Unattended ground sensors have filled much of this gap in Southeast Asia, thus denying the enemy freedom of movement in unoccupied areas. The conceptualist and materiel developers are now looking at the newly developed technology for application to other threats and other environments. Unattended Ground Sensors and other STANO technology are being examined for worldwide application to meet the many threats that could face our Nation.

USE IN BORDER OPERATIONS

For instance, the role of U.S. forces in border operations is being examined to determine how STANO devices can enhance current operations. The end goal is faster, more accurate and complete detection and collection of information on real threats to the security of the border. I don't want to say that the forces engaged in border operations can always be reduced in strength as a result of STANO devices—that depends on the situation and size of the threat. But with sensors, we can save lives and obtain a real payoff if and when the border is violated. Our main battle forces would then have much more accurate, timely and complete information upon which to determine where and when the threat should be decisively engaged rather than carrying out a series of piecemeal engagements based on sketchy information which leads to indecisive but force depleting engagements. From the enemy viewpoint, the cost to violate the border would be much larger for a successful gain over our forces.

CAPABILITY IN CONVENTIONAL WARFARE

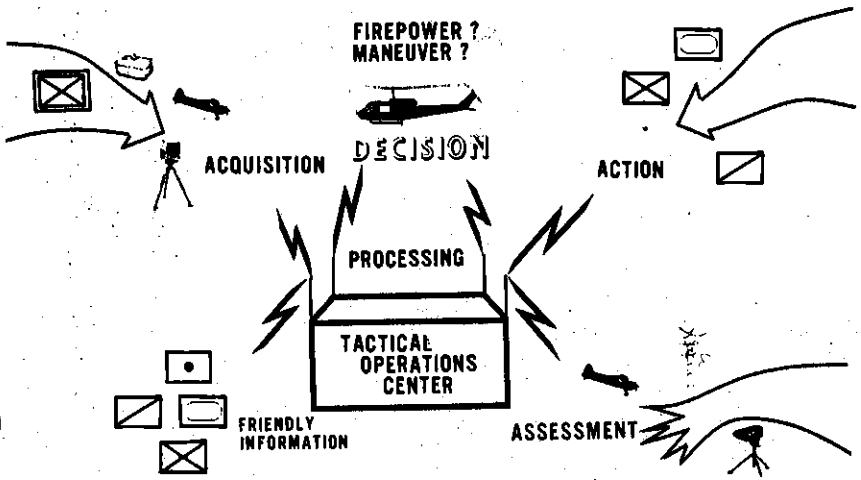
We are looking at the various uses of STANO capabilities in conventional warfare. We are now determining where we will be able to capitalize on STANO technology in carrying out the various missions that may be assigned to ground combat forces. The real potential to the Army is the effective translation of the information supplied by these STANO systems into meaningful intelligence on the enemy's activities and intentions. Getting this information to a processing point is only the first step. Then the information must be put in some form so the commander can use it.

I have been in tactical operation centers in Vietnam where we had hundereds of reports and bits of information coming in every day whether there was a small or large amount of enemy contact. Meaningless information is often times merged with the significant and it is difficult to sort the two. This often happens because there are so many people and procedures involved in the processing of these data. Nearly all of our staff and administrative actions within a division—a command of some 20,000 to 25,000 personnel with its attached units—are now done manually. This would probably amaze a modern business executive of a similar size operation because he simply couldn't afford the manpower for a manual staff and administrative system. The fact of the matter is that neither can the Army either in war or peacetime. The needed technology is just now becoming available to make these functions more efficient.

INTEGRATED BATTLEFIELD CONTROL SYSTEM

The Army expects in the next few years to take full advantage of the advances in modern communications, automation, and advanced management procedures in order to digest and handle efficiently the information that moves within the combat systems. We call this approach the integrated battlefield control system or "IBCS" concept.

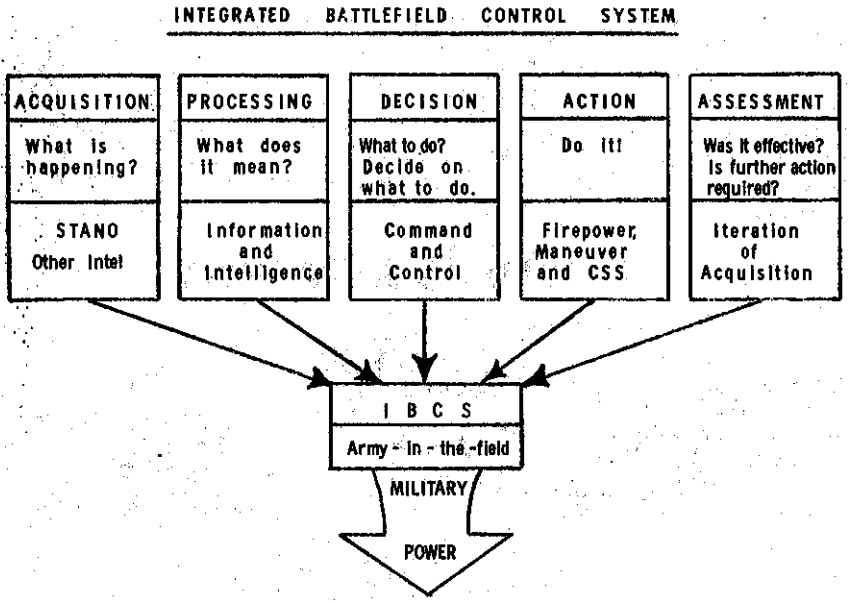
IBCS ACTIONS



Now I know that the IBCS has sometimes been confused with the electronic battlefield, the term that in the past has been used to define those efforts of DCPG. We feel that the electronic battlefield comprised of unattended ground sensor detections is just one part of our integrated battlefield control system.

Let me assure you that the IBCS is nothing really new. We have always had command post operations in the Army. In today's Army, they are essentially manual in nature and have not undergone any major changes over the past few decades. People gather information, separate it, process it and present it to the commander for a decision, a system that is cumbersome, slow and not always accurate. Commanders, especially at the higher echelons, are forced to make critical decisions based on information that may be hours to days old.

