it will be the basis of an executive-legislative consensus to provide consistent support for the program over time.
- Reflects Changes In The Strategic Environment
  - Responds To A Threat Of Increasing Concern
  - Options Remain For Expanded Missions

- More Affordable

- Will Sustain U.S. Public Support

- Prospect For Executive - Legislative Consensus
STRATEGIC DEFENSES FOR THE 1990s

We believe that, without question, strategic defenses are relevant to the new international security situation. Those in the technical community have long believed that they are also feasible. The fundamental issue is whether or not we will be funded and have the flexibility to exploit the opportunities that exist to demonstrate and validate these technologies -- to show that defense can be made affordable, survivable, and effective; and that they can be considerably less complex than the systems that have been put forward in the past.
- Strategic Defenses Are
  - Relevant To The New International Security Environment
  - Technically Feasible

- Opportunities Now Exist In Strategic Defenses For
  - Demonstration / Validation Of Technologies
  - Further Cost Reduction
  - Increased Survivability
  - Increased Effectiveness
  - Reduced Complexity

- Strategic Defenses Can Begin To Add A New Dimension To U.S. Military Capability
WHAT DOES "REFOCUS" MEAN?

We refer to this new mission as Global Protection Against Limited Strikes, or GPALS. With GPALS, we are talking about protection against limited strikes, rather than deterrence of a massive attack.

Just to give a quantitative measure -- we mean that we want to destroy with high confidence all of a limited number of incoming reentry vehicles -- or RVs. The number may be ten to 100 or 200 RVs, and they might be delivered by ballistic missiles launched from anywhere in the world to attack areas anywhere else in the world. This mission is in contrast to the prior mission, which was to destroy a percentage, on the order of half, of a mass raid involving several thousand RVs launched out of the Soviet Union toward the United States.

So we're talking about a focus shift from the United States, so far as the area defended goes, to a worldwide or global focus for our forces abroad, for our allies and friends as well as the American people. And we are talking about a limited deployment as opposed to a large-scale deployment of systems, both in space and on the ground, both here in the U.S. and potentially abroad.

We would also emphasize that we have changed our previous slides to refer to "the United States" rather than CONUS. We intend to provide protection for the Americans in Hawaii and Alaska as well as the other 48 states.
WHAT DOES "REFOCUS" MEAN?

- Deterrence vs Protection
- Massive Attack vs Limited Strikes
- United States vs Global Focus
- Large-scale Deployment vs Limited Space-And Ground-based Deployment

Changing Strategic Environment

Phase I SDS

GPALS
A REPRESENTATIVE GPALS DEPLOYMENT

As a component of a representative GPALS deployment, there could be transportable defenses that could be moved into a theater or region, if and when a hot spot might develop. In some places that are continuing hot spots, such defenses might be deployed indigenously. Such an indigenous system could be the Arrow system which we are developing jointly with the Israelis. Such systems might be owned by the United States and moved into a hot spot area upon demand, or they might be owned by the allies.

The ground-based defense that would be deployed in the United States to defend against long range ballistic missiles would involve some 50 percent fewer interceptors than previously considered. It would also continue to consist of both space- and ground-based sensors.

The space-based element of the architecture, Brilliant Pebbles, is reduced by three-quarters from its original deployment level to something on the order of a thousand pebbles as opposed to in excess of 4000.
A REPRESENTATIVE GPALS DEPLOYMENT

- Transportable Surface-based Defenses Against Theater / Tactical Ballistic Missiles
  - Owned By U.S. And U.S. Allies

- Ground-based Defense Against Strategic Ballistic Missiles
  - 50% Fewer Interceptors Than For Phase One
  - Space- And Surface-based Sensors

- Brilliant Pebbles - Global Defense Against Ballistic Missiles With Range Greater Than Several Hundred Miles
  - 75% Fewer Pebbles Than For Phase One
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)
— Defense Against Theater / Tactical Ballistic Missiles —

To illustrate GPALS conceptually, we have constructed a child's puzzle with three pieces. The size of the pieces reflect the relative investment in the three elements of the GPALS system. Pictured on each of the three pieces are the key components on the corresponding three elements of GPALS.

In the case of theater defense -- or the defense against the shorter ranged theater ballistic missiles -- we have programs that would begin by continuing and extending the upgrades to the Patriot system to extend its range capability and effectiveness. We will have a follow-on agreement with the Israelis to support development of the follow-on to the Arrow system referred to as ACES. THAAD is a high altitude defense that the Army has been considering in concept studies up to this point. We have accelerated that program considerably to put it into a "face off" with the Arrow program, a challenge for our industry to produce a wide area defense for theater applications by the mid 1990s.

We will continue to rely on ground-based radars. This ground-based radar, in a sense, will constitute a building block for the ground-based radar for the U.S. defense. And, of course, there is a command center element which would be associated with such a defense.

These theater interceptors could be deployed on land or on ship. There is also the possibility of airborne interceptors which might play in scenarios such as we are now experiencing in the Persian Gulf.
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)

Command Center

TMD-GBR

ARROW

P^3\text{1}

PAC II

ACES

ERINT

THAAD

Defense Against Theater / Tactical Ballistic Missiles
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)  
— Defense Against Strategic Ballistic Missiles —

The other ground-based element of GPALS is the defense against strategic ballistic missiles, to be deployed in the U.S. This ground-based system includes a satellite sensor we call Brilliant Eyes, which will play an important role in both improving the effectiveness of theater defenses as well as defenses against the longer-ranged strategic ballistic missiles.