In the past decade, the Army has taken on major improvements in mobility and firepower systems that have taxed the command and control systems beyond their World War II design criteria. The rapidly expanding STANO technology has provided new dimensions to our abilities to acquire information on the enemy's activities. The Combat Developments Command and PROJECT MASSTER



are now examining requirements and technology to develop a more efficient, less costly system for the acquisition of information to determine what's happening; for the processing of information to determine what it means; for the development and selection of the best course of action to assist in decisionmaking; for the translation of decisions into actions that best employ our advanced mobility and firepower systems; and for the continual assessment of the effectiveness of our actions. This enables the application of the appropriate amount of military power at the right place and time.

Our IBCS of tomorrow is just in the concept stage now. In the future, it will be a skillful combination of men, machines, and procedures in the fields of information gathering, processing, transmission, display, and command and control which will influence the tactics, techniques, logistics, and training of our future forces. IBCS will not automate the battlefield or make automatons out of soldiers—far be it from the case. The decision logic process will rest with the professional soldier. Most of the tasks will be performed by soldiers aided by machines where possible. We still have commanders at every echelon who will assess the information and properly react to this information in a judicious manner. We are using advanced technology to conserve our most valuable asset—the American soldier.

Gentlemen, in the past three decades, many of us have seen the problems of gathering information, trying to assess the information in order to determine what is going on, and then being able to understand the full significance of it. The STANO program offers us a real opportunity to know what the enemy is doing. The system of putting this information together and furnishing it to the commander in a meaningful form—IBCS if you will, offers us an even greater opportunity to put our advanced knowledge to use today in order to design the systems that will assure victory on tomorrow's battlefield.

Gentlemen, thank you very much. That completes my testimony. Thank you.

FUTURE COSTS NOT $20 BILLION

Senator CANNON. Thank you, General.

General Fulton, why don't you pull up a chair also and we will ask some questions on this matter.

Either one of you may respond, or if both of you desire to respond, that is fine.

Are you aware of any potential cost figure for the electronic battlefield program recognizing that a figure of $20 billion was used in debate on the Senate floor recently?

General FULTON. No, sir. We see in analyzing our requirements nothing that even purports to represent $20 bill on.

As you are well aware, sir, we work within the constraint budget that are determined by the President. Where this $20 billion figure came from I haven't the slightest idea but it is so far from what the facts actually indicate, that I would give it no credence.

ESTIMATED FUTURE COSTS

Senator CANNON. Could you give us an estimate as to what you think the program might cost? Give us a conservative and a liberal estimate, if you can place some sort of limit on the program for the future.

General FULTON. Sir, it would be speculation. I think I could attempt to respond to that, if I may, in executive session.

Senator CANNON. All right. One Army estimate was purportedly given that the program cost would be $200 million a year in South Vietnam.

Now, would you explain the need for the Army to develop a tactical doctrine to support the use of sensors and their allied equipment.

General NORTON. For all of the new equipment that comes on the scene, Mr. Chairman, we go through the process of evaluating the benefits and the burdens of that new item compared to what we have.

Now this I tried to cover under the heading of the materiel test. As we get the hard data, let's say on a successful new item, we then move to optimize the techniques for its employment.

As we optimize the techniques for its employment, we then look at the broader aspects of how this new equipment or system should be brought into our present tactical doctrine, so-called tactics of employment of forces and equipments. So we go from a progression of measuring the materiel, optimizing the techniques and reexamining our tactics. It could well be, for example, that successful STANO equipment, unattended ground sensors, would change our tactics for pursuing the enemy.

I gave you one illustration of a very aggressive combat leader who might have pursued the enemy deliberately with forces on a wide front. He might have tried to cut the enemy off as he withdrew, but in this case, if you will recall, he changed our tactical doctrine by using the sensors in a sense to pursue the enemy initially and then he committed, you might say, his ground forces.

Beyond the evolution then of tactics and techniques, which exploit the new equipment officially, we then organize around these findings so the progression of developing new doctrine to go with the new equipment is a must. This is the only way we can realize the most efficient returns from the new technology.

TRAINING OF INDIVIDUALS

Senator CANNON. What is the status of the Army's program for training individuals and units to use this new equipment?

General FULTON. I think I can answer that. We have introduced in the last year and a half programs, as I indicated in my testimony, at the various enlisted courses. For instance, in the combat surveillance and target acquisition course at Fort Huachuca, we trained ground sensor operators. We have maintenance courses that are being conducted selectively in the various schools such as ordnance, signal, and the like. We have concentrated the subject of STANO so that in the last academic year it is being put into all of the branch courses for the new officers as well as into the courses for our advanced classes. We are also concentrating on individuals going to Vietnam. Generally, all officers receive a 7-hour preparation for overseas orientation on all of these devices so that we can insure more efficient utilization and eliminate the on-the-job training. They are introduced to STANO and we feel it will enhance their employment of the various capabilities when they arrive in country.

As General Norton mentioned, we have now prepared and published two manuals which concentrate on doctrine and we are in the process of preparing a text to look at the future. The first draft is now in process.

We are focusing in on this subject of surveillance target acquisition and night observation as a new activity pulling it all together and concentrating on the primary task of finding the enemy.

ADVANTAGES OF FIGHTING AT NIGHT

Senator CANNON. What has this done to the historical tradition of the Army to fight in the daytime and button up at night.

General NORTON. The advantages of being able to fight at night, I guess, are fairly obvious in looking at the history of our armed forces, Mr. Chairman. The best troops in the Indian War, the best troops in the Civil War, the best troops in most of our classic wars have had a night fighting capability, and as we examine the situation in Vietnam we see an enemy that can't afford to amass a move in daylight so we must be able to maximize our capabilities for night operation I guess more than any war that I can remember. So I would submit that the night fighting capability that we gain by addition of the STANO equipment is of a very high order. We must be able to pursue that particular kind of combat at nighttime.

As we look at the other potential battlefields of the world, I suggest here that the enemy will move at night whenever he loses control of the air, that he will move at night whenever he loses in the artillery exchange, and we will find that in many cases our ability to get on his flanks or his rear can best be done at nighttime.

SENSOR USE IN POPULATED AREAS

Senator CANNON. What is the application of sensors in a densely populated area?

General NORTON. I believe the answer to that question, sir, goes to the question of the kinds of sensors that are available. In very densely populated areas where there are noncombatants, well, combatants to be considered, it would take a very precise type of sensor. For example, we find in Vietnam where we have a seismic intrusion device that can't distinguish between friend and foe, we added maybe a magnetic device and it had the additional capability of picking up the presence of enemy weapons or ammunition. So I believe in the populated areas we will have to make a very careful choice. A combination of sensors and techniques will give us the answer.

TIME NEEDED TO COMPLETE MASSTER TESTS

Senator CANNON. How long will it take the Army to complete its test program to determine which equipment is to remain in the inventory and which is to be eliminated?

General NORTON. I will start that. We have eliminated at MASSTER some six developments where the engineering was not in the right direction. I mentioned the stabilized night sight on the tank, stabilized night sight on the COBRA, and even the Army personnel carrier night visual goggles. These approaches are eliminated but the technology behind these approaches we found had great merit. So it is well we make a distinction that we eliminate approaches and continue to pursue the most potential or highly potential technology.

As to when we will have all of the answers from the technology that is available, and tactics, techniques and organization, are sorted out. My personal estimate is on the order of 3 to 5 years.

General FULTON. I would like to approach this from another way, from test and evaluation, Mr. Chairman.

In conjunction with this test and evaluation efforts, both at CDC and within the Army staff we have an analytical effort which parallels this and we do embrace all items, not only those that are developed by the Army but those that are being sponsored and developed by DCPG, and these are put into our models and into our games and analytical studies with the purpose of insuring the items that go to MASSTER are those which we want to put actually into the field. So when you ask the specific question how long will it take us to go through the list, I think we have to be aware of the fact that technology is constantly and continuously pushing new items into the system, particularly in basic and advanced research.

We have a program which looks toward MASSTER over continuous testing, a 5-year program which treats you might say these items by generation and constantly analysing them from test as well as an analytical standpoint to select only those which we can afford to buy and those which we need, and we try and balance that off by virtue of this effort.

TYPES OF EQUIPMENT TO BE EXAMINED

Senator CANNON. What types of equipment should the subcommittee examine and which ones should be eliminated in order to make a thorough appraisal of the electronic battlefield program, in your opinion?

General NORTON. Mr. Chairman, I feel that all of the technologies have great promise. So from a technological standpoint you would probably want to be abreast of some eight or 10 technologies.

I will demonstrate. Maybe 10 years ago light intensification, so-called starlight, TV technique was running very strong. The engineering was also strong, and the products were favorable. Therefore, we moved in the direction of starlight scopes for individual riflemen and for crew served weapons and so on. More recently the consensus I believe is that thermal imogeny has been brought along at a good rate. It is showing more promise for many of the difficult jobs on the battlefield at night in bad weather, and in obscuration problems. Therefore, you would want to see these differences and any additional judgments that would help confirm our own as to the direction we should go.

These are all to the good of our Armed Forces and our country. So I don't think you would rule out any of the technologies. I believe all of them are important. Most of them have come along with some engineered products but not in all cases do you see the exploitation of the technology. So it is a pretty vast field to cover and to cover well. I don't see that any of the technologies should be overlooked.

NO DEVICE TO "SEE THROUGH" WALLS

Senator CANNON. Are there any sensors or devices that can see through solid brick walls or the equivalent?

General FULTON. Normally, the atmosphere where we could have fog and dust; we have no items that are under development to see through walls. I can say that without any reservations. The PPS–14 radar, however, can detect movement toward and away from the operator through a wall.

Senator CANNON. Are there other devices to see through foliage, other than the ones we have seen here this morning?

General FULTON. Yes, there have been some specially developed items that have been prepared to meet specific requirements stated by the commanders in Vietnam. We have a Camp Sentinel radar which is a radar on a tower. It is designed to meet the requirements in a large base complex. It is a foliage penetration radar. There is another radar that DCPG, General Deane mentioned in his testimony, which was prepared from a border surveillance standpoint to look for long distances. There are others. Some, of course, are designed to meet the requirements of the small unit, others to meet specific requirements as I indicated, of essentially base defense and border surveillance.

Senator CANNON. In your earlier answer to one of my questions did you state how long it would take the Army, through its testing program at Fort Hood and elsewhere, to determine the types of equipment desired by the Army for the late 1970's?

General FULTON. Mr. Chairman, I didn't respond specifically to that. I tried to address that on the basis that new items, new technologies would be coming up, but we do have a 5-year program. We will adopt items that we can afford to buy.

With respect to the question as to what items should the committee investigate, one of the things that we have done is to lump all of our STANO effort under specific program elements in the R. & D. area. I would submit those are areas which are looked at each year by the committee. The Chief of Research and Development, it is my understanding, must justify those programs. The items that we do put into our P–1 are all supported and these are the ones that, after scrutiny and hard test, we feel we want to buy. This is one method of looking at the total program.

I simply can't respond to the length of time as we are looking at new items constantly. Those that we put into the inventory are bought with congressional approval and are our basic effort.

UNIT COSTS

Senator CANNON. What are the unit costs of these types of items that we saw here this morning?

General FULTON. May I produce that, sir, at a later time unless we have a specific——

General NORTON. I would enter in the record the equipment that MASSTER has been testing, the smallest items, like the patrol seismic intrusion detector, now running, I believe, at about $300 a set, and some of the larger sensors, some of those perhaps that are dropped by aircraft. Unattended ground sensors run in the order of $2,000 or $3,000. The other sensors that we talked about today like infrared, radar, and so on, vary over a wide range of cost figures.

I would suggest we had better submit those.

General FULTON. I can enumerate these now.

Senator CANNON. All right.

General FULTON. The costs of the items I have discussed this morning are as follows:

RESEARCH AND DEVELOPMENT ITEMS (EXPECTED COSTS)

AN/PVS–4-Individual Weapon Night Sight, $1,400 each in quantities of 1,200.
AN/TAS–2 NODLR Night Observation Device Long Range $35,000 each in quantities of 24, $30,000 in quantities of 500.
AN/PAS–7 Hand Held Thermal Viewer $8,000 each in quantities of 1,000.
AN/PPS–15 Radar $8,500 each in quantities of 500.
AN/PPS–14 Radar $6, 500 each in quantities of 300.
AN/ASQ–132 INFANT $635,000 each in quantities of 26.
AN/AAS–29 (FLIR–HAC) $250,000 each in quantities of 100 not installed; $440,000 each in quantities of 10–25 installed.
AN–AAQ–5 (FLIR–AGC) $625,000 each in quantities of 10 installed.
AN/TPS–58 (RATAC) Radar $350,000 each in quantities of 100.