Inclusion of such a space-based sensor system underscores a fact about space-based versus ground-based defenses. Even ground-based defenses require space-based sensors if they are to reach their potential. Even today, we are drawing upon information we get from space assets to make Patriot more effective in the Gulf.

The Ground-based Radar (GBR) is much smaller and more mobile than in the previous architecture. Its development will build on the development program for the smaller GBR employed in the theater missile defense system.

Other elements of the ground-based architecture include two interceptors designed to work on two formidable technical challenges in parallel. We have budgeted money to carry both of them through the demonstration and validation phase. Once we go into full-scale development, whether we carry one or both depends on that competition.

We have budgeted funds for the Exo-endoatmospheric Interceptor, or E^2^I, which is the more expensive of the two options. E^2^I performs its intercept high in the earth's atmosphere, after the reentering RVs can be distinguished from lighter decoys because the atmosphere causes distinct deceleration characteristics -- however, we must solve a critical engineering problem to assure that sensors will perform properly under severe atmospheric heating conditions. E^2^I may be the only way to solve the very tough mid-course discrimination problem, which has challenged defense designers for over 30 years, ever since we began working on this problem.

If we're able to successfully solve the discrimination problem in midcourse, then the Ground-Based Interceptor, or GBI would be the interceptor of choice, to intercept the missiles and the RVs as far away from the United States as possible. It is less expensive than E^2^I and would perhaps allow us to deploy a mix of both Ground-Based Interceptors and E^2^I. It should be noted that it may be important to have an endo-atmospheric interceptor in any case.

You will note that the size of this block is roughly twice the size of the theater missile defense, indicating roughly twice that investment.
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)

Defense Against Strategic Ballistic Missiles

Defense Against Theater / Tactical Ballistic Missiles
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)
— Brilliant Pebbles —

The final element of the GPALS architecture is the space-based interceptor portion called Brilliant Pebbles. Each Pebble is an autonomous interceptor which can act entirely on its own, once appropriately authorized. It basically looks and sees the ballistic missiles when they rise from their silos, or, in the case of the Scud, from a mobile launcher. At the appropriate time, it drops its "life-jacket" and proceeds to maneuver into the oncoming path of the threat ballistic missile — or, during the mid-course phase, of a re-entry vehicle transiting space.

A misconception is that Brilliant Pebbles could not be employed effectively to counter theater ballistic missiles. If the range is greater than a few hundred miles, normal minimum energy trajectories would carry the RV's above the earth's atmosphere and there would in fact be time to intercept them from space using Brilliant Pebbles. If we had such a system today, it could be employed to counter the Scuds launched out of Iraq into Tel Aviv and Riyadh -- and the debris from such intercepts would probably burn-up when reentering the earth's atmosphere rather than fall on city streets.

Brilliant Pebbles is neither simply a defense for the U.S. nor for the theater. It is in fact a bridge across both. It provides a means of intercepting any ballistic missile so long as its range is more than a few hundred miles -- assuring that it reaches sufficient altitude, perhaps 60 miles, to permit an intercept in space.

The area of the Brilliant Pebbles piece of the puzzle is approximately the same as that of the theater missile defense piece -- and half that of the U.S. ground-based defense against strategic ballistic missiles. This is in proportion to the relative cost of the three elements of the GPALS system.
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)

Global Defense Against Ballistic Missiles With Range Greater Than Several Hundred Miles

Defense Against Strategic Ballistic Missiles

Defense Against Theater / Tactical Ballistic Missiles
GPALS ELEMENTS - BRILLIANT PEBBLES

Brilliant Pebbles is an autonomous system. Once authorized, it looks, sees its potential targets, makes a decision on whether to engage, decides on its preferred target, and maneuvers into the path of the chosen oncoming ballistic missile. It also tells its neighbors what it is doing; its neighbors take that information into account and make their own decisions about whether to engage and against which targets. During the battle, it is not controlled by a centralized battle management system, although it must be authorized to enter the battle.

Because of its autonomous mode of operation, the Brilliant Pebbles system cannot be attacked easily. It is survivable, meeting one of the important criteria required by Congress of systems to be developed and deployed. It is also cost-effective and affordable.

Each of these Pebbles will cost from something in the order of a million dollars, perhaps one and a half million. Launch costs could double that cost. In particular, if a Pebble were to intercept a MIRVed ballistic missile, it would clearly be less expensive than its target and certainly much less expensive than the things a MIRVed missile could attack. With systems such as the SS-25 or the shorter range missiles, Pebbles is also in the ballpark of a cost trade that is reasonable.

Research, development, testing and deployment of the Brilliant Pebbles systems is expected to cost about $10 billion in FY 88 dollars.
Global Defense Against Ballistic Missiles With Range Greater Than A Few Hundred Miles
GPALS ELEMENTS - GROUND BASED

This is an illustration of the ground-based system elements. Again, it includes Brilliant Eyes, which is an important aspect of the ground-based architecture. Brilliant Eyes begins to track the re-entry vehicles and the decoys as they are dispersed from their bus, in the post-boost phase. Because Brilliant Eyes will be closer than the previous space surveillance and tracking system to the tracked objects, they may be more effective in discriminating RVs from decoys.