PEMA ITEMS (PROCUREMENT COSTS)

AN/PVS–2 Individual Weapon Sight $1,180.
AN/TVS–2 Crew Served Weapons Sight $2,500.
OV–1D MOHAWK Surveillance Aircraft $2.275 million.
AN/TPS–25 Radar $47,950.

Mr. GILLEAS. How many units are you talking about, in arriving at these unit costs? It is important to state whether you were buying five or 5,000?

General FULTON. Right now with the developmental items the unit cost is the programmed unit cost. But buying has not been determined nor will it be until we have run them through the test.

Some of what we have shown you here is in development and some is in production.

Senator CANNON. You state that the starlight device cost $1,180.

General FULTON. That is right, sir.

Senator CANNON. I believe that there was an insert in the Congressional Record that purportedly listed those devices at a cost of $230,000 each.

General FULTON. Yes; I saw that figure and it was not correct.

Senator CANNON. Was that just a figment of somebody's imagination or was there some color of truth to that kind of a figure?

General FULTON. I can only surmise that he might have been talking about a total buy or some aspect of the development itself. But I did when I looked at that, I could not figure out how the cost had been developed.

26 GERMAN DIVISIONS HID UNDETECTED

Mr. GILLEAS. General Fulton, referring to your opening statement I have three or four questions. You were commenting that in World War II, it was not possible to detect 26 German divisions even with 3,000 air reconnaissance sorties a day. I would like to have you expand briefly for a layman to understand how 26 divisions can hide that effectively.

General FULTON. It was a heavily forested area. As I recall the situation there were six crossing points but the Germans only moved by rail up to a given spot, disembarked from the rail cars and crossed at these points, cobblestone roads and the like they were able to go into the forest and they moved these units from various other sectors. Our intelligence had lost track of some of the units and could not place them in a specific location. We found on the morning of the attack that they had not only matched these divisions but also had sufficient supporting artillery and tanks. I should say when we talk about the air sorties this was in broken clouds and the like and vision was not too good but we simply didn't have the capability of detecting this movement and did not detect it. Our intelligence wasn't able to determine this threat but it was a very skillful and successful move by the Germans and they were able to surprise us with this force.

REQUEST FOR TOTAL COSTS

Mr. GILLEAS. One of the areas of continuing interest to the committee is the cost associated with the sensors and the other items of intelligence-gathering equipment.

I wonder if it is possible for you to provide for the record those major items that constitute the electronic battlefield program. By that I mean the sensors, night observation devices, IR instruments, and so forth. Could you provide us the research and development and pro-

curement funds that have been invested in each of these separate and distinct types or pieces of equipment?

General FULTON. I will be happy to do so.

Mr. GILLEAS. Would that be a classified or unclassified document?

General FULTON. I think these figures are all one way or another shown in the unclassified hearings.

The costs of our PEMA and RDTE for the STANO items which have procured during the period FY 67–FY 71 are shown in these charts. You will note that there were other RDTE costs during this period. These costs relate to systems under development that have not yet been procured.

R.D.T.E. FUNDING

[In thousands of dollars]

	Fiscal years				
	1967	1968	1969	1970	1971
1. Specific Army items:					
LOH helicopter, observation:					
OH-6	485	143	0	0	0
OH-58	0	0	117	0	0
OV-1 airplane observation, STOL (Mohawk)	0	[1] 184	0	0	0
RU-21 airplane, surveillance	0	768	3,810	144	0
OH-6, MOD, retrofit	0	50	0	0	0
OH-58, MOD, retrofit	0	0	0	0	0
OV-1, MOD, retrofit	0	0	0	0	0
OH-13/23, MOD, retrofit	0	0	0	0	0
O-1, MOD, retrofit	0	0	0	0	0
OV-1 component improvements	[2] 7,028	0	0	0	0
OH-6/58 component improvements	0	0	0	0	0
MK 673/MPQ-4A, maintenance kit [3]					
AN/TPS-58 (RATAC)	0	0	500	4,000	2,800
AN/PAS-6, Metascope image, IR [3]					
AN/PVS-2, night vision sight [3]					
AN/PVS-3, night vision sight [3]					
AN/TVS-2, night vision sight [3]					
AN/TVS-3, searchlight GP, 30 inch [3]					
AN/TVS-4, night vision sight [3]					
AN/VSS-3, searchlight	600	301	595	120	0
SU-50, binocular	3,750	4,070	1,353	565	588
Binocular, IR, M18 [3]					
AN/PPS-5	170	150	130	0	0
AN/MPQ-4A	525	250	15	0	0
Sandia seismic intrusion detector improved [4]					
U-8, MOD, retrofit	0	0	0	0	0
U-6A, MOD, retrofit	0	0	0	0	0
Crazy cat modification retrofit [3]					
Periscope and mount, night vision, M-48 tank [3]					
Driving binocular kit, IR filter (AN/PAS-5) [3]					
Metascope assembly, image IR (see AN/PAS-6)					
Night observation device, medium range (see AN/TVS-4)					
Searchlight, DC, 28V 100 amp., Xenon, IR [3]					
Searchlight, GP, 30 inch (see AN/TVS-3)					
AN/PSR-1, anti-intrusion device [3]					
Personnel detector, chemical	292	1,067	20	61	0
Total A(1) (in millions)	12.9	7.0	6.5	4.9	3.4
2. DCPG items, total (in millions)	20.7	30.0	21.8	9.3	10.0
3. Other R.D.T. & E. expenditures not included above are found in program elements:					
6.27.08 Combat support.					
6.27.09 Night vision investigations.					
6.37.04 Night vision.					
6.37.08 Image interpretation photographic processing.					
6.37.09 Ground surveillance target acquisition.					
6.37.10 Airborne surveillance target acquisition.					
6.37.14 Unmanned aerial surveillance.					
6.47.04 Aerial combat surveillance systems.					
6.47.05 Ground based surveillance systems.					
6.47.14 Night vision developments.					
6.47.17 General combat support.					
Total (in millions)	38.4	65.4	49.9	35.8	30.6
4. Total R.D.T. & E. program (in millions)	72.0	102.4	78.2	50.0	44.0

[1] OV-1D.
[2] Seamore.
[3] All R. & D. costs prior to fiscal year 1967.
[4] Non-Army. No R. & D. costs involved.

KEY STANO ITEM PROCUREMENT PROGRAM[1]

[Dollar amounts in millions]

Item	Fiscal year 1967		Fiscal year 1968		Fiscal year 1969		Fiscal year 1970		Fiscal year 1971	
	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Aircraft:										
LOH helicopter, observation (OH-6/58)	687	$49.9	528	$56.8	414	$41.2	600	$67.3	600	$64.2
Advance procurement, LOH		4.5		1.6						
Airplane, observation, STOL (OV-1) Mohawk	36	38.9	43	61.3	30	60.2	0	3.8		
Advance procurement, Mohawk		10.7		8.0						
Airplane, surveillance, RU-21					9	13.1	7	7.5		
Modification/retrofit		(46.7)		(21.3)		(17.7)		(13.2)		(9.1)
OH-6				2.0		6.7		.6		1.2
OH-58						.7		.1		4.1
OV-1		22.7		11.2		7.2		6.7		3.5
OH-13/23		.7		.7				1.0		
O-1		2.7		2.2		1.9		3.0		
Crazy-cat		8.5								
U-8		11.4		3.8		1.2		1.3		.3
U-6A		.7		1.4				.5		
Component improvement		(11.7)		(7.1)		(4.8)		(3.7)		(2.2)
OV-1		8.1		4.9		1.3		1.0		.5
OH-6/58		3.6		2.2		3.5		2.7		1.7
Total, aircraft		162.4		156.1		137.0		95.5		75.5
Communications and electronics:										
Binocular, infrared M18	1,155	.7	458	.3	1,879	1.4	721	.6	828	.7
AN/PPS-5 portable radar set for forward areas			295	14.3	191	7.3				
AN/MPQ-4A counter mortar radar set	19	8.1	25	9.3	5	1.5				
Air-delivered seismic intrusion detector	2,402	5.1								
AN/PSR-1 antiintrusion device	1,768	1.0								
Noiseless button bomblet					100,000	1.1		1.0		
DCPG projects				49.6		37.5		14.7		78.0
MK-673/MPQ-4A, maintenance kit			11	.5			10	.5		

RATAC field artillery radar set—AN/TPS-58							16	8.3	8	4.0
AN/PAS-5 driving binocular kit, with infrared	100	.3	2,200	1.1	2,700	1.6	1,200	.5		
AN/PAS-6, metascope assembly, image, infrared	4,638	1.5	4,483	1.2	4,500	1.1	1,160	.3		
AN/PVS-2, night vision sight individual served weapons	5,970	18.3	5,060	13.9	6,132	12.8	2,480	3.4	1,200	2.6
AN/PAS-4, weapons, sight infrared			600	.6						
AN/PVS-3 night vision sight, miniaturized	720	3.0	2,350	6.1	2,296	6.9				
AN/TVS-2, night vision sight, crew-served weapons	3,840	14.9	5,278	14.1	3,180	11.8			1,200	3.0
AN/TVS-3, searchlight, GP 30-inch, wheel mounted	70	2.7	140	5.8	46	2.6				
AN/TVS-4, night vision sight, tripod mounted	350	3.3	630	5.0	469	2.8	1,200	3.5	700	4.2
AN/VSS-3, searchlight, Xenon, 1KW			120	.8	590	2.6	820	3.3	463	1.8
SU-50 binocular, electronic (formerly AN/PAS-5)									1,200	2.4
Searchlight, DC, 28V, 100 amp., Xenon type, infrared filter AN/VSS-1	547	2.6	1,771	8.3						
Total, communications and electronic equipment		61.5		130.9		91.0		36.1		96.7
Other support equipment:										
Duel blade						107.3		28.3		
Sandia seismic intrusion detector					90	1.7				
Total, other support equipment						109.0		28.3		
Ammunition:										
Bomblet, button	13,625,000	22.3	31,700,000	53.2						
Mine, gravel	11,250,000	59.5	26,150,000	82.6						
Total, ammunition		81.8		135.8						
Total, PEMA		305.7		422.6		337.0		159.9		172.2

[1] The data reflected in this tabulation represents procurement programs for the line items for each program year. Some of the line items include other system costs besides STANO which cannot be identified from source documents.

Source: Fiscal year 1967, DD Form 1416 dated June 30, 1969; fiscal years 1968–70, DD Form 1416 dated June 30, 1970; fiscal year 1971, President's budget.

TOTAL STANO COSTS

Mr. GILLEAS. I would like to refer back to the cost chart you had. It showed certain costs that were associated with DCPG and certain Army costs. I want to make sure I understand correctly, that the Army's investment in STANO through fiscal year 1971 is $1.7 billion of which DCPG has funded $698 million.

Would that be correct?

General FULTON. Yes, that is included in the $1,700 million. This is the Army investment for both R. & D. and PEMA in that period of time.

Mr. GILLEAS. Over the years DCPG has returned substantial sums of money to the Army that were not required by DCPG. What is the amount of those funds, sir?

General FULTON. The funds that were quoted by General Deane I can address.

The O. & M. funds in fiscal year 1970, $7.7 million were withdrawn from the Army DCPG budget; $3.7 million was applied to funding Southeast Asia supplies and spare parts, and $4 million was applied to Project 703 to meet a portion of the expenditures reduction target.

Mr. GILLEAS. This is for fiscal year 1970?

General FULTON. This was fiscal year 1970.

Mr. GILLEAS. What is your budget in that area, $221 million total?

General FULTON. Just DCPG figures. That money, if I understand your question, those figures were returned by DCPG.

Mr. GILLEAS. Yes. What DCPG returned to you. Are they included in this chart or not? I would presume they are not.

General FULTON. They are not.

Mr. GILLEAS. Well in fiscal year 1967, 1968, 1969, and 1970 prior years, what is the total that DCPG has returned to the Army?

General FULTON. The figure in 1967 was $7.5 million. In 1968, as reported by DCPG was $68.2 million. These are PEMA funds. And fiscal year 1969, $172.8 million. And in fiscal year 1970, $94.1 million, PEMA.

Do you want to track the OMA as well?