As mentioned earlier there is a competition between the Exo-Endoatmospheric Interceptor (E²I) and the Ground-Based Interceptor (GBI) as to which would perform the high altitude intercept. GBI would intercept threat RVs outside of the earth's atmosphere. E²I would intercept threat RVs inside of the earth's atmosphere. Which interceptor we would lead with would depend on whether we're better at working the discrimination problem or the atmospheric heating problem (to assure we can see the RV's as they reenter the earth's atmosphere).

The Ground-based Surveillance and Tracking System (GSTS) is an Army system. It is a sensor launched on a probe, which will be used to fill in gaps in coverage that might exist or possibly as key system element of a GBI-only (ground based interceptor-only) system.

Research, development, testing and deployment of the U.S. ground-based defense against strategic ballistic missiles is expected to cost about $22 billion in FY 88 dollars.
Defense Against Strategic Ballistic Missiles
GPALS ELEMENTS - STRATEGIC

This chart illustrates all the components of the U.S. defense architecture against ballistic missiles with ranges greater than a few hundred miles that might be launched against the United States. It illustrates dealing with an SLBM. You will note that E²I permits a low-altitude intercept. This is important in protecting against submarine-launched ballistic missiles, which can be launched on short time-of-flight, or depressed, trajectories from relatively near our coasts. If we wish to defend key target areas, it may be important to have a low-altitude, endo-atmospheric interceptor.

Research, development, testing and deployment of these system elements, which compose the traditional SDI architecture albeit of reduced size for GPALS, is expected to total about $32 billion in FY 88 dollars.
GPALS ELEMENTS - THEATER

These are the key GPALS elements that could provide defensive capabilities in a theater or regional conflict.

The chart also shows a possible ground-based interceptor launched from land as well as from a ship. The Navy has an extraordinary air defense and missile defense for the fleet. An interceptor compatible with that indigenous capability could be very useful -- and our architecture studies with the Navy are considering such options. The Air Force is also considering the possibility of launching interceptors from tactical aircraft. We have budgeted about $9 billion (in FY 88 dollars) for the research, development, testing and deployment of such theater defense systems.

Brilliant Pebbles could have a role against missiles, so long as they go above about 60 miles altitude -- corresponding to a range greater than about 300 miles for a minimum energy trajectory. Brilliant Eyes also plays a role in enhancing the effectiveness of the theater architecture. The proposed budget for these systems is included under the "strategic" element of GPALS.
Defense Against Theater / Tactical Ballistic Missiles
GPALS ELEMENTS - STRATEGIC

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GPALS ELEMENTS - STRATEGIC AND THEATER

This chart fits all the pieces together -- strategic and theater -- for a complete perspective. Research, development, testing and deployment for all these elements is expected to cost about $41 billion in FY 88 dollars.
GPALS ELEMENTS - STRATEGIC AND THEATER

Brilliant Eyes

Reentry Vehicles (RV) & Decoys

Post-boost Vehicle (PBV)

Boost Phase

U.S. / Allied Theater Defenses

Command Center

E²I / GBI

GSTS

Brilliant Pebbles

SLBM

GBRT
SYSTEM ACQUISITION COST EVOLUTION

This chart addresses the cost of GPALS in the context of FY 88 dollars. FY 88 is the point of reference because that is the number normally used for comparisons of all architectural options since the Defense Acquisition Board meeting in 1987.

That board established an estimate for the initial Phase I architecture at about $146 billion. By November of last year, innovations to the architecture for the old Phase I mission had reduced those estimates to around $53 billion.

Looking at what is discussed for GPALS, the $32 billion SDI block relates directly to the elements considered in the past as a part of Phase I -- i.e., Brilliant Pebbles and the ground-based defense against strategic ballistic missiles. It is some $20 billion less than the complete Phase I architecture would have been.

To complete the GPALS system $9 billion has been added to cover the investment costs for the defense against theater ballistic missiles. All together, we anticipate the research, development, testing and deployment of GPALS will cost $41 billion in FY 88 dollars.
SDI BUDGET EVOLUTION

This chart illustrates, in FY 91 constant dollars, the overall investment strategy over a 20-year time-frame. It was constructed to address questions of affordability raised by Senator Nunn and others during last year's Congressional debate. Congressman Bennett referred to a $12 billion request in the mid-1990s in an OpEd published by the Washington Post last week. If he had in mind last year's plan he was correct. However, the cost of our current plan has been greatly reduced.

We have arbitrarily established a limit at $6 billion in the mid-1990s and the GPALS program has been paced accordingly. Proportionately, $6 billion is about 20 percent of the amount spent on strategic programs today, and about two percent of today's overall defense budget.

The big cut in FY 91 is due to the Congressional cut to the President's budget last year. This was the third year in a row that our program was cut. We are seeking to restore the funding level that existed in the FY 88 period. Such a level is necessary to develop and deploy defenses for the American people by the end of this decade.

Last year's severe cut reduced the support for the technical base and the follow-on activities to a lower level than was appropriated in 1985, the first year SDI received appropriations.

The chart illustrates that we have been focusing our research, development and testing activities since 1987 on building a real capability and making that capability effective and efficient. SDI is no longer just a tech base or research program.