Mr. GILLEAS. I recognize that they are a lesser amount. I am interested in your tracking the PEMA as best you can as to what the Army did with the money returned by DCPG. The thrust of my question is why don't you take the unused funds from prior years and come in with a reduced STANO appropriation request for the coming or the future fiscal year.

General FULTON. I can only say, Mr. Gilleas, that the way the Army has handled this funding has not been as you suggest, to apply it to future years. The application of the funds have been against programs. As I understand it from the program director, any reprograming that has taken place has been done with OSD program approval and I am informed that all reprograming has been reported in accordance with the procedures to Congress.

We are presently making a determination in detail as to how these moneys in prior years have been applied and utilized.

Senator CANNON. You may submit that for the record.

FUNDS, BY APPROPRIATION, RETURNED BY DCPG TO THE ARMY DURING FISCAL YEAR 1967–71

[In millions of dollars]

Appropriation	Fiscal year—			
	1967	1968	1969	1970
R.D.T. & E.	0	0	0	2.5
PEMA [1]	0	0	156.8	77.9
O. & M.	0	0	5.3	7.7

[1] In addition to the appropriated DCPG funds, $93,700,000 was applied to the fiscal year 1967 program and $46,800,000 to the fiscal year 1968 program by transfer of funds from other Army programs.

The above tabulation is based on programs approved by Congressional actions, reported on DD Form 1414, and reflects the net amounts returned from funds made available in the applicable program year. Funds in the FY 71 DCPG program which may be made available for other purposes cannot be finalized until 30 June 1971.

These returned funds were used by the Army as follows:

Operations and Maintenance, Army.—In FY 1969, $5.3 million was withdrawn from the Army DCPG budget and applied to SEA related programs. In FY 1970, $7.7 million was withdrawn from the Army DCPG budget. $3.7 million was applied to funding Southeast Asia (SEA) supplies and spare parts, and $4.0 million was applied to Project 703 to meet a portion of the expenditure reductions target.

Research, Development, Test and Evaluation, Army.—$1.4 million of FY 1970 RDT&E funds were reprogrammed to support of the Army Security Agency ($.5 million) for ground surveillance investigation and ($.4 million) for other related programs. The remaining $1.1 million was applied in unspecified prorata amounts to other high priority programs.

Procurement of Equipment and Missiles, Army.—PEMA funds were applied to other items in the applicable program year, as follows:

	Millions
Fiscal year 1969:	
UH–1 helicopter	$10.1
AH–56 helicopter	5.6
AH–56 (advance procurement)	8.9
Component improvement	6.4
Personnel carrier M113A1	13.9
Truck, 5-ton	8.7
AACOMS, high capacity (48/96)	22.7
AACOMS, radio tropospheric scatter system	2.5
Ammo—Items less than $500,000	6.3
Rifle, M16A1	21.6
Applied to finance subsequent year programs	50.1
Total	156.8
Fiscal year 1970:	
ADPE	42.9
Border sites	2.1
Truck, ¼-ton	9.9
Truck, 5-ton	12.7
Truck, forklift 4,000 pounds	3.3
RATAC	7.0
Total	77.9

The money that was returned to Army control was not applied to finance subsequent year DCPG-related expenditures because:

RDT&E appropriations for each fiscal year are authorized and approved for specific budgetary requirements. There is no provision for using these funds in subsequent years for new requirements without reprograming and Congressional approval. Funds provided from program reductions are therefore reprogramed for unforeseen requirements and program changes which require high priority funding in the current fiscal year. This utilization of funds in the year for which they were

budgeted is in consonance with the expressed desire of the Congressional Committees to reduce the year-end obligated and unexpended balances.

PEMA funds returned to Army from DCPG items have been used for two purposes.

To finance urgent unprogramed requirements which develop subsequent to submission of the budget to Congress. The major portion of the excess DCPG funds were applied as offsets to urgent unprogramed PEMA requirements as reflected in reprograming actions processes in accordance with established procedures.

To provide funds to finance subsequent year programs approved by Congress in lieu of new appropriations. Any funds/program returned during the current year and not reapplied during that fiscal year are treated as recoupments to finance subsequent year approved programs and reduces the appropriation requirement for the subsequent fiscal year.

MAJOR STAND ITEMS

Mr. GILLEAS. In addition you were going to provide us a list, General, which would show the major items of equipment associated with STANO. Hopefully that list would sum up to the cost totals you have given us. I recognize there might be some modest miscellaneous category to arrive at the total. Would not the list of STANO items come up to the cost totals you have prevented?

General FULTON. Yes, they would for R. & D. and for PEMA and we could so submit.

FUTURE ANNUAL STANO COSTS

Mr. GILLEAS. In response to the chairman's previous question. What do you foresee in the years ahead as being the cost of the annual Army STANO program?

As the chairman mentioned, there has been an estimate given of $200 million annually in South Vietnam relative to the Army effort there. What is the best financial figure you can give us as to the Army's future funding requirement?

General FULTON. I would estimate, sir, that between $125 and $150 million for both R.D.T. & E. and PEMA would adequately cover our programs for the out years.

Mr. GILLEAS. $125 million a year?

General FULTON. Yes, sir.

Mr. GILLEAS. A combination of R. & D. and PEMA?

General FULTON. Yes.

I would say between $125 and $150 million. I would like to put in that parameter.

Mr. GILLEAS. Would this program enable the Army to develop and to purchase those items of electronic battlefield equipment that the Army feels would be necessary in the out years or advisable to have with combat or potential combat units?

General FULTON. I think I am addressing, I feel that I am addressing what we see as an era of let us say peacetime normal developments with a stretchout because we do have to compete with the other high priority requirements. If in the event we had an item which we felt would give us tremendous advantage there would be a difference. In other words, if we had an accelerated program and we wanted to buy the Army out in 1 or 2 years as opposed to a 4- or 5-year buy time to meet the Army's authorized level. I hope I have responded to your question, sir.

COSTS OF AUTOMATED BATTLEFIELD CONCEPT

Mr. GILLEAS. Yes. I would like to have you expand on it a little more, specifically. Do you feel that it will permit implementation of the automated battlefield concept as General Westmoreland has referred to it, within a reasonable time frame of the mid-1970's or shortly thereafter?