The ground-based/space-based ratio on the chart also indicates that considerably more -- by about a factor of three -- of the investment is in the ground-based part. Brilliant Pebbles has helped to make the space-based element much less expensive than it was prior to last year. This clarification of our investment strategy refutes the all too frequent claims that the rest of the program is being indirectly taxed to support our space-based tier, Brilliant Pebbles.
BMD BUDGET EVOLUTION

This chart shows an overlay of the additional budget for the Theater Missile Defense Initiative (TMDI). Congress appropriated a new line item within the Department of Defense to focus on the early deployment of theater missile defenses, and the Secretary has assigned SDIO the responsibility for managing that program. The illustration reflects the dollars to support that particular line item. It is funded under the conventional programs, not under the strategic programs, budget line. The operational commanders establishing the requirements for TMDI are primarily conventional force commanders.

The vertical lines on the chart correspond to Initial Operating Capability dates for various theater defense elements during the first half of this decade, beginning with an upgrade to the current Patriot system. This will be followed by ERINT, which is a force enhancement, quadrupling the Patriot firepower with a hit-to-kill interceptor; and, as noted earlier, we are working with the Israelis to deploy Arrow by the mid-1990's. Arrow or THAAD, a wide area interceptor under development by the Army, will enable protection of 10 to 100 times the area of an existing Patriot battery.

The deployment dates for defenses for the American people against long range strategic ballistic missiles will come in the late 1990s, as illustrated by the vertical shaded region. To repeat, early deployments have to do with theater, not strategic, defense in the first half of the mid-1990s; the strategic defense deployment dates come late in the second half of the decade.

If we don't rectify the impact of last year's budget cuts by restoring our budget to FY 88 levels, deployment of a defense for the American people will likely slip into the next century.
BMD BUDGET EVOLUTION

TMDI

SDI

BP
BE
\( E^2 \text{I} / \text{GBI} \)

DoE
SDI TMD

Global - Space

U.S. - Ground

Tech Base / Follow-on

Support

FY 91 $ In Billions

Fiscal Year

85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05
GBI TECHNOLOGY HISTORY

This chart illustrates our progress in demonstrating technical feasibility. The ground-based interceptor program is headed toward reducing size and weight to a deployable product weighing 10 to 20 pounds in the late 1990s.

In 1984, the Homing Overlay Experiment (HOE) exploited 1978 technologies to demonstrate with an interceptor weighing over a ton that we could, in principal, "hit a bullet with a bullet" -- with closing velocities approaching 7 km/sec. The ERIS test last week repeated this feat under more complex conditions with an interceptor based on 1986 technology weighing a few hundred pounds.

Where we are headed next in the ground-based interceptor program is toward reducing the size and weight as illustrated by the chart in the upper right hand corner, to a few tens of pounds and to something that might be deployable in the late 1990s that might weigh 10 to 20 pounds. Such an interceptor will have much more capable computers, sensors and propulsion units than we have today. And of course, if we move to deployment it will mean that along the way we will have worked to our critics' satisfaction the midcourse discrimination problem.
GBI TECHNOLOGY HISTORY

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<td>GBI Evolution</td>
<td>HOE Kill Vehicle</td>
<td>ERIS FTV Kill Vehicle</td>
<td>GBI-X Kill Vehicle</td>
<td>GBI Baseline Kill Vehicle</td>
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SPACE - GROUND R&D INVESTMENTS

This chart illustrates the relative investment strategy between space- and ground-based elements and is intended to correct the misperception that the program is unbalanced and that we are spending too much on the space element, Brilliant Pebbles, as compared to other system elements. Historically, the investment strategy called for about the same level of investment in both the ground-based and the space-based tiers. In 1991, there was a substantial drop in our investment in the space-based portion. The innovation provided by Brilliant Pebbles meant that we no longer required the BSTS -- Boost Surveillance and Tracking System -- as an integral part of the architecture.

The future objective is to return to the earlier investment level for the space-based tier -- to roughly the same level as in the three years preceding 1991. At the same time, we intend to move out more rapidly with the ground-based elements so as to have concurrent space-and ground-base deployment dates in the late 1990s.

The investments in theater defenses are for primarily ground-based systems, although they might be sea-based, and we're even looking at the possibility of air-based interceptors in one architectural study.

This year, we are spending approximately $2 on the ground-based elements for every $1 on the space-based element. By 1993, we anticipate spending $3 on ground-based for every $1 on space.

That sense of proportion goes with the size of the puzzle pieces shown earlier, which reflected basically the relative total investment costs -- about $10 billion for Brilliant Pebbles, $9 billion for the theater missile defense portion, and $22 billion for the defense against strategic ballistic missiles that would be based on the ground in the United States -- for a total of some $41 billion in 1988 dollars.
PROGRAM FOCUS

To reiterate our objectives, we are seeking protection; we are considering ballistic missile attacks involving a limited number of reentry vehicles -- tens to a hundred or so; and we are considering attacks on U.S. forces overseas as well as U.S. friends and allies. The source of these limited attacks might be the Soviet Union or Third countries -- some we know about today, but possibly others that might gain that capability in the future.
Objective

- Protect Against

  - Ballistic Missile Attacks On U.S. Forces Overseas And U.S. Friends / Allies

  - Soviet And Third Country Accidental, Unauthorized And / Or Limited Ballistic Missile Attacks On The United States

Global Protection Against Limited Strikes

GPALS
Q and A's, 12 Feb 91 Press Conference

IQ. Ballistic missile proliferation is nothing new. Why is it a threat this year? Was it a threat last year or at any other time during the 1980s or before?

IA. (Mr. Hadley) I think it was a threat. There are threats that you see and you understand and you work, and then suddenly they become very graphic to you. That's really what has happened in connection with the Persian Gulf situation. It has been a concern of ours and we have tried to deal with it through a technology control and export control regime.

The MTCR, the Missile Technology Control Regime, is an example. What we've learned in connection with Iraq is that the MTCR is a very important element of dealing with the problem, but obviously only one element, and it is not a complete and sufficient solution.

We've learned two other things in the Persian Gulf conflict. The first is that to rely on offensive capability to hit mobile missiles and destroy them is difficult. It turns out to be hard to find mobile missiles and take them out. That's the second lesson we learned.

The third lesson we've learned from the Patriot experience is that, in addition to a regime that tries to control technology and in addition to trying to deal with mobile missiles with an offensive capability, something like the kinds of defensive systems Ambassador Cooper was talking about is an important element in dealing with this problem.

So, missile proliferation is a problem that we've had for a long time. We've had some things underway to deal with it. The Persian Gulf has both shown it to be a much more graphic and serious problem and has also shown that we need a multi-pronged approach to dealing with it in the future.

(Amb. Cooper) There's an aspect of that question which I would like to comment on. It has sometimes been charged that we are trying to reshape the SDI program as a reflection of what has gone on in the Middle East. I prefer to say that what has gone on in the Gulf is a validation of an approach which we had been advocating for some time prior to the current Gulf war. I completed and turned in an independent review for Secretary Cheney in March 1990 recommending our current approach. We were very much concerned about
the proliferation issue at that time, which was several months in advance of the invasion of Kuwait. We have been seeking to deal with it diplomatically -- and we believe defenses are important too.

2Q. It sounds like you are conceding that this is not a new threat. You may have a different approach in SDI, but it is not to meet a new or different threat.

2A. (Mr. Hadley) No, it's a threat that we've seen. But I think two things are clear. One, despite the efforts to control the proliferation, the technology is getting out. Secondly, the potent character of these missile systems, in a political rather than a military sense, is graphically demonstrated in the Persian Gulf. That was the burden of General Homer's very candid comments in that excerpt from the Aviation Week article.

3Q. Regarding the increase, you list 24 as the number of countries, by your estimation, that will have ballistic missile capability by the end of the century. Is that an increase in the number? It seems to me that the number was lower -- 20 or something -- the last time the Pentagon was making that estimate in the past.

3A. (Mr. Hadley) I don't think so. We've been talking about the ballpark numbers. I'm not sure how much we can put out in terms of detailed numbers. I don't believe it is a change in the estimate on what we've had before.

4Q. Can you tell us which countries not listed on the chart might develop this capability between now and then?

4A. (Mr. Hadley) We're in the process of getting a lot of this information declassified. I can't tell you what we have declassified and what we haven't. It's obviously something that is very relevant to this issue, something that people need and want to know. We're in the process of getting these things sorted out and into the public domain so that we can show people the real dimensions of the threat.

5Q. Ambassador Cooper, could you give us some more detail on the status and prospects for the Arrow program and the ACES follow-up? What is the relationship between these two now?
5A. (Amb. Cooper) We are negotiating the terms for the follow-up agreement. I'm sure that we'll conclude the negotiations shortly and end up in a cooperative venture, most of which will be supported by SDI funds, with the Israelis.

6Q. Can I follow on? What's the status of the program? How soon could it be deployed? And what's the difference between ACES and Arrow?

6A. (Amb. Cooper) Arrow is an interceptor which is the first step. ACES will involve smaller, more transportable interceptors. I hope to work the problem so that we can encourage the Israelis to make it "all that it can be" for themselves and for others as well. The deployment timeframe that we and the Israelis are talking about is the mid 1990s, and we're speaking of a system in this context, not just the interceptor.

7Q. You mentioned protecting friends and allies a couple of times and increasing cooperation with allies on the development of this sort of thing. Are they going to be doing technological work, or are they going to be providing money? What sort of cooperation are you looking for from allies?

7A. (Mr. Hadley) We certainly would expect that some of the allies would be pursuing their own programs, perhaps somewhat independently or in conjunction with support from us. That's something we want to encourage. We would also hope that any systems they do develop would indeed become interoperable with ours so that, in a coalition strategy, we could link up and have an effective defense across a broad area.

There are things they can do technically. We indicated on the chart some of the things such as architectural studies, concepts of approaches to these problems, computer-based test bed activities, research of various kinds. There are a range of things that can be done and avenues of cooperation. The program with the Israelis is one aspect of that.

(Amb Cooper) We have memoranda of understanding with several allied countries and have met with them. They are aware of the new direction we're taking in the program and I think it's fair to say that they are interested in a "re-look." They perceive that the world is different now from what it was a year or so ago. One of the problem areas -- the Gulf or the Middle East -- is closer to them than to us. I believe we're going to see very clearly a great spirit of cooperation among our allies, certainly in Europe.
8Q. Who did this memorandum of understanding?

8A. (Amb. Cooper) We have these with the British, the Germans, French industry, the Japanese, and others. There are several countries.