General FULTON. The figures that I have given you are expressly for STANO. It does not include such things as the TOS or the TAC FIRE which are not considered to be STANO. Those would be in addition to the STANO items that we are addressing.

Mr. GILLEAS. What would those costs be approximately?

General FULTON. I am really not capable to answer that question.

(The Army subsequently furnished the following information.)

The Integrated Battlefield Control System (IBCS), formerly the "Automated Battlefield", is currently in the concept formulation stage. The system is intended to integrate into a comprehensive whole the tactical information management needs of the field commander. Several on-going programs for Tactical Automated Data Processing systems are to be integrated into the overall concept, such as TOS, TACFIRE, TSQ–73, and SAFOC. Others, such as TACSINC, which is still in concept formulation, have not reached the stage where valid estimates can be prepared; when these IBCS components become adequately defined, life cycle costs will be identified and programmed. (Additional classified information was furnished separately to the committee.)

SENSOR REQUIREMENT IN EUROPEAN-TYPE ENVIRONMENT

Mr. GILLEAS. What do you foresee as being the realistic requirement for sensors and other electronic battlefield type of equipment in a European type of environment.

General NORTON. Mr. Gilleas, the conceptional approach, I guess, would have to come first and we certainly can't reduce that to dollars and cents at this time.

If you visualize the situation along the border, which if you remember one of my charts addressed the question of border security where there were extended frontages, bad weather, night, and with no desire on our part to keep a lot of troops on the border. I feel certain that a good number of the sensors that we have found so useful in Vietnam are going to be equally useful, in some cases more useful on border surveillance in Western Europe. This is known as the waiting and watching period when any sign of irregularity in the enemy behavior would be important to our effort. Assuming that war is started, I think you can see where many sensors that we have been using successfully in Southeast Asia would be extremely useful in our rear areas where the enemy is able to do a lot of damage by, you might say, clandestine or carefully concealed movement.

As to the countering of larger forces on the battlefield, here in conceptional terms, I believe, we can use many of our sensors to give us the advantage of precise timing for the effective use of our firepower, and in some cases for actual ground maneuver. Getting this type of concept reduced to the specifics of tactics, techniques, and organization is what we are busy doing at this time. I don't believe it is possible to give you any even general figures on cost.

POSSIBLE DUPLICATION

Mr. GILLEAS. One of the areas that has interested me—and I certainly have supported the development of sensors and these other types of equipment—is whether there is any central focal point for development within the Army? I have received the impression, for example, on night observation devices, that some of the laboratories have gone forward with ideas they thought would be helpful and have developed three or four pieces of gear or more of a particular type.

What can the Army do to eliminate the possible or potential duplication in this area or do you feel that any has existed?

General NORTON. I can categorically say we run the competition as early as possible to avoid any duplication or waste. I can only speak for my experience at Project MASSTER and that is to say that we have eliminated any item that was not in favor of the soldier, the commander, if you will, on the ground. We have eliminated any items where there was any question about the burdens being out of proportion to the benefits. The whole idea, in other words, is to have the competition at the earliest possible date, even before the items have taken in finished form. Ideally we would like to complete the technology. Ideally we would like to complete the drawings before anybody has even cut metal, but we will also complete the items just as soon as they are available.

Mr. GILLEAS. Would you comment on the potential problems of duplication also, General Fulton?

General FULTON. Yes.

I think, as you indicate, there is some competition between the various laboratories. There are several viewpoints on this. One is that though this competition, and particularly in the basic and implied research, it isn't widespread but there are one or two labs that are within or have an overlapping interest that the most promising technologies are turning out. Money is made available to them for exploratory development and then selections of technologies to be pursued have to be made. This is really a basic problem of the Commanding General AMC and I happen to know from personal conversations that it is always a matter of concern to those commanders. You get the philosophic arguments as to how closely you control this basic and applied research and how much do you allow it to go unfettered so that you can get major breakthroughs.

But I do know that both the Chief of Research and Development and the CG, Army Materiel Command, have to monitor this very closely so that it does not get out of hand.

Mr. GILLEAS. Well, is your answer that you feel there has been duplication in this area or not?

General FULTON. It has been in some cases a modest duplication, Mr. Gilleas. I can't say that it is a large scale and cause for concern. Most of these laboratories are relatively restricted to specific functional areas and within the laboratories they do slightly overlap.

ELECTRONIC BINOCULARS

Mr. GILLEAS. One of the items I had in mind as an illustration was electronic binoculars which the MASSTER people decided was not a worthwhile item to be given to the Army units.

items are tested under CDC Experimentation Center, Fort Ord, where instrumentation of a very high order is required. MASSTER doesn't have this type of instrumentation capability and Army doesn't intend to put anything more at MASSTER than, you might say, the most austere position, location type instrumentation same, some instrumentation for gathering data. But there is quite a difference between CDCEC and Fort Hood. So we see a more efficient pattern of doing highly instrumented tests at CDCEC like we have always done and do what you might call the field test of combat arms units, operating in larger formations at Hood. So the two are to complement each other to the Army's advantage.

As to the control, the way the charter of MASSTER is written, CDC has a major role in providing guidance to PROJECT MASSTER. Most of the tests that are concerned with tactics, techniques, and organization, with the guidance derived from headquarters CDC. And that is a pretty finite degree of control.

MOHAWK

Mr. GILLEAS. You mentioned, General Fulton, the OV–1D as being a new improved MOHAWK. Can we discuss the mission of the OV–1D in open session and some of the actual conditions of these aircraft? I want to explore the data link situation.

General FULTON. I would like to defer that to the closed session, if I might, Mr. Gilleas. I can generally state from the standpoint of its mission it is normally found in the aerial surveillance company, which is a corps surveillance unit. Its missions are normally tasked by the corps commanders in response requests to by the division commander for a wide area surveillance. As you know, it has three capabilities which can be used and the problem of returning the information to the using agency or the using command is wrapped up in your question with respect to the data link which I would like to address later, if I might.

TOBRA PROGRAM

MI. GILLEAS. All right. One of the things the Army has under development is an assault team concept, which I understand is to take the COBRA helicopter and put a TOW missile on it. The Senate Armed Services Committee has been reviewing in some detail the CHEYENNE which programwise, of course, is still very much an ongoing program. I understand there may be a significant amount of funds associated with this TOBRA program. The question is why should the Army be investing sizable sums of money in analyzing the COBRA with the TOW missile on it when presumably the CHEYENNE would perform these missions in a much more acceptable fashion?