(Mr. Hadley) There is a sense of a focus on theater missile defense in the informal soundings we've already taken with some of our allies. They have responded very positively to the notion that this new emphasis is a particularly fruitful area for potential cooperation.

9Q. Two questions: one legal and one as a follow-up technical one. On the legal one, aren't you going to run up against the range limit of the short-range INF treaty with your projected upgrade? Isn't 500 kilometers the range for the area? Don't you think if it's a Patriot upgrade, it's going to be longer than 500 kilometers? What are you going to do about the treaty?

9A. [Provided later: The INF Treaty specifically excludes Anti-Ballistic Missiles and Anti-Tactical Ballistic Missiles from its provisions. Article 7, paragraph 3 of the treaty states that "if a ground launched ballistic missile is of a type developed and tested solely to intercept and counter objects not located on the surface of the earth, it shall not be considered to be a missile to which the limitations of this treaty apply."]

10Q. The intercept capabilities of Brilliant Pebbles is, as indicated in the briefing, very dependent upon the missiles coming in following the minimum energy trajectory and, therefore, having a dwell time outside the atmosphere. Why do you think they're going to be that cooperative?

10A. (Amb. Cooper) At some range that's pretty hard to avoid. If you have to power through the atmosphere over the entire range of a missile that's going a thousand kilometers or so, I think you'll find that a pretty tough task to do. So at some range, even the depressed trajectories will go above the earth's atmosphere. Brilliant Pebbles would have a shot, for example, at most of the short time of flight SLBM trajectories that we concern ourselves with.

11Q. Can I ask a follow-up? You're reducing the number of Brilliant Pebbles you need because you're not going against a mass Soviet attack.
12Q. Given that the dwell time outside the atmosphere is going to be so much less for these intermediate range ballistic missiles, isn't that going to shoot up your requirements for having enough Brilliant Pebbles on station at only one point ... (inaudible)

12A. (Amb. Cooper) Not necessarily. The real issue is whether you have time to make the decision to engage and still have the Pebble maneuver into the path of the incoming RV. It depends on the scenario, but I believe that under the current circumstances -- in the Gulf, for example -- any time a Pebble had access to missiles launched out of Iraq under the current circumstances, they would have pre-delegated authority to intercept them. So that time line could be cut very short. It is a scenario-dependent concern.

13Q. Ambassador Cooper, as a follow-up to that, if you've only got 1000 Brilliant Pebbles instead of a constellation of 4000, you're going to be spread much more thinly. Is your plan to focus more in certain hot spots of the world, or...

13A. (Amb. Cooper) That's one of the architectural parameters that we'll surely be thinking about. You could increase the density, for example, in a band that might be equatorial. That's just a technical parameter that we might look at.

14Q. I'd like to follow up with Mr. Hadley on a couple of points he made. You say that political instabilities are increasing concern about Soviet use of ballistic missiles. The Soviets, of course, now have a defensive military doctrine, so what political instabilities are you seeing that increase your concern about them using those missiles?

14A. (Mr. Hadley) There's been a lot of concern in the press about the Soviet command and control structure and whether it could be affected in some way by political instabilities such as tensions between the central government and the various republic governments. I think that's the question. The question is whether there is an increasing risk of an accidental or unauthorized launch or threat of launch that arises out of the political instability and turmoil within the Soviet Union?

15Q. So is the Pentagon now worried that political unrest in the republics could lead to insurgents taking over Soviet command and control structures?
15A. (Mr. Hadley) No, I don't think so, and we have looked at that question. The Soviets, obviously, have been concerned about that question and there are others who can talk in more detail on this. But the Soviets have a very centralized command and control structure. They have various kinds of safety devices in it. It is, nonetheless -- in spite of all such assurances, the kind of thing that one would have some concern about. One of the advantages of this kind of a GPALS system is that any residual concerns you might have are ones that you've dealt with through defenses.

16Q. You say that one of the focuses of GPALS is to provide protection for U.S. Allies and friends and U.S. troops deployed. How does that, then, affect the deployment of U.S. troops in foreign countries and the deployment of U.S. technology in foreign countries? If we're now going to take on using GPALS to defend in countries other than our own, does that mean we're going to look for basing or deployment rights in order to utilize the GPALS concept?

16A. (Mr. Hadley) No, I don't think we're talking about anything more than what we're actually seeing going on in the Persian Gulf right now. It is in part U.S. Patriots that have been deployed in Israel to deal with the Scud threat. And it's the ability of the United States, in conjunction with its allies, to be able to deploy defenses against ballistic missiles that is an element of allowing that coalition to stay together and deal with the problem.

(Amb. Cooper) I would remind you that some of the Patriots defending Israel were transported from Europe -- so they were already based with some of our allies.

17Q. How far along are the Brilliant Pebbles technologies and are they far enough along to be unveiling this new climate of rising hopes? And at what point are we talking about a new ABM Treaty?

17A. (Amb. Cooper) The technology is at this point being tested. Feasibility is being tested -- in space. The technology that we will be exploiting for both the ground-based interceptor and for the Brilliant Pebbles is common -- and many people don't understand that.

One of the innovations of the Brilliant Pebbles was to get more computing power locally onboard the interceptor so that it could do the autonomous functions that I described. It
could do its own thing. Over the past year we have been exporting that same technology to the ground-based layer. There has been an innovation, or renovation, of the ground-based layer that's taken place over the past year.

The three principal contractors on the ground-based interceptor are Rockwell International, Martin Marietta and a Hughes-TRW team. They are also three of the six contractor teams that are competing on Brilliant Pebbles. The technology is in common. In fact, the technology that they are now exploiting in the ground-based interceptor is a direct derivative of the space-based interceptor work that was going on previous to Brilliant Pebbles.

So what we are seeing is a convergence of the technology to be exploited by interceptors, based on the ground or based in space, to conduct intercepts in space. The ground-based interceptor does its thing in space. So the issue is, where do you put it when it's not actually being energized? Is it to be based on the ground or is it to be based in orbit?

In my mind, there are technical issues as to which costs less, what's more effective, which is more intrusive on the environment in terms of basing issues -- and there are questions, political issues, raised by those who have concerns about so-called weapons in space and so on.

Regarding the ABM Treaty, we are conducting experiments in more complicated ways in order to assure that we remain consistent with a strict interpretation of the treaty. If we were just engineers, we would be testing full-up prototype systems sooner than we are, in fact, programming to test them. Realistically speaking, if we stick to the schedules that I have talked about here, where we want to go to reach a deployment phase by the end of this decade, then by the middle of the decade, we will be talking about full-scale development decisions and by that point we'll be up against congressional constraints regarding the treaty in a pretty direct way.

18Q. Is ACES something that could defend for the Army's core level needs?

18A. (Amb Cooper) ACES or THAAD would be able to defend an area that's a factor of 10 to 100 times larger than what the Patriot battery can defend. So it would be an area defense and it would be able to intercept the missiles much further away from their target
than the Patriots. So the debris or, in the case of chemical weapons or whatever, the products of that intercept would be more remote from the protected area.

19Q. How mobile do you envision this to be?

19A. (Amb Cooper) As I said earlier, I think we ought to try to make these defenses quite mobile. I want to see at least one of the options for the THAAD system made compatible with the vertical launch systems that we use to launch the Tomahawk cruise missile on board our ships. We have an indigenous air defense ballistic missile defense command and control structure that moves with our Navy everywhere. If you look at the globe, most of the earth's surface is water. So one of the most transportable and movable means that we have is possibly naval. We will try to make the THAAD interceptor compatible with naval applications.

20Q. Is that a new aspect of the program?

20A. (Amb Cooper) I'm not sure it's new. We are seriously thinking about it now. We have architectural studies going. The Navy is conducting studies jointly with us. The theater missile defense program that I was talking about earlier is not an Army program. It will be done jointly with the possible contribution of all the services.

21Q. Just a follow-up for the cooperation with the other countries. Do you expect funding from other countries?

21A. (Amb Cooper) We are supporting work in other countries now, and we will look at those possibilities on a case-by-case basis. We want to work with our allies. We believe there's a reason for common interests for the new direction of the program. Our first indications are that there will be, and, hopefully, we'll find lots of ways to cooperate.
IMMEDIATE RELEASE January 30, 1991

FACT SHEET

NEW STRATEGIC DEFENSE INITIATIVE PROGRAM FOCUS:
GLOBAL PROTECTION AGAINST LIMITED STRIKES (GPALS)

The revolutionary changes taking place in the international political and security environment have served to underscore the fact that the strategic environment we will confront in the 1990s will differ significantly from that which we faced in the mid-1980s when the Strategic Defense Initiative (SDI) program was established.

For more than 12 months, the United States has been evaluating the implications of these changes for U.S. defense policies and programs, in particular the SDI program.

We have succeeded in negotiating an INF Treaty which has sharply reduced the nuclear threat in Europe. The CFE treaty, when fully implemented, will put an end to the imbalance of conventional forces in Europe. We are working hard to finalize a START Treaty which will enhance strategic stability and greatly reduce the Soviet strategic threat. As a result, although the Soviets continue to modernize, we may no longer face the threat of an unbridled competition with the Soviet Union in the area of strategic forces.

At the same time, the threat posed by accidental or unauthorized launch of ballistic missiles resulting from political turmoil is of growing concern, a concern increased by widespread ballistic missile proliferation.

As a result, the United States, our forces, our friends and Allies face a growing threat from limited ballistic missile strikes.

In light of this review, the President has directed the Secretary of Defense to refocus the SDI program to provide Global Protection Against Limited Strikes, or GPALS.

-MORE-
Such defenses could protect U.S. forces deployed overseas, U.S. power projection forces, and U.S. allies and friends -- as well as the United States itself -- against accidental, unauthorized, and/or limited ballistic missile strikes.

At less than half the size of the SDI Phase I architecture, GPALS would provide an affordable defensive capability that satisfies legitimate security concerns.

The SDI program will develop the systems and technologies that will provide options to expand our defense deployments beyond GPALS if we decide in the future that circumstances require more ambitious objectives. Factors influencing any future decision on whether to proceed beyond GPALS could include:

- Political and military developments in the Soviet Union;
- Developments in arms control talks; and
- Changes in the Third World threat.

The primary responsibility for maintaining deterrence of an intentional, massive Soviet strategic offensive strike against the United States and its allies will remain with U.S. strategic offensive forces for the remainder of the century. The purpose of GPALS is to provide protection against limited ballistic missile strikes.