General NORTON. That question really has to be addressed to the Army General Staff. I suggest perhaps the ACSFOR. From my own knowledge of what we are trying to do here is that we are trying to have a flexible response to different kinds of targets that we are going to encounter on different battlefields and if you go from the low-intensity type targets we have in Vietnam to targets in higher intensity environments, it is probably true that you are not going to want to put that much of a weapons system represented by the CHEYENNE on the smallest targets.

So for a much reduced investment with an improved COBRA, you can take out a lot of low-order targets without exposing an expensive system and you do have the spectrum of warfare to consider. It is also, I guess, a question of what will be the best mix of small gunships and large gunships for high- or mid-intensity engagement. So at Combat Developments Command we are looking at the different tactics and techniques for using either system and when we really have the measurements of combat effectiveness, vulnerability, survivability of each system, we can then pick the best mix.

Mr. GILLEAS. There have already been studies. When Congress approved the CHEYENNE program there was already existing Army studies that indicated that the capability of the COBRA in mid-intensity or European type of environment was not the greatest.

General NORTON. You are quite right.

Mr. GILLEAS. That was one of the primary reasons for going forward with the CHEYENNE and the reason I brought it up today. As I understand it the air cavalry combat brigade was going to be testing ultimately at Fort Hood under PROJECT MASSTER so I thought it would be under your jurisdiction. I believe there was some $7 million next year that was going to be allocated for this program. The research, and development costs associated with putting the TOW on the COBRA are not insignificant. As I am sure you gentlemen know they are quite substantial. I would like for the record to show, if the chairman agrees, that you would expand on the requirement to proceed with this TOBRA so long as the CHEYENNE program is still alive. If the CHEYENNE program is not alive, then, I would think there would be more justification for the TOBRA.

Senator CANNON. If I understand your answer correctly, General Norton, you are not the proper witness to testify to that matter; is that correct?

General NORTON. I suggest, sir, the best evidence should come from the Assistant Chief of Staff for Force Development, but based on my own knowledge of the programs I offered the best answer I could.

(The Army subsequently furnished the following information:)

The ACSFOR has provided me with the following information:

The Army's number one requirement for new equipment is an attack helicopter capable of killing tanks and operating at night. The CHEYENNE was designed to meet this requirement. With termination of the CHEYENNE production contract the Secretary of the Army determined it prudent to initiate action toward acquiring an interim capability in the earliest practicable timeframe against this urgent requirement.

It was determined that the standard COBRA Attack Helicopter could be retrofitted with the TOW Missile to provide this interim antitank capability. However, the installation of the TOW on the COBRA does not meet the night fighting capability and stretches that aircraft to the limit of its load carrying capacity, without providing the range, speed, load carrying capacity and agility that will be attained by the CHEYENNE. It is anticipated that the limited number of COBRAs (approximately 200) proposed to be retrofitted will have continued use in the Army inventory after the introduction of the CHEYENNE.

Although excellent progress is being made in the successful development of the CHEYENNE, adaptation of the TOW missile to COBRA continues to be the least risk approach to satisfying our immediate gunship requirement and permits an orderly approach to completing development and procurement of an AAFSS. It also extracts maximum combat value from on-hand COBRAs. (Additional classified information was furnished separately to the committee).

items shown on the left; then we examined the items in their basic organizations as indicated in the center and finally, we evaluated the new systems operating as part of a large organization.

In the upper lefthand corner under materiel test you see three small hand-held sensors based on three different types of technology, the infrared and the radar and the seismic intrusion technology. After these have been individually running out we bring them together in a fairly small sample but sufficient to test their value as part of a company combat system.

In the next grouping you see all of the seismic intrusion detectors that were available in this time frame, and they are either used on the ground mode or air delivered mode, and after testing these individually we brought them together in what we call the phase III test, which is really a DCPG total system called the Bass III test.

In the lower lefthand corner you see the two airborne systems, the COBRA, and the INFANT. As these are tested individually we gather data. At Fort Hood this month we are running a materiel systems test of the airborne systems. We proceed beyond the middle frame here, and we then see a logical progression where in battalion, brigade and division structure we test all of these candidates that succeed earlier. MASSTER I and II are completed. MASSTER III will take place next spring.

A new system may easily pass the first two tests but fail in the third test because it can't be integrated into the overall ground combat force without an adverse impact on other critical systems.

FOUR BASIC CHARACTERISTICS

MASSTER tests have four basic characteristics that distinguish them from other testing and experimentation currently employed by the Army to develop and refine materiel and combat systems.

General NORTON. I think they would all agree on that.

Mr. GILLEAS. Would they also agree that the sensor system has resulted in reduced U.S. casualties?

General NORTON. Yes, sir.

SENSORS PERMIT INFLICTING GREATER CASUALTIES ON THE ENEMY

Senator CANNON. General, what was the commanders reaction with respect to whether this has permitted us to inflict greater casualties on the enemy?

General NORTON. The answer to that I would say is yes, definitely yes. You know we have used artillery fires, for what we call harassing, and interdiction roles, down through the centuries. Our Army artillery has always tried to take advantage of additional firepower and even the weight of our ammunition to keep the enemy off balance, to keep him from moving and infiltrating. Quite often these fires are done by map study, but you might by low-grade intelligence or whatever information we had to plan these fires. But now that you put the sensors in the enemies rear and along possible avenues of approach to our position you automatically got a higher degree of targeting information than we have had before. It is clear as can be that this is a big advance over our use of harassing and interdictory fires in previous wars. So I know this is a defense plus.

You heard from General Williamson and you can well hear from other officers that wherever the enemy masses and makes a head on assault on our positions and we are trying to cover maybe three or four avenues, the sensors just greatly magnify your chances of picking up that effort, and to mass and concentrate all your firepower on that area. So there are many examples of either punishing him in the infiltration mode or in the direct attack mode.

Senator CANNON. Do we have any information on whether the North Vietnamese have been using sensors against us?

General NORTON. I couldn't cover that in open session, Mr. Chairman.

Senator CANNON. Very well. That will conclude the hearings in open session and we will now go into executive session.

(Whereupon, at 12:20 p.m. the hearing proceeded into executive session.)