A GPALS defensive system would consist of the following:

- Space-and surface-based sensors to provide global, continuous surveillance and tracking, from launch to intercept or impact, of ballistic missiles of all ranges. Our studies have shown the use of space sensors would allow for a reduction in the size, cost and number of the surface-based sensors and weapons, while increasing their performance. In combination, the sensors could provide threat information to U.S. forces, and potentially, to those of our allies and friends as well.

- Interceptors, based both in space and on the ground or at sea, capable of providing high-confidence protection to targets under attack. Space-based interceptors could provide continuous, global interdiction capability against missiles with ranges in excess of 600-800 kilometers. The surface-based interceptors, located in the U.S., deployed with U.S. forces and, potentially deployed by U.S. allies, could intercept missiles of any range and with any type of warhead. Interceptors would utilize non-nuclear, hit-to-kill technology.

-MORE-
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-MORE-
BRILLIANT PEBBLES SPACE-BASED INTERCEPTOR CONCEPT

**Brilliant Pebble**

**Tasks**
- Detect, Acquire, Track, And Engage Soviet ICBMs / SLBMs
- Boost And Post-boost Kills
- Other Applications
  - TW / AA
  - Space Surveillance
  - Tactical Data Exploitation
  - Midcourse Intercepts

**Characteristics**
- Highly Autonomous
- Distributed (Decentralized) Battle Management
- Increased Survivability Through Proliferation
- Reduced Cost And Complexity
- Midcourse Kill Capability Increases Effectiveness
BRILLIANT EYES SPACED-BASED SENSOR CONCEPT

Brilliant Eyes

Tasks
- Attack Characterization
- Adaptive Flexible Defense
- PBV Precision Tracking
  - Metric Discrimination
  - IPP
- Midcourse Object Tracking
  - Radiometric Discrimination
- Interceptor Support for BP, E²I, GBI
  - RV Cluster Tracks
  - Weapon / Target Assignments
  - In-Flight Target Updates
  - Threat Object Map
  - KII Assessment

Characteristics
- Increased Survivability Through Proliferation
- Lower Weight System
- Leverages Off Technology Being Developed In Other SSI Programs
  - Brilliant Pebbles
  - Space-based Surveillance And Tracking System
  - Ground-based Surveillance And Tracking System
- Growth Potential (Laser Radar, etc.)
Patriot ATM

Patriot ATM P³/I Concept

- Multi-mode Seeker
  - Active ka-Band
  - Greater Target Handling
  - Enhanced ECM Capabilities

- Greater Capability Against TBM With Low RCS, High Terminal Velocity And High Angle Of Attack

- Enhanced Fire Control Radar
E^2I GROUND-BASED INTERCEPTOR CONCEPT

Endo / Exoatmospheric Interceptor Concept
- Mosaic Window
- Seeker
- IMU Avionics
- Lateral Thruster
- Power Conditioner
- Roll Control Thruster
- Attitude Control Thruster
- Battery

Tasks
- Terminal Layer, Endoatmospheric Defense (Design Capable To Expand To Low Exo Role)
- Intercept ICBM RVs And SLBM RVs

Characteristics
- Uses Atmosphere For Discrimination
- Keys Off Brilliant Eyes Sensor Data
- Radar Support Enables RV Destruction Within Atmosphere
- Lightweight Kinetic Kill Vehicle
GROUND-BASED RADAR CONCEPT

**Tasks**
- Acquire, Track, And Provide Precommit For E²I Against Short Time Of Flight SLBMs
- Provide Kill Assessment And Initialization For E²I
- Provide Exoatmospheric E²I Cluster Precommit
- Provide Limited Exoatmospheric Search For Independent Underlay
- Provide Additional Phenomenology As A Hedge Against Offensive Response To Optic Elements

**Characteristics**
- Increased Survivability Through Mobility
- Rapidly Deployable
- Leverages Off Existing Infrastructure (C-130; Patriot, Air Defense Interfaces, etc.)
- Lightweight
THAAD Concept

Objective

- Develop and Test a High Endoatmospheric Area Defense Interceptor for High Altitude Area Defense Against a Tactical Ballistic Missile (TBM)
- Six Interceptor Acquisition Flight Tests
GROUND-BASED SURVEILLANCE AND TRACKING SYSTEM (GSTS)

**Mission**
- Early Attack Characterization (EAC)
  - Cluster / Clump Track And IPP
  - Handover To Directed GSTS
- Directed Attack Characterization (DAC) For Midcourse
  - Closely Spaced Object Resolution
  - Track And Discriminate RVs
  - Provide TOMs And IFTUs For Interceptors
- Reconstitution Of Lost / Disabled Space-based Sensors

**Characteristics**
- Ground Launched Probe
- 3 Color LWIR Sensor
- 3 Ground Sites / 12 Per Site
- 600 -1,200 sec On Station
ERINT - 1 Configuration

Objective

- Conduct Experiment To Determine ERINT - 1 Missile Destroy Capability Against A Tactical Ballistic Missile
  - Eight Flight Tests For Intercept And Destroy Determination
  - Test To Determine Capability Against Air Breathing Threats
**Objective**

- Conduct Experiment To Determine Israeli Arrow Missile Intercept Capability Against A Surrogate Tactical Ballistic Missile (TBM)
  - Two Interceptor Flight Tests
  - Two Propulsion And Control Tests (PCT Flight)